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S&T POST

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Science in EVERYDAY LIFE

EDITORIAL

Science in everyday life

As we go through life, day in and day out, we must remember that there is science in our lives – the inevitable truth that makes life worth living and enjoying.

In this issue of the Post, we made a conscious effort to show the importance of science, technology, and innovation in our lives. The stories that unfold give us inspiration and hope as we inch our way out of the pandemic, making science more relevant, meaningful, and enabling in these challenging times.

I enjoin you to read through the pages of the Post and discover the stories that make science in everyday life closer to our hearts. Let us find hope in some of the stories in our magazine that can and will transform lives.

Here is the carrageenan plant growth promoter that can help sampaguita farmers improve their harvest. Smart and sustainable development initiatives in Cauayan, Isabela is a story we can be optimistic of for a better future within our reach. Science gives us a glimmer of hope that mined-out areas can still be 'green' again. There is a technology that promises new wood glue variant coming from local tree extracts that can provide livelihood opportunities. In the area of health, the story of AGAPAY will surely make us feel good, knowing that stroke patients will now benefit from this rehabilitation invention. Then a Balik Scientist's thirst for new knowledge ushered in the discovery of antimicrobial compounds for new antibiotics sourced from Philippine biodiversity. The firm resolve of a community in Tampilisan and their willingness to embrace science enabled them to convert solid wastes into useful products.

Stories such as these will always be told, and the Post will always find ways to share them to our readers because this is our solemn promise. We will break traditions, if need be, to search for gems in stories of trials and triumphs, of struggles and victories, because stories that matter are stories that tell the journey of individuals and communities who chose to adopt science, technology, and innovation in their lives.

Let these stories serve as reminder for us to harness the power of science, technology, and innovation and make our everyday lives much better, more colorful, and even vibrant.

RODOLFO P. DE GUZMAN
Executive Editor

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Scan the QR code link and proceed to the survey with title S&T Post Readership Survey 1st Quarter 2023.

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ABOUT THE COVER

This issue's cover highlights the day-to-day applications of science and technology (S&T). Featured in this issue are stories that highlight the various programs & technologies of DOST that cater to the everyday lives of the Filipino people.

Agwa from Israel, an AI-assisted indoor home vegetable-growing device (left) and Gul.AI, a Philippine-made mobile AI-powered plant growing system for optimum yield.

DOST technologies at par with global technologies in the Consumer Electronics Show in Silicon Valley, USA

By DOST – Office of the Undersecretary for Research and Development

The Department of Science and Technology (DOST), in an effort to strengthen emerging technologies such as semiconductor manufacturing services, artificial intelligence, robotics, and space technology industry in the Philippines, presented engagement opportunities to scientists during the Consumer Electronics Show (CES 2023) in Las Vegas, Nevada, USA and Business Mission in Silicon Valley, San Francisco, California, USA from 5-11 January, 2023.

CES is the most influential technology event in the world—the proving ground for breakthrough technologies and global innovators. This year, CES 2023 highlighted technologies on sustainability, digital health, metaverse, electric vehicles, transportation, and mobility from over 4,000 exhibitors, thereby providing various insights and

possibilities for the Philippines to utilize market intelligence and benchmarking.

The Philippine delegation, composed of the DOST, the Department of Trade and Industry (DTI), Department of Information and Communications Technology (DICT), Philippine Economic Zone Authority (PEZA), the Semiconductor and Electronics Industries in the Philippines Foundation,

continued on next page

DOST Balik Scientist taps Pinoy experts in US to support Philippine STI

By DOST – Office of the Undersecretary for Research and Development

The Department of Science and Technology (DOST) *Balik* Scientist Program (BSP), in efforts to strengthen science, technology and innovation (STI) capabilities in the Philippines through knowledge transfer, provided a recent orientation among Filipino scientists in the USA through the Consumer Electronic Show (CES) and Philippine Business Mission.

The BSP strategically holds promotion and orientation to spark the interest and patriotism among our Filipino scientists. As part of this mission in the US, three scientists immediately signified commitment to participate in the program this 2023. These scientists' expertise falls under the industry and health sectors.

The BSP continuously encourages Filipino Scientists abroad in several strategies and promotions to generate awareness of the compelling impacts they could bring along with them to the Philippines. *Balik* Scientists are engaged to conduct capacity building, knowledge transfer, assessment activities, R&D activities, production of policies and publications, curriculum development, and building linkages that creates impacts.

Two Balik Scientists shall be focusing on the industry sector. One, a creative director and expert on packaging and design shall help improve and bring new ideas and technologies that the country can adopt in terms of packaging and design of Philippine products, for which to be at par with the packaging and design of global standards. The other, a biochemist and molecular and computational biologist, shall focus on the turning Philippine plastic waste back to its raw form and be able to create new and sustainable products. Both Filipino scientists plan to engage themselves as a *Balik* Scientists with the Industrial Technology Development Institute of DOST, where R&D have been implementing such initiatives.

The third Filipino scientist shall be engaged as a *Balik* Scientist under the health sector. He is an expert in mass spectrometric techniques and applies them to environmental biomonitoring, clinical toxicology, and therapeutic drug monitoring. His works pioneer the application of high-resolution mass spectrometry to the suspect screening of environmental chemicals present in biological samples, which can be extracted not just from blood nor urine but from human hair. He plans to engage with the University of the Philippines Manila in close coordination with the Philippine Drug Enforcement Agency.

