International Conference on Sustainable Agri-vironment Education, Entrepreneurship, and Community Development
14-17 March 2023 | Mariano Marcos State University, Philippines

2023 ICSAVED

CONFERENCE PROCEEDINGS

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The **2023 International Conference on Sustainable Agri-vironment Education, Entrepreneurship, and Community Development (ICSAVED)** highlighted Industrial Revolution 4.0 as a critical factor in establishing a borderless education, entrepreneurship, and communitiy development for sustainable agriculture and environment. The conference also provided avenues to discuss the current state and potentials of agri-vironment education and entrepreneurship in the era of Industrial Revolution. Serving as resource speakers were experts of futures thinking, sustainable urban development, agricultural innovation, and city-university partnerships for sustainable development initiatives. The conference was attended by about 100 educators, researchers, and development practitioners in the fields of agriculture and the environment attended the conference.

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EXECUTIVE SUMMARY

The Fourth Industrial Revolution (IR 4.0) has largely shaped how people live, learn, and work today. IR 4.0, with its technological innovations, has transformed many societies, industries, and economies. However, the impacts of IR 4.0 on agriculture and the environment are multifaceted. There are benefits and opportunities as well as challenges and risks.

In the 2023 International Conference on Sustainable Agri-vironment Education, Entrepreneurship, and Community Development (ICSAVED), IR 4.0 was highlighted as a critical factor in establishing a borderless education, entrepreneurship, and community development for sustainable agriculture and environment. The 2023 ICSAVED was held on March 14-17 at the Center for Flexible Learning of the Mariano Marcos State University (MMSU) in Batac City, Ilocos Norte, Philippines. It was organized by the Philippine Association of Agri-vironment Educators and Entrepreneurs (PASSAGE), Inc. and MMSU with support from the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and Leads Agricultural Products Corporation.

Themed "'Sustainable Borderless Agri-vironment Education, Entrepreneurship, and Community Development Through Industrial Revolution 4.0," the conference explored the current state and potentials of agri-environment education and entrepreneurship in this era of Industrial Revolution. Resource speakers were experts of futures thinking, sustainable urban development, agricultural innovation, and city-university partnerships for sustainable development initiatives. Prof. Shermon O. Cruz, the keynote speaker, is the Director and Chief Futurist of the Center for Engaged Foresight. In his keynote address, Prof. Cruz urged conference participants to use the future as an asset to invent the future the way they want it to be. This can be done through strategic foresight, which utilizes a range of competencies, tools, methods, and frameworks.

Plenary speakers were Sr. Dr. Siti Aekbal Salleh and Dr. Rostam Yaman of Universiti Teknologi MARA, Malaysia; Dr. Glenn B. Gregorio of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA); and Dr. Nuttavikhom Phanthuwongpakdee of the Educational Partnerships for Innovation in Communities-Network. Dr. Salleh highlighted the need to protect the environment. She also shared a case study that utilized geospatial technology in multi-hazard assessment. Dr. Rostam, on the other hand, discussed some policies of the United Nations that are related to sustainable urban development and introduced green building for sustainable urbanization. Meanwhile, Dr. Gregorio emphasized transformation through agricultural innovation. He gave several pointers to strengthen the academe-industry-government

interconnectivity. Lastly, Dr. Phanthuwongpakdee talked about the Educational Partnerships for Innovation in Communities (EPIC) model. He mentioned how the model was adopted in Asia as well as the mutual benefits gained by the academe and target communities from the partnership.

For the parallel sessions, 34 papers were presented along the following tracks: 1) Data Science, Technology, and Innovations in Agri-vironment Education and Entrepreneurship; 2) Agriculture, Fishery, and Environmental Conservation, Protection, and Management; 3) The Futures of Agricultural Education in the Era of Industrial Revolution; and 4) Challenges and Opportunities on Scientific and Technological Entrepreneurship and Governance. Moreover, there was an organized panel from the Bulacan Agricultural State College. Titled "Agriculture from the Farmers' Perspective," the panel reflected the farmers' perspective on community development efforts through the evaluation of government projects.

Three papers were recognized as best papers during the conference. The paper on "Biomass, Carbon Stock, and Sequestration Assessment of Rizal and Paco Parks in Manila, Philippines" authored by Wencelito P. Hintural of the Department of Environment and Natural Resources-Ecosystems Research and Development Bureau received the 3rd Best Paper Award. The paper on the "Current Condition, External Factors, Potentials, and Challenges of Cacao Entrepreneurs: Impetus for Sustainable Rural Development Framework in Lagawe, Ifugao, Philippines" by Client William M. Malinao of Ifugao State University was conferred the 2nd Best Paper. Finally, the paper on "Mangrove Reforestation, Protection, and Conservation Initiatives: The Case of Sorsogon Bay Rompeolas, Philippines" by Cyra Mae R. Soreda and Ryan V. Dio of Sorsogon State University bagged the Best Paper Award.

Furthermore, Dr. Josefina T. Dizon and Dr. Cely S. Binoya were named the 2023 Outstanding Educator and Outstanding Researcher, respectively. Dr. Dizon was recognized for her exemplary teaching performance and contributions to teaching, research, and extension. On the other hand, Dr. Binoya received the Outstanding Researcher Award for her noteworthy contributions to research and development in the fields of agriculture, fisheries, and environment.

The 2023 ICSAVED provided an avenue for learning and sharing of knowledge and experience. About 100 educators, researchers, students, and technical staff participated in the conference. They came from 27 institutions across 15 regions in the country.

OPENING PROGRAM

WELCOME MESSAGE

Dr. Maria Ana T. Quimbo
President, PASSAGE
Professor, UPLB

Isang mapagpalayang umaga sa ating lahat! I'm sure we are revitalized and re-energized from yesterday's conference tour. It was a full-packed schedule but I'm sure everyone had so much fun! Thanks to Dr Marlowe Aquino for making the arrangements. Many thanks, too, to the hardworking volunteer-students for accompanying us and making sure that everyone had a great time yesterday. And to everyone, thank you so much for being with us today in this beautiful campus of Mariano Marcos State University (MMSU)!

First of all, I would like to acknowledge:

- Dr. Shirley Agrupis, president of MMSU;
- Mr. Shermon Ortega-Cruz, our keynote speaker, who is joining us online all the way from Australia;
- Dr. Glenn Gregorio, director of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture or SEARCA;
- Our other notable plenary speakers: Associate Professor Sr. Dr. Siti Aekbal Salleh from the Universiti Teknologi MARA, Malaysia; Associate Professor Dr. Rostam Yaman also from the Universiti Teknologi MARA; and Dr. Nuttavikhom Phanthuwongpakdee, EPIC-Network Asia Coordinator, Thammasat University, Thailand; and
- Fellow educators, researchers, colleagues, and friends representing various regions in the country from private and government organizations as well as higher education institutions.

It is my great pleasure to welcome all of you to the 2023 International Conference on Sustainable Agri-vironment Education, Entrepreneurship, and Community Development.

Just a little bit of history — this year, we are celebrating the 42nd Founding Anniversary of the Philippine Association of Agri-vironment Educators and Entrepreneurs or PASSAGE. PASSAGE was born in 1981 under the stewardship of its founding President, Dr Fortunato Battad who was then the President of Pampanga Agricultural College, now known as Pampanga State Agricultural College in Magalang, Pampanga. PASSAGE was organized as a non-stock, non-profit, non-partisan national organization of educators, environmentalists, entrepreneurs, researchers, extension workers, administrators, policy makers, practitioners, students, and institutions involved in agriculture, environment, and entrepreneurial education. You can read a short history of PASSAGE including its past and present set of officers on Pages 78 - 82 of our souvenir program.

Over the years, PASSAGE biennial conferences have been hosted by various higher education institutions and our partner organizations all over the country. This year, we are indeed honored and privileged to have as our institutional partner and host, the Mariano Marcos State University (MMSU) through the generous assistance of our Vice President (VP) at Large, Dr. Marlowe Aquino, who is also a professor here at MMSU. It has been the tradition of PASSAGE for the VP at Large to serve as the conference host and chair of the conference program committee. Once again, I would like to take this opportunity to extend my heartfelt thanks and gratitude to MMSU for this important partnership.

This year's theme "Sustainable Borderless Agri-vironment Education, Entrepreneurship, and Community Development Through Industrial Revolution 4.0" is most relevant in the midst of the unprecedented changes and disruptions that have affected how people learn, live, and work. Technological change and the fusion of evolving technologies are the driving force that propels this transformation in the dynamic work environment. The agriculture industry, specifically the teaching of agriculture in higher education institutions, is not exempted from the impacts of these innovations, transformation, and disruptions. More than ever, the important role of higher education institutions is recognized in this conference in shaping and preparing the workforce to adapt to the changing nature of the workplace.

Five years since our last biennial conference in 2018, the 2023 ICSAVED was conceptualized to offer valuable information and tackle a wide gamut of interesting and challenging topics through research results in agriculture education, environment, entrepreneurship, and community development for exchange of ideas, innovations, and best practices through the carefully-reviewed academic papers and an organized panel. Providing a richer discourse are papers under the various sub-themes that focus on data science, innovations, and futures thinking. The restrictions brought about by the pandemic did not hinder like-minded people to gather and engage in dialogues about translating research breakthroughs into manageable solutions to achieve the objectives of this conference. It is also an exceptional opportunity to renew old acquaintances, make new contacts, establish networks, and build partnerships across geographical and disciplinary borders.

At PASSAGE, we are proud to say that the interdisciplinary and multidisciplinary study of agri-vironment education and entrepreneurship enabled us to pool in this conference, innovative research undertakings from various disciplines, ranging from the natural sciences, environmental and life sciences, to social sciences, among others, to collaborate and work together in generating smart solutions to counter the problems facing agricultural education, environmental integrity, and sustainability.

Once again, my heartfelt thanks to the officers, faculty, staff, and students of MMSU, our distinguished keynote and plenary speakers, paper presenters, researchers, and my fellow officers and members of the PASSAGE Council for your graciousness and generous support to make this event possible. I'd like to take this opportunity to introduce them now. Starting off with:

- Dr. Marlowe U. Aquino (MMSU), VP at Large;
- Dr. Lynlei L. Pintor (Ecosystems Research and Development Bureau, Department of Environment and Natural Resources), VP for Luzon;
- Dr. Gilda G. Membrillos (Cebu Technological University), VP for Visayas;
- Dr. Alexander N. Morados (Camiguin Polytechnic State College), VP for Mindanao;
- Dr. Almira G. Magcawas (Cavite State University), Secretary;
- Dr. Ruth A. Ortega-Dela Cruz (University of the Philippines Los Baños [UPLB]), Treasurer;
- Asst. Prof. Ephraim C. Quiñones (UPLB), Auditor;
- Asst. Prof. Leah V. Indon (Bulacan Agricultural State College), Council Member;
- Ms. Anecil Q. Pagutayao (Central Mindanao University), Council Member;
- Dr. Carolina P. Santillana (UPLB), Council Member;
- Dr. Rowena DT. Baconguis (UPLB), Council Member; and
- Last but definitely not the least, Ms. Stella "Chie" Concepcion R. Britanico, our hardworking, very diligent, and very efficient, Chief Operating Officer. Thank you all very much!

Before I end, let me also express my sincerest gratitude to our partners and major sponsors of this event, led by the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development or PCAARRD and LEADS Agri.

At this juncture, I now declare 2023 ICSAVED open. May we all have a meaningful discourse and productive time during the conference.

Good day everyone! Keep safe and God bless. *Mabuhay!*

OPENING REMARKS

Dr. Oscar M. Agpaoa
Vice President for Administration, Finance, and Business
Mariano Marcos State University

On behalf of Dr. Shirley C. Agrupis, president of Mariano Marcos State University (MMSU) who is on official business in Manila, welcome to MMSU. To Dr. Maria Ana T. Quimbo, president of the Philippine Association of Agri-vironment Educators and Entrepreneurs, Inc. or PASSAGE; Dr. Marlowe U. Aquino, director of the Planning Office of MMSU and vice president at large of PASSAGE; our keynote speaker, Dr. Sherwin O. Cruz, who is in Australia; Dr. Glenn B. Gregorio, the executive director of SEARCA; invited plenary speakers; presenters; educators; development practitioners; and students; a pleasant day to all of you!

When the request from Dr. Quimbo came for the joint organization and hosting of the 2023 ICSAVED, MMSU instantly and warmly accepted the request. MMSU is also committed to bringing the best quality education for all. As MMSU opens its door to internationalization, the 2023 ICSAVED serves as a welcome treat for blended learning platform within our facility and flexible learning. It is very timely considering that we are advocating and operationalizing the process of the utilization and shared knowledge innovations together with futures thinking and strategic foresight development combined with agriculture, environment, and entrepreneurship education, not only at the local, regional, and national levels but globally, as well.

This year's conference theme, "Sustainable Borderless Agri-vironment Education, Entrepreneurship and Community Development through Industrial Revolution 4.0," envisions a global education focused on agriculture and environment. MMSU is already in this area but we are open and willing to accept new ideas and best practices from other individuals and institutions with similar cause and direction in sustainable development.

Looking at the thematic areas, we are assured that the conference will tackle important disciplines and specializations in agriculture as well as new perspectives in data science, educational approaches, extension services, and community engagement and development. Certainly, there will be more exciting areas to further strengthen agri-environment education, research, and development including the establishment of linkages, networks, and collaborative partnerships.

As we all face the challenges of global education, let us not forget that agriculture and environment are the drivers of development. Not to mention, food security and sufficiency, which are also relevant in ensuring quality educational approach to community development.

Once again, we thank the officers and members of PASSAGE who are bringing the 2023 ICSAVED to this side of northern Philippines.

To all of you, congratulations for joining the 2023 ICSAVED and welcome to MMSU. May you enjoy your stay here in the university and the City of Batac. We hope this event will lead to more engagements with you as research partners and collaborators.

CONFERENCE OVERVIEW

Dr. Marlowe U. Aquino
Vice President At Large, PASSAGE
Professor and Director of Planning
Mariano Marcos State University

The challenges of the past years, particularly the COVID-19 pandemic, have shown us that we can do more. The 2023 ICSAVED is a testament of our commitment for sustainable agriculture and environment through education, entrepreneurship and development. We are here to promote agri-vironment education and entrepreneurship as our business, our concern. We are here to share the knowledge we have learned from our research and experience in the past few years that shows how we have shaped and adapted to the Industrial Revolution. Although we are still in the COVID-19 pandemic, we are happy that a lot of our members and institutions agreed to the call of having a face-to-face conference.

The 2023 ICSAVED aims to provide us — educators, researchers, planners, practitioners, entrepreneurs in agriculture and environment to discuss the current state and potentials of agri-environment education, and entrepreneurship in this era of Industrial Revolution. This is where we bring the best of what we have.

We have four exciting topics plus one organized panel. While it was hard to identify topics to support the theme, we are happy because educators have bright minds. Our Council Members have decided to stick with these four tracks: data science, technology, innovations in agri-environment education, and entrepreneurship. At first, we wondered if there would be paper submissions because the topics are broad. But here we are.

For the first track, we have papers that supported the application of data science in gaining momentum in the era of digitalization, futures thinking, and revolutionized knowledge development and management.

The second track focuses on agriculture, fishery, and environmental conservation, protection, and management. In this track, we bring in the best practices in the conservation, protection, and management of our agricultural and environmental resources and the promotion of these practices.

The third track is on the future of agricultural education. Here we focus on the innovations that have affected how we learn and work. Paper presentations are related to teaching and training of different agriculture and environment learning institutes.

Finally, we bring in the challenges and opportunities on scientific and technological entrepreneurship and governance. Technological entrepreneurship and governance are emerging concepts in transforming discoveries and innovations to accelerate growth and development.

With all the papers we have received from you, we are proud to say that you are already making a difference. The COVID-19 pandemic has brought challenges to many of us, if not all. Your participation in this year's ICSAVED attests your commitment for sustainable agriculture and environment through education, entrepreneurship, and community development. Thus, our heartfelt gratitude to all of you for having this shared commitment.

KEYNOTE ADDRESS

KEYNOTE SPEAKER

MR. SHERMON O. CRUZ

Chief Futurist, Center for Engaged Foresight
Chair, Association of Professional Futurists
Chair, The Millenium Project Philippines Node

Prof. Shermon O. Cruz is the founder and current Executive Director and Chief Futurist of the Center for Engaged Foresight, a futures innovation and strategic foresight hub operating globally. He is also the Chair of the Millennium Project Philippines Node and co-founder and Vice-President of the Philippines Futures Thinking Society.

Prof. Cruz is a full member of the Association of Professional Futurists and the World Futures Studies Federation, a co-founding member of the Asia Pacific Futures Network, and a pioneer of UNESCO's Global Anticipatory Thinking Network. Moreover, he served as Director of the Philippine Foresight Education and Innovation Research at Northwestern University.

As a researcher and academic, he was formerly a supervising and research fellow for futures thinking and foresight at the Development Academy of the Philippines Graduate School of Public and Development Management, faculty at the University of the Philippines National College of Public Administration and Governance on futures thinking in public policy and governance, lead researcher and Director of the Northwestern University Philippine Center for Foresight Education and Innovation Research, focal resource on futures thinking at the Southeast Asian Regional Center for Graduate Study and Research on Agriculture, lecturer on strategic foresight at the Philippine Public Safety College, and lecturer at the Lee Kuan Yew School of Public Policy Executive Education Program New Leadership Literacy Program course. He is also an adjunct faculty member at the Asian Institute of Management School of Executive Education and Lifelong Learning, teaching futures thinking and strategic design and innovation.