"The Philippines has a reservoir of talents among our young and local researchers that promises to make the Philippines spectacular," said DOST Undersecretary Leah J. Buendia. "We can strengthen the Philippine science community and STI ecosystem by having you and the rest of our Filipino scientists. We hope that you will consider the *Balik* Scientist Program to share your ingenuity in giving back to the Filipino people," she added.

continued on next page

DOST Undersecretary Leah J. Buendia presented DOST's programs in 2023–2028 at the World Electronics Forum together with officials from DTI, DICT, PEZA, SEIPI, and PTIC, as well as participants from the government and industry sectors

DOST technologies (from page 5)

Inc. (SEIPI), and the Philippine Trade and Investment Center (PTIC) sought possible partnerships with governments and key industry players through the Philippine Business Forum highlighting the country's investment-ready environment. DOST participated in one of the fora, World Electronics Forum (WEF), where DOST Undersecretary Leah J. Buendia presented technologies and programs of the Philippine government that are at par with the emerging global technologies.

Technologies observed in CES 2023 include 1) SentiV from France, a scouting robot for monitoring field crops; 2) Agwa from Israel, an AI (Artificial Intelligence)-assisted indoor home vegetable-growing device; and 3) Land Evaluation Engine by satellite data and AI from Japan, an application for monitoring the lands of interest from space. Similarly, DOST-Advance Science and Technology Institute (ASTI) has on-going project counterparts such as 1) Robot for Optimized and Autonomous Mission-Enhancement Response (ROAMER), designed for detecting banana plantation monitoring; 2) Gul.AI, a mobile AI-powered plant growing system for optimum yield; and 3) DATOS, an AI-powered engine land feature detection from satellite images. The striking similarity in the functions between ASTI's projects and CES technologies demonstrate the relevance of its R&D activities and their potential to address society's needs.

"Similarly, as we vision to continuously be abreast with countries with cutting-edge technologies, we explored potential investment opportunities and areas for cooperation, particularly with startup companies and universities in Silicon Valley," said DOST Undersecretary Leah J. Buendia. "We also recognize the importance of having a pool of experts in achieving this vision; hence, we have the commitment of continuous knowledge transfer and developing our home-grown science and engineering workforce through the Balik Scientist Program," she added.

The DOST is the lead government agency that provides central direction, leadership, and coordination of scientific and technological efforts and ensure that the results therefrom are geared and utilized in areas of maximum economic and social benefits for the people.

DOST-Balik (from page 5)

The BSP was established in 1975 to counteract the nationwide concern on "brain drain" or the emigration of highly trained professionals from our country, in search of a better standard or living and quality of life, higher salaries, access to advanced technology and more stable political conditions in different places worldwide.

For applications or inquiries about the Balik Scientist Program, you may email the BSP Secretariat at bsp@dost.gov.ph. Interested parties may also visit the BSP website at bsp.dost.gov.ph and the BSP Facebook Page.

Colonial mentality and lack of gov't support prevent Filipino music industry from flourishing, says music expert

By Geraldine Bulaon-Ducusin, *DOST-STII*

"*Ang pinakamalaking problema ng Pilipinas ay* commodification that, we're under a colonial mentality, *kaya* number 42 *lang tayo sa* industry, *eh papano nga,* our colonial mentality is so attuned to the US, *kung ano yung sikat sa US, yun ang pino-promote natin,"* Professor Felipe De Leon Jr., member of the National Committee on Music of the National Commission on Culture and the Arts (NCCA), explained one of the reasons why the Philippine music industry ranked only 42nd, lower than Thailand, Indonesia, and Malaysia in the International Federation of Phonographic Industry.

Felipe added, *"Masyadong* American-made *ang klase ng music natin*, *yung OPM natin* is too Americanized, there's not enough variety, there's no creativity, there's no originality, unlike Indonesia, Brazil, and Sweden, *kaya ang dami-dami nilang klaseng* music that they can promote, that's why they sell, even Korea."

The status of the Philippine music industry was among the four researchers initiatives presented at the "6th Annual Basic Research Symposium: the Filipino Music and Indigenous Culture Communicating Basic Research Results to the People" of the Department of Science and Technology–National Research Council of the Philippines (DOST-NRCP) held at the Philippine International Convention Center on 20 October 2022.

The *Musika Pilipinas* project, one of the studies presented at the symposium and funded by DOST-NRCP, involves 700 survey participants and 80 music related companies and organizations. The project analyzed the country's music market, its current state, and suggested areas for development such as the government support needed for the music industry's growth.

https://singlemomsupermom.com/

Professor Felipe De Leon Jr., member of the national committee on music of the National Commission on Culture and the Arts (NCCA), said "Here, we're so Manila-centric, and Manila-centric means US-made *na klase ng* music, so how can we interest the whole world, we're very uniform, mass produced type of music."

The profile shows that the music industry is largely composed of young adults, 25–34 years old, single, males, and mostly college degree graduates. Over 23% of the respondents has been with the industry for 6–10 years, whereas over 21% have been with the industry for over 21 years. Over 70% of them work as freelancers.

Another striking finding of the study is that most people in the industry are from Manila, making it Manila-centric, which means US-made type of music, making it less interesting to the whole world because it's a very uniform, mass produced type of music. "The moment you commercialize music, we become so standardized, unless we look at the wider model, especially coming from the regions," Felipe added.

Among the recommendations of the *Musika Pilipinas* project research team is the creation of a centralized music coordinating council, bigger support for the Philippine music industry, and the study of the regions' music economies and cultural assets as prospects for music tourism and development of music communities and cities.

On another front, in the field of the sciences, the DOST showcased more research studies, innovations, and technologies in the hybrid celebration of the 2022 National Science and Technology Week (NSTW) held 23-27 November 2022 with on-site exhibits at the World Trade Center, Pasay City. Last year's theme was *"Agham at Teknolohiya: Kabalikat sa Maunlad at Matatag na Kinabukasan."* The on-site S&T exhibits and virtual forums and webinars showcased various clusters in the areas of agriculture and aquaculture, health and food and nutrition, livelihood and enterprise development, blue and green economy, nuclear science, additive manufacturing, robotics and industrial automation, disaster resilience and climate change, scholarships, and community empowerment, among others. For more information, please visit the website at http://nstw.dost.gov.ph and its Facebook page at facebook.com/nstwdost.

PhilSA AD ASTRA scholar awarded at local TEC forum

By Philippine Space Agency

The Philippine Space Agency or PhilSA Advanced Degrees for Accelerating Space R&D and Applications Scholarships or AD ASTRA scholar Engr. Raynell A. Inojosa was awarded with the 1st Best Paper and Best Presenter for the Emerging Technologies Track distinction during the Graduate Research Forum for Technology, Engineering, and Computing (GRaF-TEC '22) that was held via Zoom last November 2022.

GRaF-TEC '22 is organized by the Batangas State University Alangilan Research Office, in partnership with the Center for Innovation in Engineering Education, to assist students and faculty in the planning and implementation of their research undertakings and to provide guidance on the skills needed to develop their work.

Engr. Inojosa's paper, titled "Exploiting Fractal Geometry in the Design of a UHF Patch Antenna for LEO Nanosatellite Applications," is an initial attempt to come up with an ultra-high frequency (UHF) patch antenna design using fractal geometry that can be mounted into a standard 1U (10 cm x 10 cm x 10 cm) cube satellite (CubeSat). Experimental measurements of his research were performed in an anechoic chamber located at the Center for Nanosatellite Testing of Kyushu Institute of Technology in Japan.

One of the key components to an effective satellite system is its antenna performance, which affects the communication link. For small satellites such as CubeSats, antennas are only allocated a small space. Thus, low-profile antennas are preferred to potentially reduce the volume of the satellite or to allow space for other payloads.

Results of Engr. Inojosa's research show that the proposed fractal antenna offers better performance against a conventional UHF antenna and is expected to be deployable in low-earth orbit (LEO) CubeSat missions that gather ground data for disaster analysis, vegetation detection, environmental monitoring, and other remote sensing applications.

Engr. Inojosa is among the first batch of PhilSA AD ASTRA Scholars. His doctorate research, titled "Electrodynamic Analysis of a Geometry-Oriented Antenna for Low-Earth Orbit CubeSat," had also been selected as one of the outstanding presentations during the Institute of Electrical and Electronics Engineers Transdisciplinary-Oriented Workshop for Emerging Researchers conference held on 26 November 2022 in Tokyo, Japan.

He is currently taking up his Ph.D. in Electronics Engineering at the Batangas State University under the supervision of Dr. Celso B. Co and recently joined PhilSA as a Senior Science Research Specialist for the Spacecraft Payload and Communications Systems Development Division.

The journey of Engr. Inojosa under the AD ASTRA started with his application and acceptance into the Mentorship Program of the Advanced Satellite Development and Know-How Transfer for the Philippines Project under the STAMINA4Space Program of the Department of Science and Technology (DOST) and the University of the Philippines - Diliman. This program was implemented in coordination with PhilSA and was launched in October 2021. The program has the following components: matching mentees (those aspiring to pursue advanced degrees in space science, engineering, communications, space technology applications, and other related fields) with experienced mentors who belong to the space development sector. The program also allowed for the establishment of a platform whereby mentors are be able to support and provide direction for the mentees to attain success in the space industry.

To join, please use the hashtag #JoinTheMission to kick off your #KwentongPhilSAScholar. For additional media inquiries, contact publicrelations@philsa.gov.ph

DOST funds studies on treatment of addiction and depression in newly-renovated UP NIH Animal Laboratory Facility

By DOST – Office of the Undersecretary for Research and Development

The Department of Science and Technology (DOST) funded two behavioral studies for treating addiction and depression in the newly-renovated animal laboratory facility at the National Institutes of Health (NIH) in the University of the Philippines (UP) Manila. The facility was presented to DOST after a formal ribbon-cutting ceremony on 27 January 2023.

DOST Secretary Renato U. Solidum Jr., Undersecretary for Research and Development (R&D) Leah J. Buendia, and UP Manila Chancellor Dr. Carmencita D. Padilla led the brief ceremony and quick tour inside the facility. It will house the project titled "Cessation of Toluene (Rugby) Addiction in Adolescents: Using a Rodent Model" to test novel pharmacological and behavioral treatments for overcoming toluene craving.

"R&D provides an avenue for our country to develop better policies and programs to address pressing issues like drug addiction," said DOST Secretary Renato U. Solidum Jr. "With the data gathered from these projects, we can develop treatment and support the health and well being of Filipinos."

This project aims to assess the effects of toluene withdrawal and craving on rats' anxiety and social interaction. It could also gauge the effectiveness of three treatments (two pharmacological and one behavioral) in reducing the behavioral and neurological effects of toluene withdrawal.