Prof. Cruz is an expert in futures informed strategy development and foresight-driven planning tools and methods. He has collaborated with the best in the futures field and designed transformative and cutting-edge global and local events and projects to advance futures literacy, futures studies, and strategic foresight in governance, public policy, disaster risk reduction and management, strategic planning, and public policy. He has organized futures research and action-learning workshops and presented keynote addresses for government, corporate, and non-government organizations. He has published in some of the leading strategic foresight and strategy development journals and presented papers and chaired futures thinking conversations and panels at international conferences.

KEYNOTE ADDRESS

Futures Thinking: What Exactly it is and Why Does it Matter?

MR. SHERMON O. CRUZ
Chief Futurist, Center for Engaged Foresight
Chair, Association of Professional Futurists
Chair, The Millenium Project Philippines Node

How can we study something that does not exist yet? What exactly is futures study?

In the context of academic futurist, futures study is a discipline that allows anticipation of possibilities.

Doing foresight or futures study, one needs to develop the habit of futures thinking. It is about studying the things that are currently unknown and invisible, and expect the unexpected. The value of futures thinking is reducing the blind spots of people, decision makers, and organizations about certain events that are seen as low probable but high impact events.

Anticipating possibilities

There are points to remember about futures thinking. There is no such thing as future of data because the future does not exist yet. The data that we have are past- and present-driven. A perception needs to be experienced first and it becomes experiences and memories. Only experiences and memories can be translated into data.

In futures thinking, we do not predict the future; rather, we anticipate possibilities.

Animal kingdom of unexpected events

There are words that are coined by futurists, innovators, and foresight practitioners to study the future. Among them is “black swan,” a concept popularized by Nassim Nicholas Taleb. The black swan concept emphasizes the nature of the future – that there are certain things that are unknown regardless of the available information or data that we have due to the limitation of human cognition. We just could not anticipate or know these things until they occur. Unexpected events of large magnitude seem impossible until they occur. When black swans occur, they are called “black elephants” or the widely predicted events that are rejected as unlikely.

Another concept is the “white leopard,” which refers to the hidden or camouflage risks that can have large impacts. Moreover, the “grey rhino” concept refers to the obvious risks that are often ignored such as climate change and the COVID-19 pandemic. The pandemic, I would say is a grey rhino and not a black swan or a black elephant. Three years ago, Bill Gates had already talked about a pandemic that was coming.

Future(s), its nature and function

Like logic, anticipation is a natural ability and mental propensity of human beings. Many of us are unconsciously anticipating the future. Anticipation is an automatic thought process, but we have not really acknowledged it as an asset, a resource, or a tool that we can deploy to generate wealth. We have not really thought about the ability to anticipate things before they occur. We need to invest in that asset or skill set to increase our ability and capability to make use of it for wealth generation, decision making, or career planning to make our possibilities more robust and resilient.

There are two types of anticipation. First, we have anticipation that is informed and driven by data and by the present or current trends and second, anticipation from a point of view of studying those things that are not currently experienced. When we engage in futures thinking, we activate the future in the present. The future unfolds because we use the future not in the context of time, but we use the future to help us see the present differently. When we use the future to help us reframe and think about the things that we do or study today, it means that the future influences the present.

There are many ways we can use futures thinking. You can use it to set priorities, enable innovations, optimize resource use, explore alternative visions, and formulate policies and strategies.

Strategic foresight: Competencies, tools, and methods

Futures thinking is not about prediction. It is an approach to studying and using the future as an asset and resource to provoke, engage, and inspire personal, organizational, and societal transformation. When you apply the future in an organization context, it is called strategic foresight.

There are competencies needed to apply the tools and methods in futures thinking. One of these competencies is framing. By questioning the future, we get the opportunity to undefine it. By undefining it, we define the future according to our context, reality, and worldview.

Another competency is scanning. We need to reveal the patterns of change by scanning the obvious — those things that we hear daily. A futurist would consider these things, both data and narratives that are available. Another scanning approach is by discovering the unknowable. Foresight is really about venturing into the unknown.

Using the data sets collected from these approaches, start futuring by anticipating alternative future worlds. When you get the opportunity to rethink things, it enables you to innovate in the present. Innovation is about rethinking and reimagining how processes work that will create more impact in the process.

When we prototype the future, we can combine futures thinking and design thinking to develop strategies. Through a speculative design approach, we can link the future with our current strategies. Aside from speculative design, backcasting and systems thinking can also be applied with foresight.

Engaged Foresight Framework

For the last 15 years, I have been using the Engaged Foresight Framework. The futures and foresight journey start by questioning and discovering the probable, preferable, plausible, and wild futures. Questions are used to anticipate the future and provoke interest and foresight. Next is futuring. Spotting alternative futures and combining all of them, we get to see what transformation looks like. Then, use the learnings, the conversations, and the data generated by using the imagination and anticipatory capability to generate insights. Weave these insights and start thinking about the strategies needed and inspire people to act.

The futures of agriculture, environment, services, and data

The future, like the past, is an active aspect of the present. Let us use the future as we do the past to make sense of today.

Ask compelling questions. Questions like “what would agriculture and agricultural systems look like if it is not capital intensive, large scale, and service driven? What would you innovate and create? What would it look like if agricultural systems in the Philippines are transformed in the context of a regenerative nature and restorative approach to food production and supply chain? You can use emerging issues analysis as an approach to imagine the future of agricultural systems.

Signals of change are apparent in agriculture with the materials revolution. What would the future of agriculture and the agricultural system look like in a synthetic biological world?

We also have the future of peer-to-peer electricity. We will see buildings get to produce, store, and share energy and bring cheap energy to remote communities.

Likewise, we have regenerative microeconomies wherein the biological, digital, and human worlds are combined to mitigate climate change and create value for ecosystem services.

Health, education, and other services are becoming increasingly cross border-driven, which points us to a digital future wherein transfer of physical goods will no longer be an issue. In fact, simulations are now being done in the European Union, US, and the Mediterranean Region.

In terms of health and nutrition, some companies have been innovating ways by which metabolic and genetic nutritional profiles can be personalized. This can lead to huge advances in addressing numerous physical and mental conditions. We will see a more personalized approach to everything including food, business, and the way we consume, recreate, and reproduce nature.

In 20 or 40 years, we will also be living with autonomous robots. We will trust them as we trust smart mobile phones now.

As artificial intelligence peaks up, humans have been trying to recreate and repurpose the goods and services we currently provide.

Furthermore, with the future of smart cities, we will be seeing the digital twins of smart places. Not just places and things, but our identities as well, which we call digital identities.

Data devalued but continue to increase. This means that we will see a future wherein data is useless. What is then the future of data? Genetics. Open-source DNA of many living organisms becomes our data. Not just digital, data will be synthetic or organic DNA-driven.

We have seen that intelligent systems are potentially hackable especially in the context of synthetic biology. Imagine a world wherein everybody is connected not just digitally but biologically, and what connects them are hackable.

We live in a world our questions create. Keep on asking compelling questions. "Any useful idea about the future should appear to be ridiculous" is the second law of futures.

Use the future as an asset, a resource, to invent the future the way we want it to become.

PLENARY TALKS

PLENARY SPEAKER

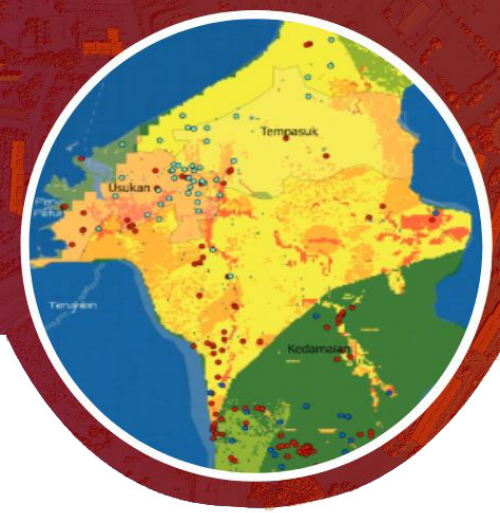
DR. SITI AEKBAL SALLEH

Head, Sustainable Technology Institute for Biodiversity and Sustainable Development
Associate Professor, Universiti Teknologi MARA, Malaysia

Sr. Dr. Siti Aekbal Salleh is the Head of Sustainable Technology, Institute for Biodiversity and Sustainable Development of the Universiti Teknologi MARA (UiTM) in Malaysia. Likewise, she is an associate professor at the Centre of Studies for Surveying Science and Geomatics, Faculty of Architecture Planning and Surveying (Fakulti Senibina, Perancangan dan Ukur in Malay or FSPU) .

Dr. Salleh is also a researcher with several refereed and indexed publications. Her research works focus on Geographical Information Science (GIS), remote sensing for urban climate modelling, and numerical simulations. Some of her recent works are related to citizen-driven urban forest and greenery initiatives for climate change mitigation. She has also an active research collaboration with the University of Nottingham. Moreover, she is a member of the Applied Remote Sensing and Geospatial Research Group and Integrated Mosquito Research Group in the Community of Research of UiTM.

For the past five years, Dr. Siti Aekbal was the FSPU coordinator of research acculturation and grants. She was also appointed as the coordinator of International Cooperation, Training and Development of UiTM from 2018 to 2020.



PLENARY TALK

Environmental Vulnerability using Geospatial Technology

DR. SITI AEKBAL SALLEH
Head, Sustainable Technology Institute
for Biodiversity and Sustainable Development
Associate Professor, Universiti Teknologi MARA, Malaysia

Geospatial technology plays a crucial role in environmental protection. Its integration with other technologies and information further enhances its potential to make well-informed decisions and address environmental challenges effectively.

But why do we need to protect the environment?

The importance of protecting the environment

The land, water, air, and living organisms surrounding us are the fundamental components of the environment. Their interactions, which are essential in maintaining balance in the ecosystem, can be grouped into two: interactions between man and the environment and interactions between other organisms and the environment. Central to interactions are human beings and other living organisms.

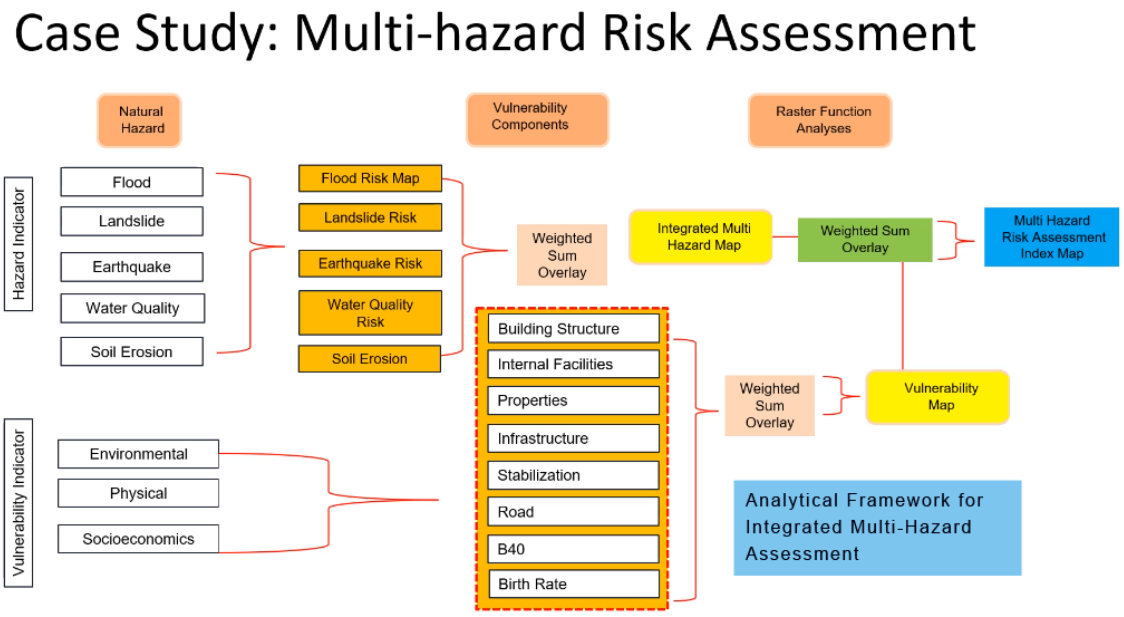
There is a difference in how human beings and other living organisms interact with the environment. The organisms tend to adapt to the environment. On the other hand, men tend to modify the environment to suit themselves. Sometimes, development is achieved at the expense of the environment.

To create a sustainable and resilient future, it is crucial to strike a balance between human needs and environmental protection by looking into the social functions and the carrying capacity of the environment. The concept of carrying capacity denotes the maximum number of individuals that a certain environment can sustainably support. This denotes that the environment and individuals will not experience a decline in their ability to support future generations within the given area.

Modifying the environment can create multiple hazards that are detrimental to the people and the environment. The complexity of multi-hazard occurrences leads to a variety of ad-hoc solutions, good at some point but unsustainable.

Multi-hazard assessment

In a multi-hazard assessment we conducted in Malaysia, we used a geographic information system to quantify the risks while considering the socio-economic, physical, and environmental factors. The results of the case study show that integrating raw information from socio-economic, physical, and environmental factors, and information on the natural hazards with geospatial technology can help determine the implications toward the environment, physical, and socio-economic development. Identifying highly risky areas will help in emergency response, disaster preparedness, and monitoring and environmental recovery strategies.



Well-conserved and balanced environment

In terms of well-conserved and balanced environment, we have five key aspirations: 1) living in a safe environment, 2) well-run environment — management and monitoring go hand in hand; 3) livable and sustainable way of living; 4) healthy environment — healthy mind and healthy society; and 5) prosperous society.

Achieving a well-conserved and balanced environment is everyone's responsibility. It is our obligation to protect and conserve the environment.

PLENARY SPEAKER

DR. ROSTAM YAMAN

Registered Surveyor and Associate Professor
Universiti Teknologi MARA, Malaysia

Dr. Ts. Dr. Rostam Yaman is an associate professor at the Centre of Studies for Architecture, College of Built Environment, Universiti Teknologi MARA (UiTM) . He is also the current Head of the Military Strategic Unit, Mk PALAPES (Reserved Officer Training Unit), UiTM and Innovative Interior Architecture Materials Research Interest Group.

He has over 15 years of teaching experience and has been an active researcher in the fields of sustainable architecture and urban design and psycho-behavioral in interior space, particularly in the field of green building assessment criteria, post-occupancy evaluation, and behavioral study. He is also into exploring the field of sustainable development for urban climate change, such as the area of post occupancy assessment impacts of a certified sustainable township and its continuing sustainable agendas towards community, regional, and global discourse. Moreover, Dr. Yaman has been involved in various construction projects as a designer and project manager. He has research collaborations with Chulalongkorn University, Kasetsart University, King Mongkut Institute of Technology Ladkrabang, Institut Teknologi Bandung, and Ecosystem Research and Development Bureau.

Dr. Yaman also served as a speaker and facilitator of various courses organized by various institutions, such as Chulalongkorn University, Kasertsat University, King Mongkut Institute of Technology, Department of Museums and Antiquities, National Handicraft Institute, Taylors University Lakeside Campus, Malaysia Institute of Art, and Malaysia Green Building Councils.

PLENARY TALK

United Nations/World Green Building Council Policies on Sustainable Urbanization

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By 2030, the earth is projected to be a global city. Cities and *metropoles* will be the hub of economic activity and productivity — the center of human livelihoods and economic development. Thus, sustainable urban development is becoming increasingly important.

Sustainable urban development is anchored on the various policies, criteria, goals, and declarations of the United Nations (UN) on sustainable development.

UN policies related to sustainable urban development

In 1987, the UN World Commission on Environment and Development published the Brundtland Report titled "Our Common Future." It is one of the earliest reports highlighting the need for sustainable development. It presents the concept of sustainable development with three main and interconnected pillars namely, environment, social, and economic. The report also points out limitations on the use of current technology and social organizations to protect natural resources. It also notes the need to address poverty to sustain the environment as poverty may lead to ecological and other natural disasters.

In June 1992, the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, was held in Rio de Janeiro, Brazil. During the Summit, Agenda 21 was adopted as a comprehensive plan of action for sustainable development. Agenda 21 contains several chapters including a chapter on "Promoting Sustainable Human Settlement Development" (Chapter 7). This chapter suggests inclusion of energy efficiency, water efficiency, and materials and resources in sustainable urban assessment criteria to address the imbalance consumption in the cities. The sustainable urban framework is designed to reduce the consumed energy, water, and materials and resources at a minimum level.

During the Earth Summit, the Rio Declaration on Environment and Development was also developed. It consists of 27 principles; four are directly related to sustainable development and sustainable urbanization. These are Principle 1, which suggests human beings should be the center of sustainable development; Principle 8, which promotes government intervention in reducing and eliminating unsustainable consumption and production; Principle 9, which promotes usage of technology in sustainable development; and Principle 11, which suggests environmental legislation.