The newly-reconstructed facility will also cater the project titled, "Assessment Pharmacokinetic and Pharmacodynamic Interactions of Selected Psychobiotic and Antidepressant Drugs in Depression-like Rat Model," which will provide documented data in preventing adverse drug events and achieving therapeutic success when psychobiotics are co-administered with antidepressant drugs, sertraline, and fluoxetine in depression-like rat models. The project also includes measurement of behavioral responses, biochemical levels, and drug concentrations.

These two projects are under the program titled "Novel Approaches to Treatment of Addiction and Depression using Animal Models," which is monitored by the Philippine Council for Health Research and Development of the DOST.

Nearly 70% of surveyed gov't workers prefer telework

By Geraldine Bulaon-Ducusin, *DOST-STII*

"Our survey results indicate that almost 70% of our respondents prefer to telecommute over physical reporting for work after the lifting of the national public health emergency," Dr. Rowena Paz L. Gelvezon, Professor at the University of the Philippines Visayas and project leader of Telecommuting Preferences of Government Workers in the Philippines (TeleWork@PH) research, said.

Gelvezon added that this may indicate an evolving concept on how work is viewed—that is, work is something that people do, not someplace that people go to—that work need not be performed in a specific physical work site nor performed in mandated work hours, but work is something that can be accomplished anywhere and anytime.

The TeleWork@PH is a part of a three-component study, wherein the other two are the Government Telecommuting Infra Cost Estimator (GTWICE) and the other is a Modeling Analysis of Telework Impact in the New Normal (MATINO), which are tools developed to help employers and employees determine the cost and suitability of telework in an organization.

The TeleWork@PH research, which intended to examine the telecommuting preferences of government workers in the Philippines, is based on a survey of 16,159 online respondents who are government workers in selected government agencies from 22 highly urbanized cities in the country. The data was collected from May to December 2021.

Among the reasons cited for government workers' preference to telecommute are these:

"I want to work during my most productive time and pace;"

"I want to lessen time spent on commuting to/from work;"

"I want to save on my travel expenses;"

"I want to spend more time with my family;"

If there's an upside to telecommuting, there are also downsides—such as workers experience stress while working remotely because of slow internet connection, learning new applications causes stress, overlapping work schedules and multiple work responsibilities, unclear work expectations and less work peer support, or the nature of work is not suited to telework, and others.

While Gelvezon believes that there's a future for telecommuting, it is, however, not for all types of work nor it is for all types of workers. It's important to have agency-specific policies and guidelines on telecommuting.

Dr. Ryan Vicerra, Professor at the De La Salle University and Project Leader of GTWICE, said that there should be a corresponding training that should go along with requiring an employee to telework.

"*Hindi talaga natin madedevelop yung* telework culture *kung takot tayong magsimula at takot tayong pag-usapan*," Vicerra said.

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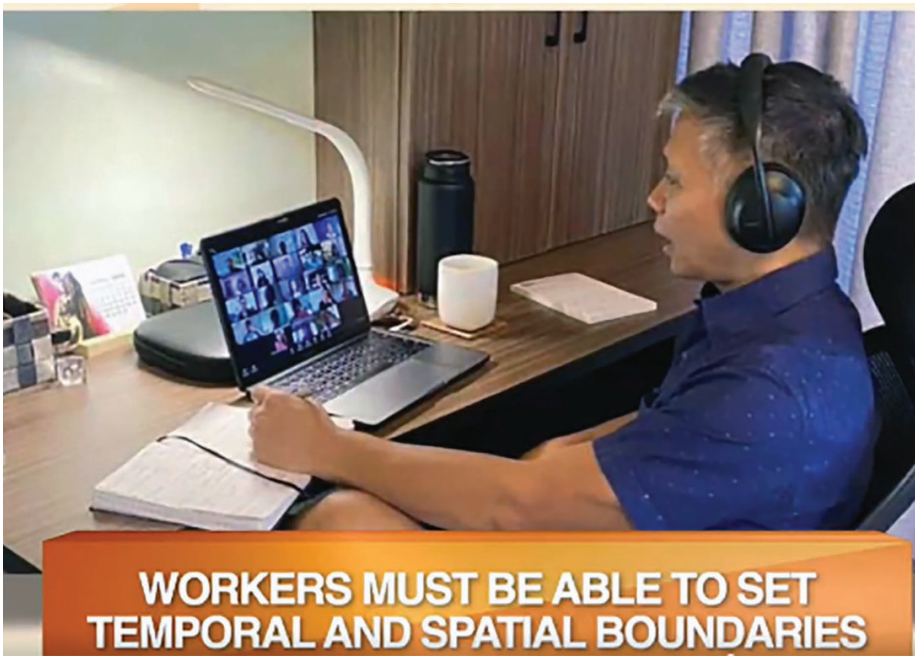


[Photo grabbed at KTOP webinar from Research Pod Facebook Page] "The way to achieve work-life balance is for you to have to learn to set boundaries," Gelvezon said. Boundaries in terms of time and boundaries in terms of space. "You have a special place in your house where you do your telecommuting work, and while you're in that room, nobody in the household should bother you. That's a boundary in terms of space and boundary in terms of time, at exactly 5 PM your boss should not bother you anymore," Gelvezon advised.

DOST-I awards carrageenan plant growth promoter to sampaguita farmers

By Catherine L. Lictao, *DOST-I*

The Department of Science and Technology Region I Office (DOST-I), through the Provincial Science and Technology Office–Pangasinan Field Office awarded 42 liters of carrageenan plant growth promoter (PGP) to the Sampaguita Farmers Association at *Barangay* Baritao, Manaoag, Pangasinan on 14 February 2023.

The association is the primary source of sampaguita flowers used to make sampaguita garland. These are traded in Pangasinan, La Union, Ilocos Sur, Ilocos Norte, and Baguio City.

The carrageenan PGP is an agricultural technology developed by the DOST–Philippine Nuclear Research Institute that has been shown to improve plant growth and induce plant defense mechanisms, thereby improving agricultural yield and reducing loss due to infestation.

The PGP is just one of the technology innovations that DOST-I provides to different proponents that lead to support of different industries to increase productivity, product quality, and improve production processes.

Nearly 70% (from page 10)

The other component of the project, which is the MATINO, being led by Dr. May Lim of the University of the Philippines Diliman, is a telework calculator website that allows users to input variables in order to compute an estimated impact of their proposed teleworking scheme.

Lim explained that the goal of MATINO is not just to give users the numbers; rather, to give users a set of questions, wherein after answering those questions, the users, who are employers and employees, would be able to discuss.

"You start discussing it because you need to find the solution and the solution's something that both parties could agree on," Lim emphasized.

Lim believes that telework is here to stay, but it's not going to be the telework that people are seeing now. There's a need to improve a lot of things–the technology, the way technologies are incorporated, the value being given to telework, and a lot of things that are still evolving.

"The idea is we want a more caring, we want *na may* community *tayo*, we want things to be better, and telework is just one component for that to happen," Lim pointed out.

Telework@PH is a project funded by the DOST-NRCP as part of their *Kapakanan ng Tao sa Oras ng Pandemya* (KTOP), an R&D priority area focused on the socio-economic dimensions of the pandemic.

USHER tech ushers in a new way to make communities earthquake-resilient, bags PHP 1-M cash prize from BCY Foundation

By Rodolfo P. de Guzman, *DOST-STII*

Francis Aldrine A. Uy (standing, 4th from left) of USHER Technologies bags the top prize of PHP 1 million during the Benita and Catalino Yap Foundation Inc. Innovation Awards 2023 for its innovation called Universal Structural Health Evaluation and Recording System or USHER, a technology that monitors the integrity of buildings and infrastructures to be more resilient to earthquakes. Others in photo included BCYFI Founder and Chairperson, Antonio Yap (seated, 4th from left), BCYFI officials, and other finalists that included Director Richard P. Burgos (standing, extreme right) who represented the Department of Science and Technology–Science and Technology Information Institute (DOST-STII) for its entry called Science and Technology Academica Research-based Openly Operated KioskS or STARBOOKS.

USHER tech ushers, in a new way to make communities earthquake-resilient, bags PHP 1 M cash prize from BCY Foundation

After the destructive earthquakes in Turkey and Syria, there is really the need to be more vigilant and proactive in preparing for such natural hazards so that our communities will remain safe, and to prevent the loss of lives and livelihood.

The Philippines, which is located in the so-called Pacific "Ring of Fire," experiences a number of earthquakes every year with several faults scattered across regions in the country. With this scenario, a new technology called the Universal Structural Health Evaluation and Recording System or USHER was developed by Dr. Francis Aldrine A. Uy that will address the risks brought about by earthquakes.

This novel technology was recently recognized by the Benita and Catalino Yap Foundation Inc. (BCYFI) Innovation Awards 2023 as the top winner of the PHP 1 million cash prize.

USHER is a building structural health monitoring system that can be used for 24 hours, seven days a week, that is composed of three components–namely: an advanced accelerograph, a web portal system, and a mobile application.

USHER serves as an innovative solution to address disaster risk reduction and management initiatives of both private and public sector, especially government agencies and local government units, to determine the structural integrity of public and private buildings.

This technology can be installed in public infrastructures like bridges, public and private buildings, and other critical structures, and will help engineers and building owners to regularly monitor the integrity, soundness, and performance of buildings and different structures under seismic and other geological events.

With USHER in place, disaster managers, local government unit (LGU) officials, and private enterprises can prepare their buildings and make necessary retrofitting, if necessary, to prevent economic loss, as well as keep people safe when they are inside these buildings and structures.

Dr. Uy stressed, in his recorded message about the Innovation Awards, that his work addresses the need to protect lives by protecting the structures that they populate, especially considering that earthquakes occur often in the country. Here is an excerpt from Dr. Uy's message as a finalist prior to his winning the award.

"I am Dr. Francis Uy, the founder and chief visionary officer (CVO) of USHER Technologies. In many parts of the world, a strong earthquake is IMMINENT. It's NOT a matter of IF but WHEN. The global annual cost of damage due to earthquake is USD 36 billion. Imagine how much we can save and do with USHER. We are now monitoring 24/7 almost 60 buildings all over the country."

He further emphasized the importance of research to have practical application that will benefit a great number of people and to become less vulnerable because of science.

"USHER is an amazing lifesaving and only Filipino made structural health monitoring technology, the electrocardiogram (ECG) machine for buildings. USHER has a very inspiring story to tell, it is the real deal in successfully bringing a research product from a university lab to the industry and communities to ensure infrastructure safety and resilience. A BCYF recognition will further confirm the various recognitions we received, and its reward will help us pursue our corporate social responsibilities (CSRs) and R&D initiatives to promote safety and resilience in the country. Thank you BCYF and let us all USHER a safer and more resilient world."