Shortly after the Summit, the Commission of Sustainable Development was established in December 1992. It acted as an effective measure of UNCED to oversee the implementation of Agenda 21.

In 2012, the Sustainable Development Goals was developed during the Rio+20 Conference. SDG Goal 11, "Make Cities and Human Settlements Inclusive, Safe, Resilient, and Sustainable," corresponds to urban sustainable framework criteria on sustainable site planning and management. It also covers water efficiency, air quality, and waste management.

Green building for sustainable urbanization

Throughout the world, green building frameworks are being used to measure sustainability of existing and newly developed buildings. Newly built cities or urban areas are also adopting green city planning framework as measure to sustainable development.

Moreover, Green Building Councils (GBC) are operating worldwide to promote sustainable built environments. GBCs, non-profit organizations comprised of national and regional entities, are part of a global network called the World Green Building Council. Currently, there are 90 GBCs operating in different countries.

GBCs have recognized the needs of frameworks and guidelines for sustainable communities. Various assessment criteria and tools for sustainable development were developed and constantly revised.

Sustainable urbanization is not limited to the physical and built environment. Rather, it acknowledges the importance of the spatial context surrounding the building and psychological and emotional impacts of the internal space to the end users.

PLENARY SPEAKER

DR. GLENN B. GREGORIO
Director
Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Philippines

Dr. Glenn B. Gregorio is the Director of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). He is also a professor at the College of Agriculture and Food Science at the University of the Philippines Los Baños and Chair of the Technical Panel for Agriculture of the Philippine Commission on Higher Education.

His career was developed at the International Rice Research Institute (IRRI) as geneticist and senior plant breeder for 29 years. He had a three-year stint as crop breeding manager in a private seed company. He is a co-founder of Binhi, Inc., an agri-research start-up company on micropropagation and seed business. He has more than 120 publications to date.

In 2018, Dr. Gregorio was conferred Academician by the National Academy of Science and Technology-Philippines. He was also appointed as one of the new Champions of the United Nations Food Systems Summit 2021. Also in 2021, Dr. Gregorio was selected as one of the recipients of the 6th Filipino Faces of Biotechnology conferred by the Philippine Department of Agriculture-Biotechnology Program Office. Another recent award of Dr. Gregorio is from the University of the Philippines Alumni Association (UPAA). He received the 2022 UPAA Distinguished Alumni Award for Science and Technology (Agriculture-Plant Breeding and Stress Tolerance).

PLENARY TALK

The Futures of Agriculture Education in the Era of Industrial Revolution 4.0

DR. GLENN B. GREGORIO
Director, Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Philippines

Characterized by rapid technological advancements, the Industrial Revolution has significantly transformed agriculture and agricultural education. Collective learning among key players in agricultural development–the academe, industry, and government is relevant in shaping the futures of agricultural education.

SEARCA, the leading enabler and champion of excellence in agricultural and rural development in Southeast Asia and beyond, has established its Eleventh Five-Year Plan (FYP) called ATTAIN: Accelerating Transformation Through Agricultural Innovation.

In today's uncertain, complex, and constantly changing environment, innovation is crucial to adapt to change.

Transformation in agricultural systems

Transformation in the agricultural food systems entails mindset change in how farming is viewed – from farming as production to farming as a sustainable business. We want farmers to be "transfarmers", a term we use to refer to farmers who have a business mindset and use disruptive technologies in agriculture.

Innovations for transformational change

Innovations for transformational change involve innovations at the social, technological, conceptual, institutional, and policy levels. SEARCA is positioning itself to influence the policymakers, the influencers, the local governments, and the international organizations because they are the enablers. They provide the financial resources needed to support innovations.

Strengthened Academe-Industry-Government Interconnectivity

In its Eleventh FYP, SEARCA commits to strengthening partnerships with key partners. Here are some action points to strengthen academe-industry-government connectivity.

Action points for the production sector

- Support local capacity towards self-sufficiency through well-planned production and post-production systems.
- Design financial technologies to empower farmers and rural communities.
- Promote incentive systems to support innovative studies and activities that will improve production and post-production, increase efficiency, and promote value-adding activities.

Action points for integrative technology innovations

- Invest on integrative studies assessing risks and uncertainties related to price volatilities and climate change-related hazards that characterize farm production systems.
- Provide support in improving the design of financial technologies for farmers and in encouraging wider participation in these financial systems.
- Formulate policies to support institutional and organization interventions that are suitable to the cultural condition of a community and relevant for the local and national conditions.

Action points for sustained interest in agriculture and agri-entrepreneurship

- Encourage full participation, particularly the youth and women, through several systematic education and mentorship programs with sustained incentives and innovative training modalities and backed with social safety net systems.
- Strengthen the agricultural extension system of the Philippines through the Province-led Agriculture and Fisheries Extension Systems (PAFES) and the Community-based Participatory Action Research Program of the Department of Agriculture.
- Through integrative study, explore how the capacity of local government units could be strengthened with the Mandanas Ruling.

Action points toward strengthening the capacities of higher education institutions (highlighting the need for food system innovations and biodiversity toward food security and sovereignty, resilience, and poverty reduction)

- Increase capacity to implement curricular programs with emphasis on agriculture and entrepreneurial skills.
- Conduct more public-value driven research initiatives that are geared toward the strengthening of local food systems.
- Develop science and technology-based extension services with greater emphasis on sustained community engagement and public service.
- Establish agri-innovations hub complemented with sustained capacity building for students on Agri 4.0/5.0 technologies and encourage strong lifelong learning.

ASEAN-ready Agriculture Education

I envision agriculture education to be ASEAN-ready — inclusive, innovative, creative, and employment and enterprise ready.

To be ASEAN-ready, agri-education should have competency-based curriculum, industry co-designed and co-owned, partnership-driven or infrastructure-based, employment and enterprise ready, multi-track and specialization, and have all-in ASEAN community perspective.

Invention occurs in academic and research institutions. It is when these institutions partner with industries that innovations happen. Innovation is the act of turning research results into revenues – economic and social gains. If the partnership with industries did not lead to innovation, the partnership built is what matters in the end.

The real challenge of transformation through agricultural innovation or education is the overall ability to achieve the desired food security and economic development that is sustainable, inclusive, environment-friendly, and most importantly, resilient to the current and future pandemics.

PLENARY SPEAKER

DR. NUTTAVIKHOM PHANTHUWONGPAKDEE

EPIC-N Asia Coordinator, Thammasat University Research Unit in Urban Futures and Policy

Dr. Nuttavikhom (Kay) Phanthuwongpakdee is the Coordinator of the Educational Partnerships for Innovation in Communities (EPIC) – Network Asia, a nonprofit organization whose mission is to unite the human capital of universities with local governments and communities to improve the quality of life and social wealth for all involved.

Dr. Kay is a multi-disciplinary environmental researcher. His research interests include sustainable development, regional development, environmental science and engineering, political ecology, natural hazards, and disaster adaptation. He has been working with developing communities, regional and national policymakers, and the private sector in Thailand and other Southeast Asian countries. He is currently the Deputy Director of the SDG Research and Support Programme (SDG Move) and a researcher at the Urban Futures and Policy Research Unit of Thammasat University. Moreover, he is a lecturer at the Puey Ungphakorn School of Development Studies, Thammasat University.

Dr. Kay holds Joint PhD degree in geography from King's College London and the National University of Singapore, concentrating on resilience and disaster adaptation, and MS degree in water and environmental management from the University of Bristol.

PLENARY TALK

Engaging Local Universities in Resilience Strengthening Initiatives through the EPIC Model

DR. NUTTAVIKHOM PHANTHUWONGPAKDEE
EPIC-N Asia Coordinator, Thammasat University
Research Unit in Urban Futures and Policy, Thailand

Preparing for the uncertainties of the future is crucial for students in higher education. Among these uncertainties is ensuring food security for the communities, especially with the threats from climate change. Students should be equipped with the knowledge and skills needed to make a positive impact towards a sustainable future. While coursework is essential for learning, real-world experience is also valuable for students. Working with people in the field can provide a new perspective and a deeper understanding of their work. This experience is not only informative but also enjoyable.

At the same time, students have immense potential and drive, with an insatiable thirst for knowledge and a desire to bring positive change to their communities. Local governments stand to gain immensely from the enthusiastic efforts of students driven to make positive changes in their communities. By offering strategic guidance and forging partnerships with higher education institutions, these students can be fully empowered to make a difference. Regrettably, numerous local governments and even some educators have not fully grasped the potential of young individuals. These individuals are often overlooked, and their ideas are disregarded.

EPIC model

One way to gain hands-on learning opportunities across disciplines with as little cost as possible is through large-scale city-university partnership models like the Educational Partnerships for Innovation in Communities (EPIC) model. The EPIC model complements existing city-university partnerships by involving students in project-based coursework rather than just extracurricular opportunities.

This means that participating students and their instructors are already part of on-campus courses and the regular teaching load and programmes of study. Through the EPIC model, students can gain valuable experience while earning credits towards their degree. To establish a successful partnership, a university coordinator, and a local government representative brainstorm to identify critical projects that align with existing plans and budgets. The university can then provide courses and instructors to support the local government's initiatives, resulting in positive change for the community. Recognizing the value of participating in university classes that provide hands-on experience with real-world projects in the local community is vital. This model ensures that students at the tertiary level receive a well-rounded education and that all members of the community have equal opportunities to engage. Collaborating to make a positive impact both inside and outside the classroom is essential for everyone.

EPIC model's five elements

To guarantee that city-university partnerships are impactful and valuable to all, the EPIC model has five elements.

- The first element requires that the partnership values existing administrative structures and responsibilities on all sides.
- The second element expects that the university creates a genuine partnership with local governments.
- The third element requires the partnership to prioritize sustainability and resilience. The solutions should align with the United Nations' Sustainable Development Goals.
- The fourth element requires that the partnership focuses on community-identified, community-driven, and community-assessed contributions to the community. The university is not working for the community, but it is working directly with the community.
- The fifth element stresses that the partnership should catalyse many disciplines and large numbers of classes and hours of effort by engaging many students from many courses in many fields who work together and simultaneously.

EPIC partnerships can assist local government and non-governmental agencies in obtaining funding for their projects. While they do not directly provide funding, they offer valuable analysis, community engagement, visual renderings, and project recommendations that can be included in funding requests. This simplifies the process for agencies to access available funding sources and increases their likelihood of securing the necessary funding for their projects.

EPIC model in Asia

The EPIC model has been adopted by more than hundred institutions across the world. In Asia, several risk-averse local governments with limited resources to access new knowledge collaborated with universities with excess capacity

and unlimited access to new knowledge through the model. For instance, in the Philippines, various city departments and agencies collaborated with the University of the Philippines Los Baños to employ the EPIC model on the "Enhancing Disaster Preparedness of Lakeshore Communities in Calamba City, Laguna, Philippines" project. Students from the College of Development Communication and the College of Public Affairs and Development were involved in this collaboration. The project was divided into two components, "Information and Education Campaign on Sanitation and Waste Management During Flooding in the Time of the Pandemic" and "Revisiting Disaster Plans of Lakeshore Communities of Calamba."

In Indonesia, Politeknik Negeri Manado used the EPIC model to engage the students with the City of Manado to update and improve the city's flood early warning system. Students in the Department of Civil Engineering, the Department of Information Technology, and the Department of Computer Science Departments could use what they have learned in class to develop sustainable infrastructures, besides disaster mitigation and information technology, to support the city's attempt to minimize the negative impacts of flooding events.

Similarly, in Thailand, the Urban Futures and Policy Research Unit at Thammasat University launched their EPIC program in 2021 in partnership with Hat Yai Municipality to assist with their goal of becoming a green and resilient city. The programme involved university students from the Faculty of Architecture and Urban Planning working to create geographic information system (GIS) layers to form an inventory of existing green spaces in the community. The data generated from this project would enable the municipality to identify areas that should be prioritized for additional green spaces. This information will significantly improve the quality of life for residents. Also, at Thammasat University, students at Puey Ungphakorn School of Development Studies worked hand in hand in several local governments on the projects on Social Return on Investment.

Lastly, in Vietnam, the People's Committee of An Giang Province collaborated with the Department of Rural Development of An Giang University to achieve the SMART Water City Vision in Long Xuyen City. More specifically, the local authorities engaged with the lecturers and students to draw a map to identify flooding areas in Long Xuyen.

EPIC-N seeks to expand its presence in Asia through strategic partnerships with esteemed organizations, such as the UN Environment Programme - Global Adaptation Network, Local Governments for Sustainability (ICLEI), and the National Science Foundation (USA). By fostering meaningful collaborations between universities and local governments, our organization is committed to utilizing the EPIC model to guide sustainable development initiatives and empower students to positively impact their communities. Our ultimate goal is to contribute to the achievement of the Sustainable Development Goals while facilitating productive partnerships that will drive impactful change.

PRESENTATION ABSTRACTS

TRACK 1
Data Science, Technology, and Innovations in Agri-vironment Education and Entrepreneurship

The challenging application of data science is gaining momentum in this era of digitization, futures thinking, and revolutionized knowledge development and management. Discovering knowledge using scientific methods, processes, algorithms, and systems is relevant to solving problems. By analysing and extracting useful insights, data science can transform agriculture, fisheries, environment, and entrepreneurship.

Through generation, development, and commercialization, technologies and innovations are translated into feasible, viable and relevant influencing factors that aid in the holistic development of agriculture, fisheries, and entrepreneurship. These certainly encourage users for their maximum utilization and application most especially in education where competencies and knowledge acquisition are of prime importance.

The first presentation under this track discussed the effect of maltodextrin and varying the concentration of papaya extract on the physical properties of papaya leaf extract powder. Other presentations focused on how a development approach improved the lives of small farmer households and how the digital readiness of farmers can be improved.

Physical Properties of Spray-dried Carica Papaya Leaf Powder Extract

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ABSTRACT

Carica papaya leaves are commonly considered unwanted; however, their extracts have been interrelated with various health benefits. Therefore, this study determined the effect of maltodextrin and varying the concentration of papaya extract on the properties of papaya leaf extract powder. A 2x2 factorial design was used to assess the impact of the different papaya leaf extract powder concentrations utilized in the study. Results revealed that the papaya leaf extract powder has lower water activity (0.435-0.81 aw), high total soluble solids or TSS (40.0 - 49.33°Brix), bulk density ranging from 0.05 – 0.575 g/ml, packed density ranging from 0.714 – 0.91 g/ml, and pH of 0.403 – 0.545. The addition of maltodextrin and varying the concentration of papaya extract affected its physical properties. Furthermore, results showed the lower concentration and higher maltodextrin, the lower the water activity, the higher the TSS, higher bulk and packed density, and lower acidity. Spray-dried papaya powder is a low-acid food that is not susceptible to microbial proliferation. It is non-hazardous and has better storage attributes. Therefore, all the treatments are safe to consume.

Keywords: Carica papaya, extract, leaves, physical properties, spray-dried

Agroenterprise Clustering Development Approach for Smallholder Farmers Toward Household Food Security in Davao City, Philippines

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ABSTRACT

This case study examined the Agro-Enterprise Clustering Development Approach (AECDA), which addresses the challenges faced by smallholder farmers through the collective action of farmer groups referred to as the clustering approach. Specifically, it aimed to a) discuss how smallholder farmers practice AECDA; b) assess the household food security status of the smallholder farmers; c) examine the policy environment that facilitated or hindered the effective implementation of AECDA; and d) analyze the effect of AECDA on household food security. Examination of AECDA as a development intervention is important in order to assess its effectiveness in consolidating the farmers' produce, thereby enabling them to become more competitive in the market toward improved economic opportunities for smallholder farmers. A purposeful sampling method of informant selection was used. Moreover, a combination of qualitative and quantitative research techniques was employed. Data were gathered using survey questionnaires administered to 42 smallholder farmers, a focus group discussion with the seven cluster leaders, and key informant interviews of four agro-enterprise facilitators. The practice of AECDA was assessed using a 5-point Likert scale. The validity of the survey instrument was established through its pre-test while the reliability of the Likert scale used was ascertained using Cronbach alpha. Results show that AECDA contributed to the development of the lives of smallholder farming households. Evident changes manifested in their improved knowledge of modern planting technology, causing an increase in farm production. The study also affirms that the increased farm income provided livelihood stability and food security for the families of the smallholder farmers with the help of the AECDA. The study proposes an enhanced AECDA framework to improve household food security. The proposed framework considers the three assets that were found to have a significant impact on the smallholder farming households: social, physical, and human assets. It was seen that for AECDA to succeed, the intervention should consider aspects that would improve these three assets of the smallholder farming households.