Trailblazing the innovation ecosystem, Dr. Uy created the Usher Technologies Inc., a commercialization project of various institutions composed of the following: Mapua University, the Department of Science and Technology (DOST), and the DOST–Philippine Council for Industry, Energy, and Emerging Technology Research and Development. The company is an all-Filipino team composed of experts from different fields ranging from engineering to technology to business and more.

So, to support innovative start-ups, the BCYFI was established that will further encourage innovators in the country to think outside the box and create or recreate products and services that will benefit the Filipino people. The awards event is a part of its endeavor to recognize individuals, teams, or organizations who have embraced innovation to contribute to socioeconomic development in the country.

The BCYFI Innovation Awards is a yearly event that recognizes innovators that is organized in partnership with the Shell LiveWIRE Program, the global flagship enterprise program of the Pilipinas Shell Petroleum Corporation. This award is part of the foundation's Comprehensive Social Development Program that focuses on different areas—namely: education, research, and developmental social enterprise.

Dr. Francis Aldrine A. Uy with his message after bagging the BCYFI Innovation Awards top prize of PHP 1 million for his innovation called USHER.

DOST-PCAARRD-DMMMSU ATBI elevates La Union entrepreneurs

By Carla Joyce B. Cajala, *DOST–I*

The Department of Science and Technology–Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development–AgriAqua Technology Business Incubator (DOST-PCAARRD-ATBI), led by Dr. Angelina T. Gonzales, Professor Anabella G. Valdez, Eden P. Borce, assisted by their technical staff, was established at Don Mariano Marcos Memorial State University (DMMMSU) with the goal of promoting and facilitating the transfer of agriculture and aquaculture technologies through technology business incubation.

Through incubation and acceleration, the DOST-PCAARRD-ATBI's initiative seeks to efficiently assist the use and commercialization of advanced technologies in the agri-aqua natural resources industry. Crops, livestock, aquaculture, post-harvest handling, food processing, agricultural machinery, farm inputs (feeds, biofertilizers, and biopesticides), disease diagnostics, and wood and non-wood forest products are among the diverse technical groups that ATBI provides assistance to.

On 21 February 2023, during the visit of DOST-I Officer-in-Charge (OIC) Teresita A. Tabaog, La Union Provincial Science and Technology Director, Jonathan M. Viernes, OIC for Field Operations, Adelisa C. Florendo, RDILMPC (Research and Development and International Linkages Program Management Center) Head, Ms. Annalie L. Rosales, Engr. Bernadine P. Suniega, and Ms. Carla Joyce B. Cajala, the team presented an overview of the initiative and the present status of the facility to the DOST-I team.

Training sessions, networking for financial support, accounting and bookkeeping, business planning and business model canvassing, marketing, food testing and sensory evaluation, trademark development and application, database management, and website design are among the services provided.

At the moment, DMMMSU has lecture halls, training rooms, conference rooms, product processing rooms, laboratory equipment, production farms, market space, and technological support facilities that will be very useful in implementing this joint undertaking.

The facility is available to incubatees who seek to enhance their approaches to handling agricultural and aquatic resources. The various advantages of being an incubatee were listed, including technology management, company development, marketing, networking, access to facilities and equipment assistance, and administrative support.

Meanwhile, the commodities on seaweeds, banana, mango, *bangus*/*tilapia*, grouper, fish, goat, pelletizing machine, and pellet feeds for goat currently have a number of incubatees. Application, recommendation, screening, offer, onboarding, execution, graduation, and post-graduation engagement are all part of the incubation process.

As a result, the ATBI was able to start building the DMMMSU ATBI/Innovation Center in 2021. The following recognitions were also awarded to them:

- Outstanding Regional Partner (Department of Social Welfare and Development (DSWD)–Sustainable Livelihood Program)
- First Place: Oral Development Category Regional Symposium on R&D Highlights
- First Place: Regional Agriculture and Fisheries Extension Network 1

OIC-RD Tabaog commended the team's efforts and committed to assisting their future endeavors.

KIST Park: DOST, ISU, LGU Cauayan to explore STI frontiers for smart and sustainable development

By Dave M. Masirag, *DOST–II*

The Department of Science and Technology (DOST) Secretary Renato U. Solidum Jr. joined Isabela State University (ISU) President Ricmar P. Aquino, Mayor Caesar Dy Jr., DOST Undersecretary for Regional Operations Engr. Sancho A. Mabborang, and DOST Region II Office (RO2) Director Virginia G. Bilgera in the groundbreaking ceremony of the Knowledge, Innovation, and Science and Technology (KIST) Park on 24 March 2023.

KIST Park is a pioneering initiative of the City of Cauayan that aims to establish a center of excellence for research, innovation, and entrepreneurship in the field of science and technology.

With cutting-edge facilities and a thriving ecosystem of academic and business partners, the KIST Park will serve as a regional hub for cutting-edge research, technology transfer, and enterprise growth.

KIST will not only revolutionize the field of science and technology in the region but also create new opportunities for research, innovation, and entrepreneurship. This will serve as one of the DOST's platforms for technology transfer and commercialization of technologies in Cagayan Valley.

"Embrace knowledge, innovation, science, and technology and seal it with a KIST," said amused DOST Secretary Dr. Renato U. Solidum in his speech at the groundbreaking ceremony of the KIST Park.