Keywords: agro-enterprise clustering development approach, assets, food security, income, smallholder farmers

TRACK 1
Data Science, Technology, and Innovations in Agri-vironment Education and Entrepreneurship

Assessment of the Digital Readiness of Vegetable Farmers in Selected Areas in CALABARZON

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ABSTRACT

The study assessed the digital readiness of vegetable farmers in selected provinces in CALABARZON. Primary data were collected through personal interviews of 370 *pinakbet* vegetable farmers. Knowledge, attitude, and practice (KAP) scoring was performed using indicator statements for the following elements of digital readiness: availability, affordability, awareness, accessibility, ability, and attitude. Correlation analysis was performed between the computed scores and socio-economic characteristics of the respondents. Results revealed that 78% of the respondents were non-users of digital marketing and 22% used online selling platforms in marketing their produce. The cellphone was the most common medium used in communicating with their input suppliers and their buyers and logistics providers. Internet usage was 84% with home Wi-Fi and cellular data as most popular. Facebook (65%) was the frequently used social media platform. The Digitally Ready farmers were 10.27% and those Unprepared and Traditional had 0.54 and 1.62% share, respectively. The Reluctant were 22.70% while the Cautious Clickers were 64.86%. Province-wise, the Cautious Clickers were lowest in Batangas (58.82%) but highest in Quezon (68.99%). Those Digitally Ready were highest in Cavite (15.57%) and lowest in Quezon (5.43%). Digital readiness had negative weak association with sex, age, and civil status but had weak positive relationship with household income, size, and educational attainment. Educational attainment and availability had moderate positive association but educational attainment and occupation had moderate positive relationship with ability. The rest had only weak negative and weak positive relationships. Recommendations were made on how the digital readiness of the farmers can be improved.

Keywords: digital marketing, KAP scoring

TRACK 2
Agriculture, Fishery, and Environmental Conservation, Protection, and Management

The performance of the agriculture, fishery, and environment sectors depends on the knowledge, skills, and expertise of the key players in the field. Hence, education and training are integral in the conservation, protection, and management of agriculture, fishery, and environmental resources.

Presentations related to agriculture discussed the persistence of *Escherichia coli* in manure amended soils, the efficacy of dried housefly maggots on the growth performance and meat quality of Rhode Island Red, and the yield potential of mungbean as influenced by different rates of Lactic Acid Bacteria Serum. There were also presentations on the morphological characteristics and management practices of native pigs, feedstuff for backyard pigs, vermiponics technology for the survival and growth of lettuce, and lettuce production using organic nutrient solution under hydroponics system. Other presentations identified the suitable sites for small-scale irrigation projects, dissemination strategies on natural farming technologies among agricultural extension workers, and impact of institutional support and services to good agricultural practices (GAPs) compliance of corn farmers.

On fishery, a paper presentation proposed a mobile traceability system to contribute to the potential increase in the marketability of the Philippine tuna.

Lastly, presentations on the environment focused on the conservation of coastal environment and a farming village, mangrove reforestation and protection, and rehabilitation of abandoned mining lands. There were also paper presentations on the social vulnerability assessment of coastal barangays; biomass, carbon stock, and sequestration assessment in urban green spaces; and spatial analysis of Metro Manila green spaces.

Sustainable Coastal Resource Management in Tagkawayan, Quezon, Philippines Through Scenario Development

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ABSTRACT

This is a qualitative study conducted among the members of the registered fisherfolks of the peoples' organization in the selected coastal communities of Tagkawayan in Quezon Province, Philippines. A participatory approach was used to envision and explore future scenarios in the coastal and marine environment of the place. Issues and concerns were enumerated by the participants and were explained as the group generalized their answers in a workshop session. As a result, the fisherfolks envisioned a better coastal environment that is free from illegal activities, a healthy sea, and restored marine ecosystem with diverse and abundant marine organisms that could give them a good source of income, which will improve their wellbeing. Information campaign, rehabilitation of disturbed coastal environment, and reporting of illegal fishing activities to authorities are possible means of protecting and conserving the environment. Thus, it is encouraged that local executives, academes, and other stakeholders will conduct activities for information dissemination on the significance of protecting and conserving the coastal ecosystem of the place for its sustainable use.

Keywords: participatory scenario development planning, Awasan reef, Tagkawayan coastal ecosystem

Vermiponics in Growing Lettuce (*Lactuca sativa*)

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ABSTRACT

Lettuce (*Lactuca sativa*) is one of the most popular vegetable in the preparation of salad. It is because of its delicious taste and the mineral nutrients it contains. Hence, high demand for this leafy vegetable was observed. The Center for Environmental Resources Research and Development, which takes charge of the vermicomposting project of the university and produce vermicompost, started to produce vermiwash. It is a liquid collected from the leachate of the vermicomposting setup. In a greenhouse experiment, the said vermiwash was used in growing lettuce. which serves as a source of nutrients and is called vermiponics. Vermiponics is a soilless farming technology that uses water and nutrient solution to grow vegetables. The objective of the experiment was to know the effect of vermiwash in the survival and growth of lettuce. The different ratios of tap water and vermiwash was used in growing lettuce. Results of the preliminary trial showed significant effect of vermiwash supplied to the lettuce plant. Lettuce plant height, leaf length, root length and fresh total weight were significantly better in 50% tap water and 50% vermiwash mixture over the control and other treatments. Hence, it is the best recommended rate to be used in the future planting of lettuce using the vermiponics technology. However, a verification experiment need to be conducted before the technology be given to concerned farmers and other stakeholders.

Keywords: vermiwash, nutrient, tapwater, vegetable height

Mangrove Reforestation, Protection, and Conservation Initiatives: The Case of Sorsogon Bay Rompeolas, Philippines

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ABSTRACT

Mangrove losses have been observed in several parts of the world including the Philippines despite its explicit directive through Republic Act 8550 or the Philippine Fisheries Code in ensuring the conservation, protection, and sustained management of the country's fishery and aquatic resources. This qualitative research made use of a case study design at Sorsogon Bay Rompeolas through observation, field visits, and interviews to describe and evaluate the milestones and challenges encountered in the mangrove reforestation and protection initiatives among volunteer stakeholders. The study found out that the post-implementation (monitoring) phase of the project was the least participated activity while the project implementation phase was the fully participated activity of the different stakeholders involved in the project. Waste pollution, unsustained participation of residents, and natural calamities were the challenges encountered by the project. The local government units in collaboration with the concerned national authorities may adopt blended infrastructure projects with the environmental protection program in the preservation and enhancement of the current state of the coastal ecosystem.

Keywords: stakeholders' participation, conservation initiatives, sustainability plan and measures (SMP)

Social Vulnerability Assessment of Coastal Barangays in Naic Cavite: Baseline Data on Barangay's Resilience to the Effects of Climate Change

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ABSTRACT

A social vulnerability assessment was conducted in the selected coastal barangays of Naic, Cavite to identify the population's exposure to natural calamities due to climate change; identify the level of exposure, sensitivity, and adaptive capacity of each barangay; and calculate the social vulnerability index of each barangay. The study made use of mixed method research design utilizing sequential exploratory approach to measure the level of social vulnerability of the selected coastal barangays of Naic. Household level survey was used to gather data on the coastal barangays' socio –demographic profile and to measure the barangays' level of sensitivity and adaptive capacity toward climate-related changes and hazards. A total of 354 households were surveyed following simple random sampling technique where each coastal barangay was sampled for every 5th house in each barangay located within 300 meters from the established shoreline to national highway. Data were analyzed using descriptive statistics and geographic information system analysis. Focus group discussions were also conducted to gather the primary data and to validate the data gathered from the household survey and secondary data. Results revealed that the seven coastal barangays of Naic had a low to moderate level of sensitivity to hydro meteorological risks, particularly the effects of global warming, given their socioeconomic position. Based on the adaptive capacity index and potential impact index of each barangay, it can be deduced that Barangay Labac had a 0.55 social vulnerability index, which is interpreted as highly resilient. Other barangays had a social vulnerability index ranging from 0.39 to 0.49, which is interpreted as moderately resilient. The study provides policy options in the context of climate-related hazards.

Keywords: social vulnerability assessment, adaptive capacity, community resilience

Efficacy of Dried Housefly (*Musca domestica*) Maggots on the Growth Performance and Meat Quality of Rhode Island Red (*Gallus gallus domesticus*)

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ABSTRACT

Houseflies laying maggots are a fundamental concern of many residents around poultry vicinity; however, these are good protein sources and can be utilized as an alternative animal protein for poultry production. Therefore, this study determined the efficacy of dried houseflies (maggots on the growth performance and meat quality of Rhode Island Red in varied concentrations. A complete randomized design was used to assess the efficacy of the different housefly maggots concentrations utilized in the study. Results revealed that including 15% dried housefly maggots in the feeding formula for Rhode Island Red chickens could positively affect the birds' growth performance and meat quality. This has increased cumulative weight gain, improved feed conversion ratio and average daily gain, higher dressing percentage, and heavier carcass weight compared to the control treatment. These results suggest that dried fly maggots can be used as a supplementary feed source for chickens. Still, it is important to note that further research is necessary to determine if these results are consistent and replicable. Dried fly maggots should be carefully evaluated and regulated to ensure their safety and suitability as a feed ingredient and minimize potential health and environmental risks.

Keywords: Rhode Island Red, dried maggots, growth performance, pH and meat quality

Biomass, Carbon Stock, and Sequestration Assessment of Rizal and Paco Parks in Manila, Philippines

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ABSTRACT

Global warming, which is largely driven by anthropogenic emission of greenhouse gases, is an important forcing to regional climate change in a city. Atmospheric levels of carbon dioxide — the most dangerous and prevalent greenhouse gas, emitted in the atmosphere through human activities such as deforestation and burning fossil fuels. As a result, interests on carbon sequestration studies have intensified in terrestrial ecosystems for its ability to store carbon over an extended period of time to address climate change. This research was conducted as a baseline study to estimate carbon density and gross sequestration rate of trees in Rizal and Paco Parks, Manila City. The study aimed to determine the carbon stock in tree biomass in the parks of Rizal and Paco using Chave allometric equation and root biomass as 0.26 ratio inferred from the above-ground biomass. Results showed that the estimated tree biomass density from the sampling sites in Rizal Park was 78.22 Mg ha-1 and 642.06 Mg ha-1 in Paco Park. In terms of tree biomass, Rizal Park had a stronger correlation with diameter at breast height (DBH) than tree height but negligible correlation with wood density. Whereas in Paco Park, the tree biomass had a stronger correlation with DBH than with height and weak but positive correlation with wood density. For 2023, the estimated gross carbon sequestration in Rizal Park would be 2.33 MgC ha-1 and 51.50 MgC ha-1 in Paco Park. Using the Environmental Protection Agency estimations, the carbon sequestration value of Rizal Park in a year would be PhP 228,151.86. On the other hand, Paco Park was estimated to have a carbon sequestration value of PhP 35,801.33 in one year. Carbon stock studies in urban green spaces could help augment carbon offsetting on top of the carbon from forests and for possible inclusion in the Intended Nationally Determined Contribution in the long run.

Keywords: climate change, carbon sequestration, carbon stock, Intended Nationally Determined Contribution

TRACK 2
Agriculture, Fishery, and Environmental Conservation, Protection, and Management

Spatial Analysis of Metro Manila Green Spaces

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ABSTRACT

Urban green spaces (UGS) are valuable space for habitat conservation, cultural heritage preservation and maintenance of regulating ecosystem services. UGS are also crucial for enhancing resilience against the impact of climate change, infectious diseases, pollution, extreme heat, and stress associated with urban lifestyle. This study was conducted to estimate and compare the vegetation area of the 13 UGS in the National Capital Region of the Philippines using the Normalized Difference Vegetation Index (NDVI). Satellite images captured by Landsat 8 in July 2020 and July 2015 were used to analyzed the NDVI and vegetation area. The mean NDVI for July 2020 ranged from 0.05 to 0.54 while the mean NDVI for July 2015 was 0.21 to 0.49, but not significantly different ($p>0.05$). Maximum NDVI ranged from 0.1 to 0.9 for July 2020 and 0.3 to 0.8 for July 2015, but not significantly different ($p>0.05$). The top three UGS with the highest mean NDVI were Forbes Park in Makati, the University of the Philippines in Quezon City, and New Alabang Villages in Muntinlupa City. In general, shrub and grassland were dominant (NDVI: 0.2 to 0.5) but patches of dense vegetation were also observed most especially in UGS with legally protected status or restricted access. This study shows that Landsat 8 satellite images can be used to assess, monitor, and reliably predict the greenness at the local level. The UGS, if placed in a long-term conservation status and sustainable land use, warrant the continuous flow of ecosystem services necessary for the well-being of urban dwellers.

Keywords: urban green spaces, Normalized Difference Vegetation Index, Landsat 8

Impact of Institutional Support and Services to Good Agricultural Practices (GAPs) Compliance of Corn Farmers in Nueva Vizcaya, Philippines

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ABSTRACT

The study investigated the institutional support and services influence on corn farmers' compliance with good agricultural practices (GAPs) in the corn cluster municipalities of Nueva Vizcaya. The study determined the demographic characteristics of the respondents, the level and extent of institutional support and services influence on the adoption and compliance of corn farmers to GAP corn certification requirements, and the constraints on implementation. One hundred sixty (160) corn farmers who were active participants in the GAP corn project were randomly selected. A descriptive method of research was used, and descriptive statistics such as frequency counts, percentages, and means were used in describing the demographic characteristics of the respondents. A 4-point Likert scale was used to analyze the level of institutional support and services and implementation constraints. The demographic profile shows that there were older corn farmers, most had formal education and more experience in farming, and were members of farmers' organizations. Active involvement of men and women in farming improved their compliance with GAP corn. The institutional support and services rendered by Department of Agriculture, local government units, and line agencies indicated an overall mean of 2.33, which denotes slight influence. Research and extension education and information dissemination had moderate influence; production, credit and marketing assistance had slight influence; and post-harvest facilities and other interventions had low influence. In terms of constraints on institutional support and services, the lack of a niche market for GAP corn products was rated as very serious. The rest of the identified constraints were rated as serious.

Keywords: influence, compliance, certification, safety

Multi-Criteria Analysis (MCA) of Rehabilitation Alternatives for Abandoned Mining Lands

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ABSTRACT

There are at least 31 abandoned mines in the Philippines and only very few of them have undergone rehabilitation. Unrehabilitated abandoned mining areas can pose serious threats to the health and safety of the immediate community and the environment. The Philippine government issued a provision under the Philippine Mining Act of 1995 stating that abandoned mining lands should technically and biologically be rehabilitated. This study presented possible rehabilitation options for abandoned mining areas using Multi-Criteria Analysis (MCA). Formulation of the criteria for the evaluation process was derived based on the rehabilitation project's impacts on the environment, economic benefits and costs, and social impacts. Based on the conducted analysis, afforestation gained the highest score among the three rehabilitation options tested, followed by recreational development, and lastly commercial development. This analysis presented how MCA can be utilized to aid decision makers and stakeholders in making informed decisions and sound judgement for rehabilitation of abandoned mining sites.

Keywords: trade-off analysis, analytical hierarchy process, abandoned mining sites

Escherichia coli Persistence in Manure Amended Soils Under Two Types of Cultivation

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ABSTRACT

The incorporation of biological soil amendments of animal origin, such as manures, is deemed important in promoting the growth and yield of crops and general soil health. However, it is also a recognized source of zoonotic pathogens. In the Philippines, few studies have been done on the analysis of microbial contaminants on leafy produce applied with different manures. Hence, this study investigated the persistence of *Escherichia coli* as an indicator for faecal contaminants in manure amended soils planted with lettuce under protective structure and open field. Treatments employed were without manure, carabao manure, fresh chicken dung, dried chicken dung, vermicast and goat manure. *E. coli* populations in soil and leafy type lettuce at weekly interval and at harvesting were examined, respectively. Initially, soils incorporated with fresh chicken dung obtained the highest *E. coli* counts of 5.82 and 6.11 log CFU/g in protective structure and open field, respectively. Over the trial, *E. coli* decline was evident among all treatments ranging from 1 to 4 log reduction. Moreover, it was found out that at 35 days, all treatments in protective structure and open field were below the critical limit of <2 log CFU/g. At harvest, only 2% of the total harvested lettuces were above *E. coli* detection limits of 1 log CFU/g and the rest were at lower counts. Results of this research may benefit farmers, policymakers, or individuals in terms of manure quality and application to harvest interval in fresh produce specifically lettuce, an essential vegetable and salad ingredient.

Keywords: lettuce, contamination, die-off, pathogen

Morphological Characteristics and Management Practices of Native Pig (*Sus scrofa*) in the Municipality of Tuburan, Province of Cebu, Philippines

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ABSTRACT

Native pigs raising is one of the sources of livelihood for most rural farmers in the Philippines. However, the population of pure native pigs nowadays are perceived to be declining due to the augmentation of hybrid pigs. The study was conducted to evaluate the morphological characteristics and management practices of native pig in Tuburan, Cebu through frequency percentage. A total of 90 native pigs raisers representing the nine barangays were personally interviewed using a survey questionnaires, and the morphological characteristics were recorded through visual observation. Respondents were chosen using referral technique. Majority of the respondents were between 31 and 40 years old, female, and married. They had elementary level education and engaged in farming as their means of livelihood. They were earning a monthly income of below PhP 2,000. They obtained the parent stock of native pigs from the neighborhood and acquired their knowledge of rearing from their parents. Farmers practiced in wet feeding twice a day except for lactating sows and fattening pigs. Neck tethering under the tree was employed by farmers commonly on sows and boars. Natural breeding was still practiced due to lack of technical knowledge of artificial insemination. Native pigs were still dominated by black color (61%). Sows were perceived to be native, however their offspring were crossbred due to the absence of pure native boar. In terms of morphology, majority of the native pigs were black color, semi-droop ear, straight face, angular body, flat belly, straight back and pendulous tail. Most farmers kept sows with 14 teats or seven pairs. Farmers in upland barangays still practiced a traditional way of rearing native pigs. Therefore, it was concluded that farmers in upland barangays of Tuburan still practiced a traditional way of rearing native pigs. Native pig production was generally affected due to poor management and farmers' lack of technical knowledge. Moreover, farmers had increasing preference for hybrid or crossbred hogs and losing interest in the indigenous breed.

Keywords: survey questionnaires, frequency percentage, artificial insemination, natural breeding, interview

Developing a Mobile Traceability System for Tuna in Davao Region, Philippines: Preliminary Results

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ABSTRACT

Yellowfin tuna remains as one of the commercial fish species with the highest volume of production in the Davao Region. However, the fisheries sector is confronted with issues regarding food safety and illegal, unreported, and unregulated fishing. To respond to these problems and to meet the standards of importing countries such as the European Union and Japan, the Bureau of Fisheries and Aquatic Resources (BFAR) set the national guidelines for the traceability system for fish and fishery products. Traceability is a mechanism that enables the recording of catch, food safety-related information, processing, and other significant processes from the point of catch to the final consumer of a product. To support compliance with the BFAR circular and administrative order and develop a mechanism for implementation based on the status of the tuna value chain, this project attempted to develop a mobile application traceability system that aligns with the local conditions in Davao Region. Through rapid market appraisal, the tuna value chain in Mati, Davao Oriental was mapped to identify the critical tracking events and key data elements, which are crucial in the development of the traceability application. The project proposes a mobile application in android phones as a platform for the traceability system. Possible challenges in implementing the traceability system were also identified. This proposed traceability system shall contribute to the potential increase in the marketability of Philippine tuna through compliance with the global standard for traceability and safety.

Keywords: Davao Region, mobile traceability application, traceability, traceability system, tuna

Knowledge, Attitudes, Practices (KAP) and Impacts of Agroforestry in the Conservation Farming Village (CFY) in Ligao City, Albay, Philippines

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ABSTRACT

The majority of the Philippine forests are currently being degraded and transformed into agricultural land. An example of a province in the Bicol Region experiencing this tendency is Albay. A study was conducted to describe the socio-economic and demographic profile of the local people involved in the establishments and operations of conservation farming village (CFV); to analyze the knowledge, attitudes and practices regarding agroforestry development and operations; and to determine the impacts of CFV to the local people in agroforestry development in Ligao City, Albay, Philippines. Data was analyzed through descriptive statistics. A total of 15 farm volunteers and 137 adopters served as respondents. Findings revealed that the respondents had a comprehensive understanding of projects in their inception and their degree of satisfaction with the implementation of the project was high. It is significant to note that the attitudes of the respondents toward the initiative remained positive and maintained a high grade in terms of behaviors. Many farmers admitted that the reestablished forestlands had benefitted them through less water runoff and acting as windbreaks. Having an active farm organization was a very good strategy among the project implementers. Overall, the activities that were done by the CFV have a positive impact on the lives of the farmers when it comes to quality of life, farmer empowerment, and upland development.

Keywords: adopters, inception, organization, satisfaction, sustainability

Identifying Suitable Sites for Small Scale Irrigation Projects in Region I Through GIS-Based Water Resources Assessment

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ABSTRACT

The development of small-scale irrigation projects (SSIPs) is one of the modest attempts of the Department of Agriculture (DA) to increase productivity in the rainfed agricultural areas. This research project was conducted primarily to develop suitability maps for SSIPs in Region I, specifically for small farm reservoir (SFR), shallow tube well (STW), small water impounding project (SWIP), and diversion dam. A rapid inventory of existing SSIPs in the region was conducted. The inventory can be used as a basis in the allocation of SSIPs at the regional, provincial, and municipal levels. For the suitability mapping, criteria were considered as well as their corresponding weights were identified through analytical hierarchy procedure and as a result of a series of workshops and consultation with experts from the Bureau of Soils and Water Management and DA management, along with technical experts from the different state universities and colleges in the country. ArcGIS software was primarily used in the suitability analysis. Results of suitability analyses revealed that the Ilocos Region was generally moderately to highly suitable to SFRs, STWs, and SWIP. Among the four provinces in the region, Pangasinan was found to be the most suitable for the establishment of SFRs and STWs. The extent or total area for each suitability category (i.e., highly suitable, moderately suitable, marginally, not suitable) was also estimated using the software. On the other hand, results on the identification of potential sites for diversion dam showed that there were six potential sites in Ilocos Norte and one in La Union. The generated maps provide valuable information in appropriate establishment of SSIPs, as well as in land use and infrastructure planning.

Keywords: ArcGIS, small scale irrigation projects, suitability analysis, shallow tube well, small farm reservoir, small water impounding project, diversion dam

Lettuce (*Lactuca sativa L. var. Lalique*) Production Using Organic Nutrient Solution Under Hydroponics System

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ABSTRACT

Lettuce is one of the most widely hydroponically grown crops. Studies have shown that lettuce has a high yield and good quality under a soilless production. However, the nutrient solution used in hydroponic systems is based on chemical fertilizers. Recently, there has been an increased interest in organic hydroponics as the market for organic food continues to grow. The study was conducted to evaluate commercially available organic nutrient solutions (Vermitea, BioVoltin, Ramils, Healthynest) in comparison to conventional inorganic fertilizers (Snap) in hydroponic lettuce production with water as a negative control. The crop experiment was carried out in a plastic polyhouse with a mesh net at the Institute of Agriculture, Camiguin Polytechnic State College – Catarman Campus from 1 November 2021 to 15 December 2021, using a Randomized Complete Blocked Design with three replications. Results of the study revealed that among organic nutrient solution, Treatment 5 (Ramils) and Treatment 7 (Healthynest) showed comparable results to conventional inorganic fertilizer, Treatment 1 (Snap), in terms of horticultural characteristics, root development, survival rate, yield, nutrient solution consumption per plant and total nutrient solution consumption, sensory quality attributes, and cost and return analysis. Treatment 5 (Ramils) was considered best overall in terms of sensory quality attributes, overall acceptability, and marketability. Also, Treatment 5 (Ramils) showed a comparable result to Treatment 1 (Snap) in terms of yield, hence generated a comparable net returns, net profit margin, and return on investment. Overall, the results showed that using T1 (Snap solution), T5 (Ramils), T7 (Healthnest) can be used effectively to increase production under hydroponic system. However, potential use of these various organic nutrient solutions should be further tested for verification under different growing season to elicit substantial conclusions.

Keywords: hydroponics, lettuce, organic nutrient solution, sensory quality, yield

Yield Potential of Mungbean as Influenced by Different Rates of Lactic Acid Bacteria Serum (LABS)

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ABSTRACT

Lactic Acid Bacteria Serum (LABS) is a natural organic fertilizer made from rice washed and pure milk in fermented food which give strength to plants, used as soil conditioner and are generally considered safe for plants. The study was conducted at Rebuken, Sultan Kudarat, Maguindanao from October 2017 to January 2018 to evaluate the yield potential of mungbean as influenced by different rates of LABS. A Randomized Complete Block Design was used in the study with five treatments and it was replicated three times. The quantitative data were analyzed using F-test and analysis of variance were tested both at 5% and 1% levels of significance. Results of the study revealed that there were significant differences in plant height and number of seeds per pod of mungbean. On the other hand, number of pods, thousand seed weight and bean yield were not significantly affected by the application of LABS. However, treatments applied with 4 tbsp of LABS obtained the tallest plant height in centimeter and produced more number of seeds/pod. Moreover, increasing the rates of LABS from 2 tbsp per 14 L of water would significantly increase the height of the plant. Results showed that LABS improved growth, increased the number of seeds, gave strength to weak plants. and could be easily absorbed by the plants; thus, it safe for human's health.

Keywords: rice washed, potential, conditioner

Dissemination Strategies on Natural Farming Technologies Among Agricultural Extension Workers in Camiguin, Philippines

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ABSTRACT

The implementation of the policy on organic agriculture is continuously facing a challenge because of the extensive use of inorganic fertilizer and pesticides among farmers. This qualitative study sought to assess the dissemination strategies on natural farming technologies in Camiguin, Philippines. Primary data from key informant interviews with model farmers, faculty members from the Camiguin Polytechnic State College, municipal agriculture officers and focus group discussions with agricultural extension workers in the Province of Camiguin were supplemented with secondary documents like photographs and print and online materials. Results showed that group methods through group discussions known as "Hisgot sa Panguma", farmers' meetings supplemented with PowerPoint presentations, posters as well as mass media like rekorida, printed materials, radio and Facebook were used to promote organic concoctions like fermented plant juice, fermented fruit juice, indigenous microorganisms, oriental herbal nutrients and lactic acid bacteria serum. With minimal participation in both theoretical and hands-on trainings, the agricultural extension workers had moderate understanding of the government's organic agriculture program, projects, and activities. Limited budget affected the frequency of home/farm visits and establishment of demonstration farms. Social media platforms like Facebook had limited promotional use because most of the farmers are senior citizens. Policies enacted by local government committees on agriculture provide legal framework to push through these initiatives; thus, there is a need to lobby and advocate with the Local Government of Camiguin to put in place the Provincial Organic Agriculture Program as well as extension and communication interventions.

Keywords: adoption, campaign, extensionists, fermentation, organic

Feedstuff for Backyard Pigs in Northern Philippines

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ABSTRACT

This study was conducted in the City of Batac, Ilocos Norte, Philippines to survey feedstuffs used by the smallholder pig raisers. Through the proportional allocation scheme, 117 backyard pig raisers from the top five barangays with the highest number of pigs raised, regardless of the breed, were interviewed. Descriptive statistics such as means, frequencies, percentages, and ranks were used to summarize and analyze the data. Results showed the backyard pig raisers were middle-aged female and high school graduates. Their source of income was primarily from farming activities. The respondents had raised pigs for at least one year and a maximum of 50 years for a profit. There were 11 local feedstuffs identified. These include Alternanthera sp., Musa sp., *Portulaca oleracea*, *Ipomoea aquatica, Amaranthus spinosus, Amaranthus viridis, Ipomoea batatas, Amorphophallus campanulatus, Dioscorea alata, Colocasia esculenta*, and *Manihot esculenta*. However, the respondents used only eight of the identified fresh or cooked feedstuffs. The respondents' primary goal in giving pigs feedstuff was to save money. Leaves, stems, trunks, and tubers of the feedstuff were given to pigs, ages at least three months, twice daily. All the findings in this study are valuable information to agriculture, especially for development in animal science education. Incorporating these feedstuffs as forage crops to instruction and research could serve as a benchmark for further studies such as the growth performance of pigs fed with the various feedstuffs.

Keywords: Alternanthera sp., Portulaca oleracea, smallholder, sustainable

TRACK 3
The Futures of Agricultural Education in the Era of Industrial Revolution

Technological innovations have affected how people learn, live, and work. The agriculture industry, specifically the teaching and training of agriculture in learning institutions, is not exempted from the impacts of innovations, transformations, and disruptions.

One of the presentations under this track discussed how the 21st-century skills affected the academic performance of senior high school graduates studying at the College of Economics and Management of the University of the Philippines Los Baños. Another presentation highlighted the institution of social dynamism of agricultural innovations through revitalized and revolutionized sustainable community development. There was also a presentation on the agriculture 4.0 readiness framework for Philippine research and development organizations. The last presentation proposed a gender- and culture-sensitive agriculture and development education in higher education institutions.

21st Century Skills and the Academic Performance of Aligned and Misaligned Senior High School Graduates Studying at the College of Economics and Management, University of the Philippines Los Baños

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ABSTRACT

The implementation of senior high school (SHS) has not been without its fair share of challenges. These include a possible mismatch between the SHS graduates' track and their course at the university through the Commission on Higher Education Memorandum Order 105 series of 2017. The purpose of this quantitative study was to determine how the 21st-century skills affect the academic performance of aligned and misaligned SHS graduates studying at the College of Economics and Management at the University of the Philippines Los Baños. Of the 38 respondents, only 42.1% graduated from the ABM strand, which is considered aligned to the courses in the college. Mann-Whitney U test showed that there was no significant difference between the academic performance of aligned and misaligned SHS graduates with a test statistic of 175.5 and a p-value of 0.988. Similarly, Kruskal-Wallis H-Test revealed no significant difference between academic performance and strand with an H-test statistic of 0.114 and a p-value of 0.945. This may also imply that misaligned students were able to successfully bridge the demands of their college courses despite not having the theoretical foundations offered during SHS. The Mann-Whitney U test revealed that only ICT skills showed a significant difference between aligned and misaligned SHS with a test statistic of 78 and a p-value of 0.003. This seems to indicate ICT skills as a tool to help bridge the initial knowledge gap among the misaligned students in CEM's degree programs.

Keywords: senior high school, non-parametric tests, Kto12, track alignment

Instituting the Social Dynamism of Agricultural Innovations Through Revitalized and Revolutionized Sustainable Community Development in Ilocos Region

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ABSTRACT

The increasing concern on the challenges in agriculture and rural development in the Philippines has triggered the development of agricultural innovations applied in local communities. Inspired by socio-cultural based strategies, the Mariano Marcos State University (MMSU) focused on the revolutionized and revitalized strategies that shaped agricultural development with social dynamism process in Ilocos Norte. Several development strategies anchored on the programs of MMSU contributed to the enhancement of agricultural education, extension, and community engagements including clientele and stakeholder development. These strategies include the agricultural development partnership of state universities and colleges and local government units, agriculture learning route, blended agricultural education, agricultural executive competency program, agriculture and rural development support services, agri-tourism innovative programs, and the sustainable professional knowledge exchange. Through revitalized social dynamism, MMSU continuously maintains an active participation on the ground with its key players resulting to clientele empowerment, responsive development, and localized community resiliency. MMSU has also created the process of progressive community interest, appropriate application of best practices, and leading transformational learning in agriculture and rural development and education.

Keywords: agricultural innovations, social dynamism, agricultural education, community development

An Agriculture 4.0 Readiness Framework for Philippine Research and Development Organizations

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ABSTRACT

Agriculture 4.0 refers to the range of concepts and technologies of Fourth Industrial Revolution (IR4.0) used to enhance and develop agriculture innovations and systems across the value chain. It is expected to improve agriculture productivity, environmental sustainability, food and nutrition security, and income. While ideally, Agriculture 4.0 promotes sustainability and addresses climate change, societies need to determine the appropriate physical, digital, and biological conditions as well as technological interventions that can help achieve food security and productivity. In the Philippines, the extent of research and development organizations (RDOs) readiness for Agriculture 4.0 has yet to be explored and determined. Through a triangulation approach of desk review, Real-Time Delphi and key informant interviews, this study developed a readiness framework for Philippine RDOs in the agriculture, aquatic, and natural resources sector. Five readiness dimensions were identified as human capital, organizational leadership, planning and strategy, smart operations, and technology management to be able to evaluate the readiness levels of RDOs in preparation for Agriculture 4.0. Based on a Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM), a total of 40 items were used as components for the readiness framework that assess the readiness levels of the RDOs. Findings of the study will later on suggest relevant organizational and institutional capacity building interventions, technological improvements, and sustainable strategies that can drive the local agri-fishery and natural resources sector toward development and sustainability.

Keywords: Agriculture 4.0, readiness framework, agriculture development, research and development

Instituting a Gender and Culture Sensitive Agriculture and Rural Development Education in Higher Education Institutions

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ABSTRACT

Agriculture and rural development education are considered as the most influential factors in encouraging the shift from theoretical practice to application of local technologies in rural areas. The inclusion of gender- and culture-sensitive parameters results to a holistic and systematic process of educational development among stakeholders particularly teachers and learners. Challenges in agriculture and rural development were evaluated in relation to gender and culture sensitivity toward improved delivery of agricultural education practices. These include interactive and practical courses in agriculture, fisheries, food and sustainable development, adequacy of teaching-learning resources, conducive environment, competent agriculture teachers, and responsive and resilient learners. Through these challenges, a gender and culture-sensitive agricultural education (GCSAE) model was developed, which was evaluated before and during the occurrence of the COVID-19 pandemic through innovative teaching-learning platform in higher education institutions. The utilization and application of the GCSAE model provides a systematic approach in developing the competence levels of teachers, learners, and higher education institutions in responding to the changing condition of the educational development landscape in agriculture and rural development.

Keywords: gender, culture sensitive, agriculture, rural development, model

TRACK 4
Challenges and Opportunities on Scientific and Technological Entrepreneurship and Governance

Technological entrepreneurship and governance are emerging concepts in transforming discoveries and innovations to accelerate growth and development. A major driver of economic and social advancement will be the establishment of new businesses that act as change agents in their particular industries by utilizing technological advancements, generating employment, and supporting local communities. Meanwhile, technological governance is the process of ensuring the development, diffusion, and use of technology breakthroughs as promoted by political, economic, and administrative authorities.

One of the paper presentations under this track discussed the socio-economic characteristics of farmers, potential business opportunities for farmers, and the problems they encountered. Another presentation discussed the current condition, external factors, potentials and challenges of cacao entrepreneurs. Lastly, a paper presented the lived experiences, challenges, and opportunities of selected micro, small, and medium enterprises.