"Throughout the years, you have seen how you progress through science, technology, and innovation. It has grown into a very strong relationship and what a solid testament that the embrace is now sealed with a kiss. See what partnership can do for economic development?," Solidum added.

This activity will also nurture and spur the Cagayan Valley's growth of new high-tech firms, facilitate the transfer of university know-how to locator-companies, encourage the development of faculty or student-based spin-offs, and stimulate the development of innovative products and processes.

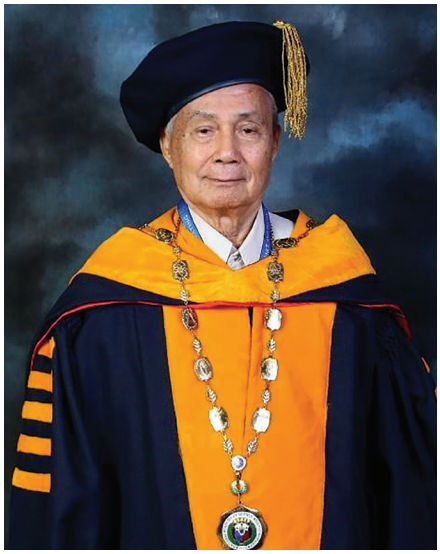
The groundbreaking ceremony was attended and headed by the DOST Secretary Dr. Renato U. Solidum Jr., DOST Undersecretary Engr. Sancho A. Mabborang, DOST RO2 Regional Director Virginia G. Bilgera, with the Mayor of Cauayan City Hon. Caesar "Jaycee" Dy Jr., and the University President of ISU Dr. Ricmar P. Aquino, and Executive Officer of ISU-Cauayan Campus Dr. Precila C. Delima.

National Scientist Angel C. Alcala remembered for works on conservation of marine protected areas

By National Academy of Science and Technology, *Philippines*

National Scientist Dr. Angel C. Alcala—a marine biologist, herpetologist, research advocate, civil servant, and an acclaimed scientist—has passed on last 01 February 2023, at the age of 93.

As a well-renowned scientist, he was recognized for his outstanding scientific contributions to the systematics, ecology, and diversity of amphibians and reptiles and marine biodiversity, reef fishes, and conservation of marine protected areas. His research and advocacy for marine no-take zones led to a national policy and program that established no-take marine protective areas all over the country and became a model of coastal resource management and conservation that many countries have adopted.



Dr. Angel C. Alcala
National Scientist, 2014
Academician, 2004

Dr. Alcala was born in Negros Occidental on 01 March 1929. He grew up in a family of 10 siblings, him being the eldest. His family resided in Caliling, a coastal village in Cauayan of Negros Occidental, famous for its immaculate beach where Dr. Alcala's connection to marine life began. He planned to take medical studies after completing a pre-medical course at Silliman University. However, due to financial constraints, he chose to stay at Silliman University and finished a degree in biology.

He obtained his Bachelor of Science in Biology (*magna cum laude*) from Silliman University in 1951, his Master of Arts, and his Doctor of Philosophy in Biological Sciences from Stanford University in 1960 and 1966, respectively. He also received honorary doctorates from Xavier University and the University of Southeastern Philippines.

Dr. Alcala started as an Instructor in Biology at Silliman University to having various high-ranking positions, including Dean of the College of Arts and Sciences, Director of the Marine Laboratory, and eventually President of the University from 1991–1992. He founded the Silliman Marine Laboratory, which has been active in research on marine protected areas, fisheries and marine biodiversity, mariculture, and conservation of Philippine plant and animal species. His marine science publications consist of about 80 papers on coral reef fish, marine reserves, and the long-term effects of protection on marine biodiversities such as corals and top predatory fish. Most of these papers have been published in refereed, international journals and books.

In 1992, former President Fidel V. Ramos appointed him as Secretary of the Department of Environment and Natural Resources (DENR), where he initiated DENR's program on marine conservation. He was also designated as the first Chairperson of the Commission on Higher Education from 1995–1999, where he served with probity, integrity, and transparency. In addition, he promoted faculty capacity building and research projects to encourage research programs in colleges and universities.

Many of the remarkable awards National Scientist Alcala received are the *Likas Yaman* Award by the Ministry of Environment and Natural Resources in 1979, the *Ilaw ng Karunungan* Award for Biological Sciences by the Philippine Fulbrighters' Association in 1983, The Outstanding Biologist for Region VIII by the National Science and Technology Authority in 1985, Ramon Magsaysay Award for Public Service in 1992, Outstanding Men and Women of Science by the Department of Science and Technology in 2009, and Gregorio Y. Zara medal for Basic Science by the Philippine Association for the Advancement of Science, Inc. (PhilAAS) in 2011, among others.

In 2004, Dr. Angel Chua Alcala was elected to the National Academy of Science and Technology, Philippines (NAST PHL) as an Academician and was conferred the Order of National Scientist by virtue of Malacañang Proclamation No. 783 signed by the late President Benigno S. Aquino III on 06 June 2014, the highest recognition given to a Filipino man or woman of science in the Philippines who has made outstanding contributions in one of the different fields of science and technology.

The National Academy of Science and Technology, Philippines (NAST PHL) is an attached agency of the Department of Science and Technology (DOST) created by Presidential Decree 1003-A (P.D. 1003-A) on 06 October 1976. It is the symbol of the nation's commitment to science that is mandated to: (1) recognize outstanding achievements in science and technology as well as provide meaningful incentives to those engaged in scientific and technological researches; (2) advise the President and the Cabinet on matters related to science and technology; (3) engage in projects and programs designed to recognize outstanding achievements in science and to promote scientific productivity; (4) embark on programs traditionally and internationally expected of an academy of science; and (5) manage, operate and maintain the Philippine Science Heritage Center.