Socio-economic Characteristics of Farmers in Bukang Liwayway, Kibawe, Bukidnon, Philippines

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ABSTRACT

The study generally aimed to identify the socio-economic profile of farmers in Barangay Bukang Liwayway in the Municipality of Kibawe, Bukidnon. Specifically, it sought to identify potential business opportunity needed in the community and identify problems encountered by the farmers. Data were gathered through personal interview of 23 farmers using a survey questionnaire and analyzed using descriptive statistics such as mean, percentage, and frequency counts. Focus group discussion and key informant interview were also used in the study. Findings revealed that the respondents were mostly female, middle aged, Roman Catholic, Cebuano, and farmers who had experiences in farming and owned a piece of land that is used for agriculture. Their sources of farm credits were lending institutions, neighbors, and friends. Mushroom production was identified as opportunities for agribusiness and technology commercialization. The problems met by the farmers were infestation of pest and diseases, high prices of inputs, and low farm gate prices of farm produce.

Keywords: problems met, technology commercialization, mushroom production

Current Condition, External Factors, Potentials & Challenges of Cacao Entrepreneurs: Impetus for Sustainable Rural Development Framework in Lagawe, Ifugao, Philippines

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ABSTRACT

Rural development relies heavily on entrepreneurship and innovation. Rural development requires harnessing existing community assets and expanding local economies while pushing business capabilities to be more efficient and innovative. As a result, the current conditions, external factors, potentials, and challenges faced by cacao entrepreneurs in Lagawe, Ifugao were investigated as a foundation for a comprehensive framework for a sustainable rural development strategy. Both quantitatve and qualitative approach were used to accomplish identifed research objectives. To collect information from local cacao entrepreneurs, a researcher-made questionnaire was administered, along with key informant interviews with local government unit officials and government agency representatives. Employing weighted means and inductive analysis, results revealed that local products were in good condition based on the One Town One Product (OTOP) program in the Philippines. Entrepreneurs in the cacao business had access to a variety of governmental institutions' technological, commercial, and social infrastructures. Cacao goods had the potential to be widely recognized as businesses start to develop their products to suit the requirements and standards of customers and other agencies in reaching wider market. Areas for improvement were identified based on the OTOP criteria. Finally, a thorough structure was put forth to create a cocao industry that is sustainable and profitable as an instrument for rural development.

Keywords: access to finance, cacao entrepreneurs, cultural value, one town one product, product potentials

Lived Experiences of Selected MSMEs on Technological Assistance

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ABSTRACT

Sustaining healthy business operation is the bottleneck of every manager and owner, thus proper and accurate technological intervention is essential. The study aimed to present the lived experiences, challenges, and opportunities of selected DOST-assisted micro, small, and medium enterprises (MSMEs), either from Grant in Aid (GIA) for group, organization, and cooperatives or Small Enterprise Technology Upgrading (SETUP) for individuals. Qualitative phenomenology was employed using interview, observation, and site visits. GIA-assisted enterprises are initiated either by the government, the religious sector, or non-government organizations that commonly capitalize on locally available resources; while SETUP is mainly availed by privately owned enterprises. Technology interventions, to most of the GIAs, did not show optimal utilization due to small level type of production, low capital, and unstable raw materials. Human resources are not being prioritized, hence needing further attention and due importance. Among the constraints experienced by the co-participants include: limited working capital; lack of market; technical and production problems (slow production and tedious process, number of rejects during the early stage of the project, inappropriate equipment and tools); high turn-over of workers; difficulties on managing people; and lack of committed employees and members of the organizations. Managing daily operations of the enterprise is critically influenced by the type of business organizations. The study revealed that SETUP and GIA projects had significant difference, as experienced by the recipients, in relation to business functions such as marketing, production, financial, and human resource management. Hence, technology intervention should be based on taker's readiness and capability to adopt the technology for maximum use.

Keywords: MSMEs experiences, technology upgrading, operational business functions

ORGANIZED PANEL

Agriculture from the Farmers' Perspective

Convenor: Dr. Imee D. Esguerra, Director for Extension Services
Moderator: Mr. Rael C. Tejada, Director for Research
Bulacan Agricultural State College

The panel reflected the perspectives of farmers on community development efforts through the evaluation of government projects. One of the studies presented discussed the farmers' satisfaction of the Rice Competitiveness Enhancement Fund components particularly seed and financial assistance. Another study determined the farmers' level of awareness of crop insurance programs and their participation and level of satisfaction in these programs. Likewise, the farmers' perceived usefulness, problems encountered, and level of satisfaction with the adoption of mechanical rice transplanter were also discussed.

Moreover, the panel covered a study on the participation and satisfaction of Rural Improvement Club members and studies on farm and cooperative management. Recordkeeping practices of rice farmers and application of strategic management in cooperatives presented an overview of the management skills of farmers.

Results from the aforementioned studies are essential in the formulation or enhancement of policies to further the improvement of the farmers' lives.

Level of Satisfaction of Farmers on Rice Competitiveness Enhancement Fund (RCEF) Components on Seeds and Financial Assistance

Mark Keano Dane M. Adres, Rosemarie F. Estrabela, Juvilyn C. Pineda, MJ Nicole T. Estravela, Shairin DC. Gacutan, Reymart G. Dela Rosa, and Nerilyn J. Victoria*
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ABSTRACT

The study was conducted to determine the level of satisfaction of farmers on Rice Competitiveness Enhancement Fund (RCEF) seeds and financial assistance components. A total of 321 farmer beneficiaries of RCEF seeds and financial assistance components from San Ildefonso, Bulacan were the respondents of the study. Using correlational research design, the study looked into the relationship of the perception of farmers on RCEF program, problems encountered, and the level of satisfaction of farmers. Data were gathered through survey questionnaires. According to the findings, majority (90.03%) of the farmers were older adults, 76.3% were male, 92.21% were married, and 27.73% reached secondary education. The farming profile shows that farmers had been in farming for 21 years and above, most of the farmers (38.32%) had a farm size of 5,000m^2-1 ha for their rice cultivation, and 92.52% spent three years being a member of the RCEF program. During the dry season, it shows that the farmers produced yield with 81 cavans and above (29.28%). Also, in the wet season, farmers (39.88%) generated yield of 81 cavans and above. The perception of farmers on RCEF seeds and financial assistance components was significantly affected by their level of satisfaction. It suggests that as their perception increases, their level of satisfaction also increases. As the farmers encountered problems with the RCEF seeds and financial assistance components, their level of satisfaction with the program became affected, which had a negative effect on their production.

Keywords: Rice Competitiveness Enhancement Fund (RCEF), seeds component, financial assistance component

Awareness, Participation and Satisfaction of Rice Farmers in Crop Insurance Programs

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ABSTRACT

This study was conducted to determine the level of awareness, participation and level of satisfaction in crop insurance programs of 171 rice farmers in three barangays of San Miguel, Bulacan, namely Camias, Magmarale, and Salangan, Using correlational research design, survey method was used through face-to-face interviews. Findings showed that there was no significant relationship between the farmer's socio-demographic profile, and level of satisfaction in crop insurance programs. No significant relationship between years of farming and level of satisfaction of rice farmers in crop insurance programs were also found. The level of awareness affected the farmer's level of satisfaction in crop insurance programs. As the farmers' level of awareness increased, their level of satisfaction also increased. There was significant inverse relationship found between the farmers' participation in insurance programs during the wet season and their level of satisfaction in crop insurance programs. As the participation of the farmers in crop insurance programs increased, their level of satisfaction decreased.

Keywords: crop insurance program, awareness, participation, satisfaction

Perceived Usefulness, Problems Encountered and Satisfaction of Farmers on the Mechanical Rice Transplanter

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ABSTRACT

This study aimed to determine the farmers' perceived usefulness, problems encountered, and level of satisfaction with the adoption of mechanical rice transplanter (MRT) in Nueva Ecija in terms of the social, technical, environmental, economic, and political aspects. The overall assessment of the level of satisfaction of farmers using MRT resulted in a grand mean of 3.95 with a verbal equivalent of satisfied. The correlation analysis result showed that the level of satisfaction of farmers had a significant relationship to the rice farming profile of farmers, perceived usefulness of using the MRT, the problems encountered in adopting MRT, and extension modality used in the promotion of MRT. Farmer-respondents strongly agreed with the perceived usefulness of using the MRT. Farmers who used MRT had significantly increased their yield compared to manual transplanting. The cost of crop establishment was reduced, and the problem of labor scarcity during crop establishment was solved. Despite the benefits of using the MRT, many of the respondents discontinued the use of this technology. The study identified the top problems of the farmers that caused them to discontinue the use of MRT: 1) a limited number of seedling trays, 2) a limited number of MRT, 3) laborious seedling preparation, and 4) no available spare parts for the repair of the machine. Addressing these problems can increase its adoption rate and improve farmers' satisfaction level with this technology.

Keywords: mechanical rice transplanter, satisfaction, adoption level

Participation and Satisfaction of Rural Improvement Club (RIC) Members

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ABSTRACT

The study aimed to determine the extent of participation and satisfaction of Rural Improvement Club (RIC) members in San Ildefonso, Bulacan. The factors were determined by studying the socio-demographic profile of RIC members, their level of participation, extent of satisfaction, and the relationships among variables. The respondents were selected among the top three barangays with the highest number of active members and with existing livelihood projects implemented. The study used quantitative and correlational research design using survey questionnaires retrieved from 93 RIC members. Results showed that majority of the RIC members were middle-aged adults, married, high school graduates and with farming as their source of income for five family members. The study also showed that respondents were members of RIC for at least 6-10 years. In terms of level of participation, respondents often joined RIC with the help of other members that were introduce in a project or skill-based enterprises provided through capacity enhancement seminars. With regards to extent of satisfaction, members were satisfied with the income derived from RIC projects on food production of agricultural commodities and skill-based enterprises. Members were highly satisfied with the capability enhancement attended that promote mutual cooperation among members and the financial grants given that helps in promoting activities of organization. Significant relationships were found between the level of participation and extent of satisfaction, age, source of income, and number of years in the organization. However, no significant relationships were found between civil status and educational attainment and their extent of satisfaction.

Keywords: Rural Improvement Club, extent of satisfaction, level of participation

Record Keeping Practices and Income of Rice Farmers

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ABSTRACT

The study was conducted to evaluate how many farmers keep records of their rice farming activities in selected barangays in San Ildefonso, Bulacan. A total of 91 randomly selected rice farmers from the three barangays such as Casalat, Umpucan and Sapang Putik served as respondents of the study. The reasons of keeping records and reasons of not keeping records of their income for the last two cropping seasons were given emphasis in this study. Based on the result, most of the respondents belonged to the age bracket of 60 years old and above. The majority of the farmers were male and married. Most of them were elementary graduates and have been planting rice for 31-40 years with a land area of 1-2 ha. Respondents strongly agreed on the importance of keeping records of the activities on their farms having an overall mean of 4.92. On the other hand, there were reasons stated by rice farmers why they did not keep records of their farming activities. They strongly agreed that there was no need for them to keep records having overall mean of 4.30. As regards to the total expenses of two cropping seasons, dry season expenses amounted to an average of PhP 35,712.87. Meanwhile, the average expenses for wet season amounted to PhP 34,176.81. The study showed that correlating education to their income had a significant role in terms of recordkeeping. It was also proven that farmers with high educational attainment had more knowledge and background of recordkeeping (ρ = .299*, ∞ = .004).

Keywords: record keeping, income, rice farmers

Strategic Management Process and Profitability of Selected Cooperatives

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ABSTRACT

Strategic management can be interpreted as a set of managerial decisions and actions of an organization that can be used to facilitate competitive advantage and long-run superior performance over other organizations. This study aimed to analyze the significance of the strategic management process of selected agricultural cooperatives in San Ildefonso, Bulacan in terms of strategic objectives and analysis, strategic formulation, strategic implementation, and strategic evaluation and control to the profitability of the cooperatives for the year 2021. The researchers used quantitative inferential and correlational design using a modified and validated questionnaire floated to 60 respondents. Samples were determined using the probability technique utilizing equal allocation stratified random sampling. The results revealed that strategic objectives and analysis, strategic implementation, and strategic implementation and control had a significant relationship to profitability, while strategic formulation results did not. However, the overall strategic management process showed that there was no significant relationship to the profitability of the three agricultural cooperatives, thereby accepting the null hypothesis.

Keywords: cooperative, process, profitability, strategic management

RECIPIENTS OF THE BEST PAPER AWARDS

BEST PAPER

Mangrove Reforestation, Protection, and Conservation Initiatives: The Case of Sorsogon Bay Rompeolas, Philippines

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ABSTRACT

Mangrove losses have been observed in several parts of the world including the Philippines despite its explicit directive through Republic Act 8550 or the Philippine Fisheries Code in ensuring the conservation, protection, and sustained management of the country's fishery and aquatic resources. This qualitative research made use of a case study design at Sorsogon Bay Rompeolas through observation, field visits, and interviews to describe and evaluate the milestones and challenges encountered in the mangrove reforestation and protection initiatives among volunteer stakeholders. The study found out that the post-implementation (monitoring) phase of the project was the least participated activity while the project implementation phase was the fully participated activity of the different stakeholders involved in the project. Waste pollution, unsustained participation of residents, and natural calamities were the challenges encountered by the project. The local government units in collaboration with the concerned national authorities may adopt blended infrastructure projects with the environmental protection program in the preservation and enhancement of the current state of the coastal ecosystem.

Keywords: stakeholders' participation, conservation initiatives, sustainability plan and measures (SMP)

The paper is currently being considered for publication in a refereed journal. Hence, only the abstract of the paper is included in this proceedings.

BEST PAPER
RESEARCHER'S PROFILE

MS. CYRA MAE R. SOREDA

Cyra Mae R. Soreda is a young, enthusiastic, and dynamic instructor of Sorsogon State University, Philippines. She holds a bachelor of secondary education degree, biological science major, from Sorsogon State University and master of arts degree in biology education from Bicol University. She completed her bachelor's degree with academic distinction. She also received an award for her master's thesis. It was presented in an international conference on multidisciplinary education, leadership and management and was hailed as the best research paper. Through training and collaborations with her professors and colleagues in the university, her research knowledge and skills were enhanced. Her passion in the conservation and preservation of the natural environment also led her to engage in activities that promote environmental sustainability. Moreover, her research interests and innovations in the fields of education, biology education, and environmental education led her to writing modules and conducting basic research that break the gap between theory and practice.

BEST PAPER
RESEARCHER'S PROFILE

DR. RYAN V. DIO

Dr. Ryan V. Dio is a young, dynamic, and achiever professor and administrator of Sorsogon State University, Philippines. The learnings he has gained from being a member of the National Research Council of the Philippines since 2016 have provided him opportunities to offer several research policies and guidelines to elevate the quality and relevance of research in his institution. With his passion to conserve and preserve the natural environment, he was given the chance to lead two extension projects on environmental management that improved the community's environmental management practices. His research interests and innovations in the fields of education, social sciences, and realistic mathematics also led him to be recognized as the Most Outstanding Teacher in Sorsogon in 2017. Dr. Dio is also one of the top researchers of Sorsogon State University. He has research papers published in indexed journals and cited in Google Scholar. Currently, he also serves as the first Vice President for Research, Extension, and Training of the university.

2ND BEST PAPER

Current Condition, External Factors, Potentials & Challenges of Cacao Entrepreneurs: Impetus for Sustainable Rural Development Framework in Lagawe, Ifugao, Philippines

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ABSTRACT

Rural development relies heavily on entrepreneurship and innovation. It requires harnessing existing community assets and expanding local economies while pushing business capabilities to be more efficient and innovative. The study investigated the current conditions, external factors, potentials, and challenges faced by cacao entrepreneurs in Lagawe, Ifugao and developed a comprehensive framework for a sustainable rural development. Both quantitatve and qualitative approaches were applied in the study. To collect information from local cacao entrepreneurs, a researcher-made questionnaire was administered, along with key informant interviews with local government unit officials and government agency representatives. Employing weighted means and inductive analysis, results revealed that local products were in good condition based on the One Town One Product (OTOP) Philippines framework. Entrepreneurs in the cacao business had access to a variety of technological, commercial, and social infrastructures of government institutions. Cacao goods have the potential to be widely recognized as entrepreneurs start to develop their products to suit the requirements and standards of customers and agencies in reaching a wider market. Areas for improvement were identified based on the OTOP criteria. Finally, a thorough structure was put forth to create a cocao industry that is not just sustainable and profitable but also an instrument for rural development.

Keywords: access to finance, cacao entrepreneurs, cultural value, one town one product, product potentials

INTRODUCTION

Entrepreneurship and innovation are seen as essential components of society's progress, including developing sustainable rural areas (Fink et al., 2017).

Based on the bottom-up development theory, one viable response to the economic crises in developing countries is to stimulate and sustain development in rural regions (Claymone & Jaiborisudhi, 2011; Lopez et. al., 2019). A perfect example of rural entrepreneurship promoting rural development is Japan's One Village One Product (OVOP) initiative, a unique approach to local action to seek a solution to the country's severe rural economic decline.

After the successful implementation in neighboring nations, the Philippines has been pushed to embrace OVOP in 2017. The One Town One Product (OTOP) Philippines assists micro, small, and medium companies in producing, offering, and marketing unique products or services by utilizing local raw resources and talent. It is a government-priority program to foster entrepreneurship and employment creation (Department of Trade and Industry [DTI], 2017).

One of the rural areas in the country that aim for sustainable economic development is Lagawe, Ifugao. The municipality capitalizes on local products, services, and resources to improve the local community's welfare. However, the competitiveness of the municipality in terms of economic growth is still a problem that needs immediate concern.

This study explored the current conditions of cacao entrepreneurs using the OTOP components, access to external factors that affect cacao entrepreneurs, and the potentials and challenges that emanate from the current conditions and external factors. Results served as bases to develop a comprehensive framework for the cacao industry to become a strategy of sustainable rural development.

METHODOLOGY

A combination of qualitative and quantitative research methodologies was used in this study. Specifically, the qualitative-descriptive research design through interviews was used to determine the current conditions of entrepreneurs. On the other hand, the quantitative-descriptive research design was adopted to understand the effect of access to external factors.

The entrepreneurs of locally-made cacao products in Lagawe, Ifugao were the primary participants of the study. The study group was determined using criterion sampling and the selection criteria used to identify the participants were patterned from the One Village One Product movement of Japan.

Representatives of government agencies were also interviewed for this study to validate the the quantitative data on access to external factors

To analyze the data on the current conditions of entrepreneurs, open coding was done and product descriptions were noted. The extent of the effect of external factors were processed using SPSS, where descriptive analyses were performed. Lastly, in the proposed comprehensive framework for sustainable rural development, the inductive technique of writing was used based on the salient findings on the current conditions and external factors.

RESULTS AND DISCUSSIONS

Current conditions

The current conditions of cacao entrepreneurs are described using the 10 components of the OTOP Philippines framework .

Product quality. Entrepreneurs apply bean selection to ensure the quality of products. Only good quality beans are used in chocolates.

Product design. Tablea and chocolates have different product designs that are equally attractive. Most chocolate products are rectangular with native-inspired designs and packaged in blue violet or dark colors, The tribal patterns have added beauty to the design and ensured distinction from other chocolate products in the market. Flavorings and added ingredients are also indicated in the packaging of chocolate products. For tablea, brown paper is used for packaging

Packaging and labeling. Chocolate bars are packaged in two layers: thin aluminum foil and a box. On the other hand, all tablea products use a doypack or stand-up pouch, airtight sealed, for packaging.

Cacao by-products contain some product labels such as business name, brand name, net weights, chocolate flavor, and added ingredients. Notably, tablea products contain their expiration date. For both products, however, the nutrition labeling and direction for storage are not indicated.

Marketability. The target market of tablea and chocolates are the locals, tourists, chocolate lovers, and health-conscious consumers. They can purchase the products at the physical stores of entrepreneurs and partner retailers and wholesalers in Lagawe and Baguio City. Selling price is based on the production cost per unit.

To maintain the products' taste and attract customers, entrepreneurs use more cacao and fewer emulsifiers in chocolates, which also serve as their products' competitive advantage. Moreover, entrepreneurs promote their products through word of mouth and Facebook. They actively participate in trade fairs of government agencies. However, they do not have yet a marketing plan and positioning strategies.

Branding. Both tablea and chocolate products have unique brand names but these are not registered with the Intellectual Property Office of the Philippines (IPOPHL). Study participants, whose business names are already registered with the DTI, were not planning to register their brand with the IPOPHL.

Production and delivery capacity. The production capacity depends on the availability of cacao beans. Oftentimes, 30-50 packs are produced for every product variety. Production centers also serve as storage areas. Once a month or upon order, entrepreneurs deliver products to partner retail stores. Retailers shoulder the delivery fee.

Financial capability. Entrepreneurs use family funds to produce products continuously. To monitor and track their income and expenses, they maintain a record book. They also conduct inventories done twice a month (i.e., beginning and ending inventories). However, they are still learning the different financial statements and budget plans. Nevertheless, they have allocated funds to improve their products' texture, packaging, and labeling.

Innovations. Starting with tablea as the main product, cacao entrepreneurs added dark chocolates and flavored chocolates (e.g., milk chocolates) to their product lines. They also have chocolate products with other ingredients like almonds.

At the start of operations, problems with texture were present. With the training activities attended, entrepreneurs have enhanced the texture of their chocolate products. With the use of machines, tools, and equipment, the quality and production of products have also improved.

Moreover, to meet the changing demands of consumers, entrepreneurs have also enhanced their packaging and labeling.

Cultural value. Cacao entrepreneurs' pride in their community is seen as a substantial factor in ensuring the sustainability of their business. They believe that using all-natural indigenous cacao in chocolates makes the products culturally connected.

Customer experience. To know the consumers' feedback, entrepreneurs collect Facebook reviews and posts. To address product complaints, they offer product return, refund, or replacement. However, no post-sales service strategy is being offered.

External factors affecting cacao entrepreneurs

Results showed that financial subsidy from the government did not affect cacao entrepreneurs. Participants claimed that they never received any financial subsidy. Access to finance was from personal investments and through loans that significantly affect business continuity.

On the other hand, access to technology had a great effect on their business operations. Food processing technologies and raw materials production technology, which improved their production process, were provided by various government agencies.

Market access had greatly influenced the visibility and availability of products within and outside the municipality.

However, participants' minimal access to social infrastructures did not affect the business operation.

Lastly, environmental factors such as the supply of raw materials and production materials, inbound and outbound logistics, human resources, and competition had greatly affected business operations to a very great extent.

Potentials of cacao business

Good quality of cacao beans, standardized process, good production technology, and appropriate packaging materials ensure good quality of chocolate and tablea products. Products are equally attractive and appealing. Labels are available and evident in all products, including brand names. Product, price, distribution, and promotional strategies target general consumers. Through the DTI, the business can penetrate other markets. More so, the business has identified a differentiation strategy. The business ensures a consistent supply of products through its partner retail stores within and outside the municipality. The business has an available storage area and facilitates the transport of products through a delivery mechanism. Monitoring of records and inventory of products are regularly conducted. Initiatives on texture, packaging and labeling improvements were made. Appropriate tools and technology are being used in producing good quality products. A service recovery strategy is also available. Personal investments are the sources for financing the business. Food processing technologies from the government agency and private investments are used to produce final products. Market and social infrastructure access are through the local government units and DTI. The company also has a steady supply of raw and processing materials, appropriate forward and backward linkages, and staff.

Challenges of cacao entrepreneurs

Even tablea and chocolate entrepreneurs are not FDA approved or registered and not compliant with the prescribed product labels. Promotional, market penetration, differentiation, and positioning strategies are inadequate. Brand identities are not duly registered. Limited networks are established outside the municipality which means limited distribution of products. No one from the businesses prepare and analyse financial statements. No additional improvements on product quality were done. There is also a weak cultural connection in the development and the production process. The business does not have a standardized feedback mechanism and after-sales service.

Sustainability framework for cacao entrepreneurs

Based on its findings, the study proposed a comprehensive framework for the cacao industry as a sustainable rural development strategy (Figure 2). The framework is a graphical representation of the critical drivers for cacao producers to become sustainable. The framework is based on the existing best practices of the cacao producers. Identified recommendations were added to make cacao products become sustainable and become a strategy for rural development.

CONCLUSIONS

Locally made cacao products produced in Lagawe, Ifugao, Philippines are in a good state in terms of product quality, product designs, packaging and labeling, marketability, branding, financial capability, production and delivery capacity, innovations, cultural integrations, and customer experience.

Entrepreneurs have access to various external factors provided by local and national government agencies and private organizations that have significantly affected the business operations, production, and continuity.

Generally, local entrepreneurs in Lagawe have the potential to produce products that are possible to compete within and outside the locality. A proposed comprehensive framework was made to guide local entrepreneurs in establishing a sustainable industry-viable product, in reaching a broader market, and in making the cacao industry a driver of rural development.

Furthermore, the study identified some areas for improvement to sustain the cacao business and become a strategy for rural development. It also offered action steps for private and government agencies to strengthen their collaboration with small businesses. Lastly, the study recommended the regular monitoring and evaluation of programs, projects, and activities of private and public entities to ensure their effective performance and long-term viability, which will support rural development.

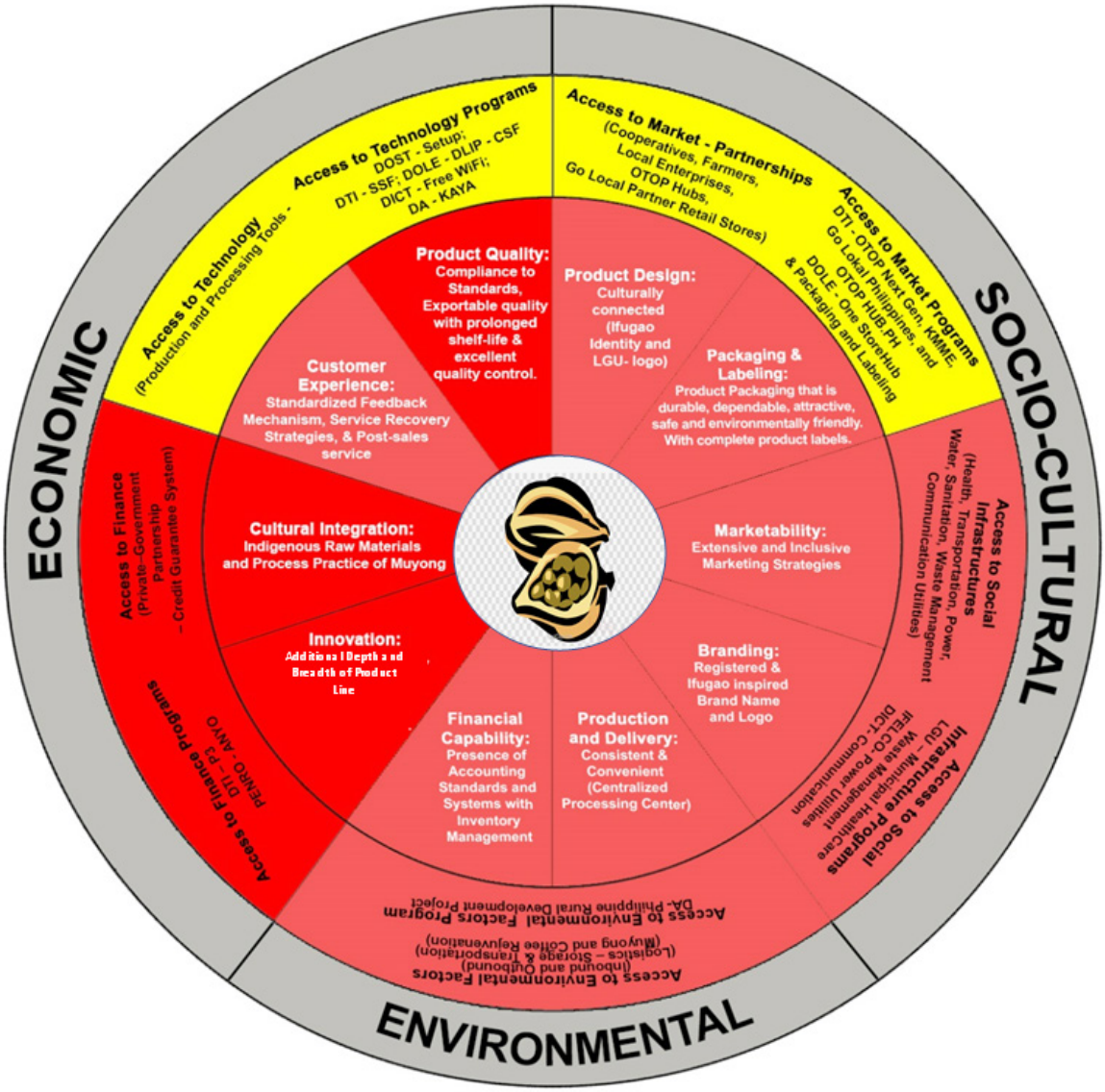

Figure 2. Proposed Framework for Sustainable Cacao Industry

REFERENCES

Claymone, Y., & Jaiborisudhi, W. (2011). A study on one village one product project (OVOP) in Japan and Thailand as an alternative of community development in Indonesia. *Thai Journal of East Asian Studies, 16*(1), 51–60.

Department of Trade and Industry. (2017). DTI one product one product (OTOP) Philippines. http://docshare01.docshare.tips/files/23276/232761473.pdf

Fink, M., Lang, R., & Richter, R. (2017). Social entrepreneurship in marginalized rural Europe: Towards evidence-based policy for enhanced social innovation. *Regions Magazine, 306*(1), 6–10. https://doi.org/10.1080/13673882.2017.11878963

Lopez, M., Cazorla, A., & Del Pilar Panta, M. (2019). Rural entrepreneurship strategies: Empirical experience in the Northern Sub-Plateau of Spain. Sustainability, 11(1243), 1243, https://doi.org/10.3390/su11051243

2ND BEST PAPER
RESEARCHER'S PROFILE

DR. CLIENT WILLIAM M. MALINAO

Dr. Client William M. Malinao holds a straight degree program in business administration. He finished his bachelor's degree in business administration with a major in marketing management at the Cagayan Valley Computer and Information Technology College, master's degree at Northeastern College, and doctor's degree in commerce at Saint Mary's University. He is an active member of the National Research Council of the Philippines. He is a licensed Professional Teacher, a certified bookkeeper, trainer's methodology certificate holder, and civil service eligible as per Presidential Decree 907. He has published research papers in journals indexed with leading international indexing agencies. His areas of expertise in teaching and research are business management, marketing management, business education, entrepreneurship, humanities, and social sciences, and higher education. He is currently connected at Ifugao State University as a faculty member for both graduate and undergraduate programs and the Program Chairperson for PhD Management and Master in Business Administration.

3RD BEST PAPER

Biomass, Carbon Stock, and Sequestration Assessment of Rizal and Paco Parks in Manila, Philippines

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ABSTRACT

Global warming, which is largely driven by anthropogenic emission of greenhouse gases, is an important forcing to regional climate change in a city. Atmospheric levels of carbon dioxide — the most dangerous and prevalent greenhouse gas, emitted in the atmosphere through human activities such as deforestation and burning fossil fuels. As a result, interests on carbon sequestration studies have intensified in terrestrial ecosystems for its ability to store carbon over an extended period of time to address climate change. This research was conducted as a baseline study to estimate carbon density and gross sequestration rate of trees in Rizal and Paco Parks, Manila City. The study aimed to determine the carbon stock in tree biomass in the parks of Rizal and Paco using Chave allometric equation and root biomass as 0.26 ratio inferred from the above-ground biomass. Results showed that the estimated tree biomass density from the sampling sites in Rizal Park was 78.22 Mg ha-1 and 642.06 Mg ha-1 in Paco Park. In terms of tree biomass, Rizal Park had a stronger correlation with diameter at breast height (DBH) than tree height but negligible correlation with wood density. Whereas in Paco Park, the tree biomass had a stronger correlation with DBH than with height and weak but positive correlation with wood density. For 2023, the estimated gross carbon sequestration in Rizal Park would be 2.33 MgC ha-1 and 51.50 MgC ha-1 in Paco Park. Using the Environmental Protection Agency estimations, the carbon sequestration value of Rizal Park in a year would be PhP 228,151.86. On the other hand, Paco Park was estimated to have a carbon sequestration value of PhP 35,801.33 in one year. Carbon stock studies in urban green spaces could help augment carbon offsetting on top of the carbon from forests and for possible inclusion in the Intended Nationally Determined Contribution in the long run.

Keywords: climate change, carbon sequestration, carbon stock, Intended Nationally Determined Contribution

INTRODUCTION

The concentration of greenhouse gases in the atmosphere is one of the main causes of climate change, a phenomenon brought about by global warming. Greenhouse gases, in particular carbon dioxide, trap surface heat in the atmosphere by way of a mechanism that prevents that heat from being released into space, which would otherwise make it warmer. As a result of the rise in global temperature and the melting of ice glaciers that causes an increase in sea levels, there has been a dramatic change in the global climatic pattern (Lasco & Pulhin, 2003; Intergovernmental Panel on Climate Change [IPCC], 2007).

As the center of economic developments in the country with the highest population density, the National Capital Region contributes the most in terms of carbon emission. Only 12% of green space remains in the metropolis, according to data from the Department of Environment and Natural Resources. These include the Rizal and Paco Parks in Manila, which are managed by the National Parks Development Committee, an attached agency of the Department of Tourism.

This study sought to answer the questions "Is the carbon sequestration potential of Rizal and Paco Parks really helpful in reducing climate change effect?" By answering this research question, the study addressed the scarcity of science-based information as bases for the effective management and improvement of urban parks in the Philippines. The quantification of carbon stock and sequestration potentials of these parks were studied to elevate their ecosystem services and functions as climate change solutions, highlighting the potential of urban green spaces to contribute to the Intended Nationally Determined Contribution of the country.

METHODOLOGY

Study area and research design

The study was conducted in the parks of Rizal and Paco, Manila City. Prior to assessment proper, survey, mapping, and planning (SMP) was made. In Rizal Park (58-ha land area), a total of 910, 20mx20m grids, were laid out using the geographic information system. For the assessment, a sampling intensity of 10%, equivalent to 91 total sampling plots, was assessed. For Paco Park (0.411-ha land area), a 100% inventory was conducted.

Tree inventory

Trees with diameter at breast height of ≥ 5.0 cm were included in tree biomass determination. Species ID, diameter at breast height (DBH) and height measurements, distribution status, and tree health condition were assessed.

Tree and root biomass calculation

Above-ground biomass was computed using the improved allometric model for tropical trees of Chave et al. (2014). Root biomass was determined using the root-to-shoot ratio estimate of 0.26 by Cairns et al. (1997). This study followed the suggestion of Nowak et al. (2013), wherein an adjusted factor of 0.8 was used to take into consideration the documented differences between forest and urban trees. The link between tree biomass with wood density, DBH, and height, was evaluated using Pearson's correlation. Lastly, wood specific density of tree species was retrieved from the Food and Agriculture Organization.

Carbon determination on tree and root biomass

To determine the carbon content in tree biomass, the study adopted a default value of 45% as defined by the IPCC (Sales et al., 2005).

Annual rate of carbon sequestration

An annual increment value of 1.19 cm/year and 1.05 m/year, for DBH and height, respectively, were added to the existing tree diameter and height to estimate tree diameter and height in year x+1 (Schneider et al., 2013). Annual increment was also adjusted based on crown condition (Nowak et al., 2013).

Figure 1. Rizal Park (above) and Paco Park (below)

RESULTS AND DISCUSSION

Tree species composition, diameter class distribution, and crown status

A total of 439 trees were assessed and 51 species were identified in the 36,400 m^2 plots in Rizal Park. Majority of these species belonged to *Swietenia macrophylla* (22.78%) and *Pterocarpus indicus forma indicus* (19.82%). In Paco Park, a total of 108 individuals representing 20 species, 17 genera, and 8 families were recorded. Balitbitan (*Cynometra ramiflora* L.), a native tree species is the prominent tree species and Fabaceae (45%) was the dominating family.

In terms of diameter class distribution, about one fourth (24.60%) had a DBH Class of 20 cm (15-24 DBH) while 22.32% of them had a Class 30 cm (25-34 DBH) in Rizal Park whereas in Paco Park, Class 10 cm (5-14 DBH) was the most dominant (29.29%).

As to crown condition in Rizal Park, the majority of the trees had fair to excellent crown condition with 86.10%. On the other hand, the crown condition of trees in Paco Park was quite decent wherein 98.15% of trees had fair to excellent crown condition.

Tree and root biomass, carbon stock and annual rate of sequestration

The estimated tree biomass density from the sampling sites in Rizal Park was 78.22 Mg ha-1. Tree biomass had a stronger correlation with DBH (r=0.93; p value=0.00) than with height (r=0.46; p value=0.00) but not with wood density (r=-0.0249; p-value= 0.6029). Whereas in Paco Park, the estimated tree biomass density was 642.06 Mg ha-1. Tree biomass had a stronger correlation with DBH (r=0.9675; p value=0.00) than with height (r=0.5616; p value=0.00) and weak but positive correlation with wood density (r=2.180; p value=0.01). Tree biomass was influenced by factors such as tree type, with DBH, wood density and tree height (Chave et al., 2014). This result is contrary to the previous finding of Chave et al. (2014) that wood specific gravity is an important predictor to AGB but consistent with the results of the study of Pansit (2019) in Cebu City. The inconsistency can be explained by the low diversity of tree species (H'=2.46) found in the sampling sites. It is expected that little variation in wood density occurs in urban tree community with low species composition.

The estimated carbon stock density in Rizal Park was 35.25 Mg C/ha and 288.93 MgC ha-1 in Paco Park. Carbon stock density in Rizal Park was quite lower than that of city parks in Cebu City with 87.81 MgC ha-1 (Pansit, 2019) and with Bacolod City Plaza with 189.02 MgC ha-1 (Tutor et al., 2018). However, the latter utilized the allometric equation of Brown (1997) which, according to Labata et al. (2012) and Ketterings et al. (2000), was found to overestimate the actual factor. On the other hand, the carbon stock density in Paco Park is comparable to mahogany plantation in Mt. Makiling with 375.32 MgC ha-1 (Racelis et al., 2008). Such comparability is attributed to the centennial trees in Paco Park.

Payment for ecosystem services: Rate of carbon sequestration

The study adopted the market value of social cost of carbon on the rate of carbon sequestration, wherein market price is based on the value of economic damages that resulted from emitting one additional ton of greenhouse gases in the atmosphere. As per ton of CO2 on Environmental Protection Agency estimates, the carbon sequestration value of Rizal Park in a year would be PhP 228,151.86. On the other hand, Paco Park was estimated to have a carbon sequestration value of PhP 35,801.33 in one year.

CONCLUSIONS

A Pearson correlation analysis revealed that factors such tree species, wood density or wood specific gravity, DBH, and tree height had a substantial impact on the tree biomass. Therefore, selecting allometric equations that incorporate these factors into consideration will minimize inaccuracy in the estimation of biomass and carbon stock. The incomparability of the current study with other studies could be due to the age of the stands. The older the stands, the larger the biomass (given the favorable condition). Since most of the allometric equations and simulation models on tree biomass are dependent on DBH, there are pros and cons in choosing the models to estimate the biomass of the tree. Hence, to have an accurate estimation of biomass, choosing the allometric equations that consider these factors (i.e., DBH, height and wood density) minimize error in biomass and carbon stock estimation. In order to assess the contribution to the overall carbon stock and generate carbon credits under REDD+, it is essential to have an accurate estimation of biomass of different

forest components. The carbon capture strategy of a species was strongly associated with disturbance, with species from disturbed sites having traits that confer capacity for fast growth. Adjustments based on tree condition was significantly correlated with total tree biomass (r=0.9076, p=0.00). Thus, maintaining healthy trees in the green spaces increases carbon sequestration from the atmosphere. Since carbon sequestration is a function of biomass accumulation, the simplest way to expand carbon stocks is to plant trees. The choice of species to be planted will affect the potential to sequester carbon. Fast-growing species, such as *Paraserianthes falcataria* and *Casuarina equisitifolia* are commonly used. They accumulate more biomass and carbon than slow-growing species for the same period of time. Based on the correlation analysis of wood density and tree biomass, fast-growing species typically have lower wood density and thus contain less carbon per unit volume than wood of slow-growing species. Effective urban planning, urban green space management in particular, requires proper data on urban green spaces. The potential of urban green spaces to provide benefits to urban inhabitants (ecosystem services) depends on whether they are managed as a comprehensive system of urban green infrastructure. Better understanding of green space data sources is necessary in urban planning and especially when planning urban green infrastructures.

REFERENCES

Brown, S. (1997). *Estimating biomass and biomass change of tropical forests: A primer.* FAO Forestry Paper 134.

Cairns, M. A., Brown, S., Helmer, E. H., & Baumgardner, G. A. (1997). Root biomass allocation in the world's upland forests. *Oecologia 111*, 1–11. https://doi.org/10.1007/s004420050201

Chave, J., Réjou-Méchain, M., Búrquez, A., Chidumayo, E., Colgan, M. S., Delitti, W.B.C., Duque, A., Eid, T., Fearnside, P. M., Goodman, R. C., Henry, M., Martínez-Yrízar, A., Mugasha, W. A., Muller-Landau, H. C., Mencuccini, M., Nelson, B. W., Ngomanda, A., Nogueira, E. M., Ortiz-Malavassi, E., Pélissier, R., ...Vieilledent, G. (2014). Improved allometric models to estimate the aboveground biomass of tropical trees. *Global Change Biology, 20*(10), 3177–3190. https://doi 10.1111/gcb.12629

Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Synthesis Report*. https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf

Ketterings, Q. M., Coe, R., Van Noordwijk, M., Ambagau, Y., & Palm, C.A. (2000). Reducing uncertainty in the use of allometric biomass equations for predicting above-ground tree biomass in mixed secondary forests. *Forest Ecology and Management, 146*, 199–209.

Labata, M. M., Aranico, E. C., Tabaranza, A. C. E., Patricio, J. H. P., & Amparado Jr, R. F. (2012). Carbon stock assessment of three selected agroforestry systems in Bukidnon, Philippines. *Advances in Environmental Sciences, 4*(1), 5–11.

Lasco, R. D., & Pulhin, F. B. (2003). Philippine forest ecosystems and climate change: Carbon stocks, rate of sequestration and the Kyoto protocol. *Annals of Tropical Research, 25*(2), 37–51.

Nowak, D. J., Greenfield, E. J., Hoehn, R. E., & Lapoint, E. (2013). Carbon storage and sequestration by trees in urban and community areas of the United States. *Environmental Pollution, 178*, 229-236.

Pansit, N. (2019). Carbon storage and sequestration potential of urban trees in Cebu City, Philippines. *Mindanao Journal of Science and Technology, 17,* 98–111.

Racelis, E. L., Carandang, W. M., Lasco, R. D., Racelis, D. A., Castillo A. S. A., & Pulhin J. M. (2008). Assessing the carbon budgets of large leaf mahogany (*Swietenia macrophylla* King) and dipterocarp plantations in the Mt. Makiling Forest Reserve, Philippines. *Journal of Environmental Science and Management, 11*(1), 40–55.

Sales, R. F., Lasco, R. D., & Banaticla, M. R. N. (2005). Carbon storage and sequestration potential of smallholders tree farms on Leyte Island, the Philippines. In ACIAR Smallholder Forestry Project repor (pp. 129–141).

Schneider, T., Ashton, M. S., Montagnini, F., & Milan, P. P. (2013). Growth performance of sixty tree species in smallholder reforestation trials on Leyte, Philippines. *New Forests, 45,* 83-96. https://doi: 10.1007/s11056-013-9393-5

Tutor, J., Palijon, A., Visco, R., Castillo, A., & Militante, E. (2018). Carbons stock assessment as basis for public green spaces planning and management in Bacolod City and Iloilo City. *WVSU Research Journal, 7(*1), 15–26.

3RD BEST PAPER
RESEARCHER'S PROFILE

FOR. WENCELITO P. HINTURAL

Wencelito P. Hintural is currently holding a technical position of Science Research Specialist at the Department of Environment and Natural Resources–Ecosystems Research and Development Bureau (DENR-ERDB). He has been part of several ERDB research initiatives since 2011. A graduate of master's degree in environmental science from the University of the Philippines Los Baños (UPLB), Hintural is a licensed forester, Civil Service Career Professional eligible, and a licensed environmental (urban) planner. He was an awardee of F.S. Pollisco in 2016 by the DOST-PCAARRD for the research project "Bioecological Characteristics of Migratory Waterbirds at Priority Wetlands in Relation to Climate Change". He also received recognitions for outstanding research, development, and extension (RDE) works and the Early Career Research Award from the UPLB School of Environmental Science and Management. His stint as a researcher for about 11 years in government and academic institutions and consulting firms have trained him to be passionate and excellent in supervising, developing, and implementing RDE programs as well as in formulating policy recommendations. He has wide experience in the fields of forest resource management, biodiversity management, soil and water conservation, integrated pest management, silviculture, urban forestry, socio-economics, and environmental science. He has been involved in a number of environment and natural resources studies, such as biodiversity assessment, environmental impact assessment, baselining and impact assessment studies, carbon stock and sequestration studies, riparian ecosystem studies, and life cycle assessment studies of urban parks.

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OUTSTANDING EDUCATOR AWARD

DR. JOSEFINA T. DIZON

Dr. Josefina T. Dizon was recognized for her exemplary teaching performance and contributions to teaching, research, and extension. For 19 years, she was a faculty member at the College of Public Affairs and Development (CPAf) of the University of the Philippines Los Baños (UPLB). She retired in 2022 but she continues to mentor MS and PhD students. Recently, she received a professor emeritus status from the university.

Through her mentoring, Dr. Dizon has contributed to the development of human resources and leaders in Asian countries like Lao PDR, Cambodia, Myanmar, Thailand, Timor Leste, Indonesia, Vietnam, and the Philippines. Some of her former student-advisees hold key government positions in their respective countries. Her teaching performance has been recognized by CPAf in 2011 when she was awarded Outstanding Teacher. Likewise, she has been awarded the One UP Professorial Chair Award in Community Development for Outstanding Teaching and Research in 2016-2018, 2019-2021, and 2022-2024. At the international level, she was awarded Most Outstanding Professor by the World Education Congress, given during the Global Edu Tech Congress in India on 27 October 2020.

Aside from teaching, Dr. Dizon is also a prolific researcher and writer. She received various research awards from CPAf, UPLB, UP, and a professional organization. She has also held several administrative positions at CPAf. In 2018, the UP System awarded her a Meritorious Public Service Award in the field of governance for significantly contributing to the continuing institutional strengthening and capacity building of the primary implementers and stakeholders in the management of the environment and natural resources of the country.

Dr. Dizon is a lifetime member of PASSAGE and has served the association as Vice-President for Luzon (2011-2014), National Vice-President (2014-2016); President (2016-2018), and Ex-officio Member (2018-2020).

OUTSTANDING RESEARCHER AWARD

DR. CELY S. BINOYA

Dr. Cely S. Binoya received the Outstanding Researcher Award for her exemplary contributions to research and development in the fields of agriculture, fisheries, and environment. Some of her research and development projects include the "Climate Risk Management and Disaster Preparedness in the Philippines for Agriculture and Fisheries," which was funded by the Food and Agriculture Organization of the United Nations (FAO) and the FAO-European Commission Humanitarian Aid department's Disaster Preparedness Programme (DIPECHO) project on "Consolidating Capacities for Disaster Risk Reduction in Southeast Asia." She was also a co-implementer and gender consultant of the 5-year Bicol Agri-Water Project funded by the United States Agency for International Development and the project leader of the United Nations Educational, Scientific and Cultural Organization – funded project that nominated Mt. Isarog Natural Park as a biosphere reserve. Moreover, she was the program leader of a research on integrated research and development for climate change adaptation and disaster risk reduction and management in the agriculture, fishery and forestry sectors in the Bicol Region. It was funded by the Commission on Higher Education (CHED). At present, she is the program leader of a research and development program on "Developing Social Enterprises for Economic Resilience of Disaster Survivors in Bicol," which is also funded by CHED.

Dr. Binoya is the current Executive Director of the Asia Pacific Association of Educators in Agriculture and Environment, President of the Board of Trustees of the Center for Disaster Preparedness Philippines, and a Board Member of Tabang Bikol Movement. She is also working as technical consultant for research, extension, and program accreditation of Mariners Polytechnic Colleges Foundation of Canaman and Naga and part-time graduate professor of Partido State University and Central Bicol State University of Agriculture (CBSUA).

Dr. Binoya earned her doctoral degree in extension education from the University of the Philippines Los Baños. She was holding an academic rank of Professor VI when she retired in 2015. She held various administrative positions in CBSUA. She also served as PASSAGE President from 2004 to 2007.

ANNEXES

Annex 1. List of participants

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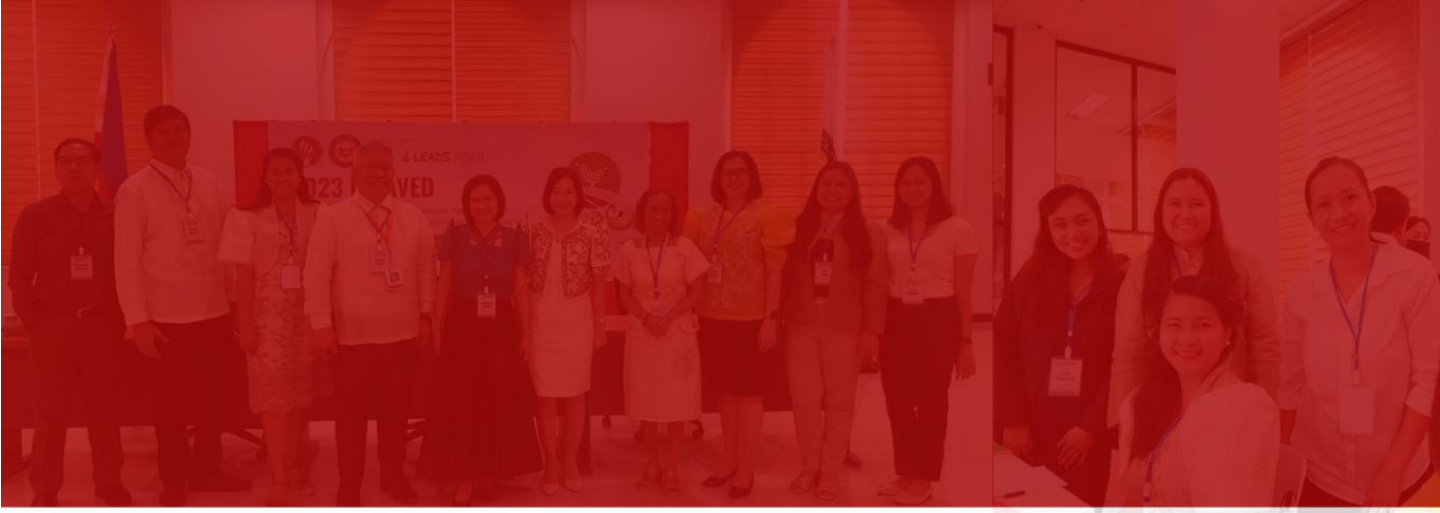

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