Can mined-out areas be green again?

By Geraldine Bulaon-Ducusin, *DOST-STII*

Yes, mined-out areas can still be rehabilitated through the government's Greening Mined-out areas in the Philippines (GMAP) program that adopted bioremediation, the use of live microbes and plants as biological solutions to clean up and rehabilitate stressed environment such as mined out or mine tailing areas.

The GMAP program, lead by Dr. Nelly Aggangan of the University of the Philippines, Los Baños, successfully developed microbial-based protocol that can effectively rehabilitate unproductive mine tailing areas in the Philippines, converting barren lands into mini forests.

Photo grabbed from the slideshow presentation of the GMAP.

Mined-out areas are devoid of plants due to many biotic and abiotic factors, and one of them is the presence of residual heavy metals in the mining wastes.

"Bioremediation is the cleaning of contaminated soil with microbes, enhancing carbon capture, and reducing heavy metals contamination to surrounding communities," Aggangan explained.

The first phase of GMAP program was done in 2015–2018 in a copper gold mined-out and mine tailing dumpsite in Marinduque, of which the protocol developed in Marinduque is now being adopted by the local government units and being replicated in Surigao, which is the second phase of the program.

The GMAP in Surigao del Norte, which is expected to end this year aims to test the effectiveness of Marinduque bioremediation protocol by assessing Marinduque isolates potency in rehabbing gold and nickel areas, and it also looked for microbes in Surigao that can help in bioremediation.

"We are expecting that these Marinduque isolates will work also in Surigao. If that is the case, we can also introduce the Marinduque isolates in all mined-out areas in the Philippines," Aggangan explained over what could happen if the beneficial effects of the isolates from Marinduque is applied to the plants of Surigao.

The researchers developed microbial-based fertilizers MYKOVAM®, which is a soil based mycorrhizal inoculant and MYKORICH®, which is a sand-based mycorrhizal inoculant.

These developed inoculants give way to symbiosis, meaning there is a give and take relationship between plants and the fungus. With symbiosis, fungi derive nutrients from the soil, whereas the plants give out carbohydrates and this increases the population of microbes.

Aggangan clarified the difference between the traditional fertilizer and the inoculants. The former is quite expensive, easily runs out and can even end up polluting the ecosystem, whereas the latter can only be applied once and lasts for a longer period.

"*Pag palagi kang naglalagay ng abono, nagiging* acidic *yung lupa. Samantalang sa mikrobyo*, *yung* acidic *ginagawa nyang maging* neutral *para maging mas malago ang halaman. Pag* acidic, *posibleng mamatay or maging bansot yung halaman*," Aggangan pointed out the advantages of inoculants when applied in the soil of mined-out areas.

Inoculants cause plants to grow bigger, taller, and with more developed roots. Inoculated plants take out more nickel contaminants in soil. As contaminants are drawn in by plants, the soil is cleaned from toxic materials.

Despite the success of the first phase of the program and the initial success of the second phase, Aggangan appeals to the mining companies to cooperate and allow them to conduct their research in their mining sites because their previous experience was quite a challenge.

"*Hindi ko kaya ito mag-isa. Tulungan nyo po ako at lalong-lalo na sa mga andoon sa mga* mining areas, please help us *para naman lalong maganda ang aming maituturo sa inyo*," Aggangan said.

GMAP program is under the "SUSTAINABLE COMMUNITIES," the top priority program of NIBRA (National Integrated Basic Research Agenda) of the HNRDA (Harmonized National Research Agenda) 2017–2022 of the DOST-NRCP (Department of Science and Technology–National Research Council of the Philippines).

Local tree extracts are promising wood glue ingredients – DOST-FPRDI

By Apple Jean C. Martin–de Leon and Catherine D. Masacayan, *DOST-FPRDI*

Tannins, or extracts from locally available trees, have been found promising ingredients for making plywood glue.

This was the initial finding of a collaborative project among Department of Science and Technology–Forest Products Research and Development Institute (DOST-FPRDI), Switzerland-based Bern University of Applied Sciences (BFH), Philippine Coconut Authority–Zamboanga Research Center (PCA-ZRC), and Visayas State University (VSU). The project was funded by the Swiss National Science Foundation.

Initial results showed that experimental plywood bonded with tannin-phenol formaldehyde adhesives passed the bond quality requirement of ISO 12466-2 (2016), with minimum amount of formaldehyde emission released. In addition, some of the crude tannin extracts were found moderately effective to effective against fungi and insects when applied as wood preservative.

The project was part of the research program "Pinoy Tannin: Development of a Sustainable Tannin Extraction in the Philippines," that evaluated the most effective way to extract tannins. Led by BFH's Dr. Sauro Bianchi, the program aimed to develop a low-cost and sustainable tannin extraction technology among local communities in the Philippines, as well as the use of local tannins as substitute for conventional adhesives and preservatives for the country's wood industry.

Tannins are organic substances normally present in barks and other plant tissues, which are commonly used to make leather and wood adhesives. "Some are used as tanning agents for leather products, clarifying agents for wine production, and ingredients in cosmetics and pharmaceuticals products," said DOST-FPRDI's Rebecca B. Lapuz.

The Institute led the project on the characterization of tannin extracts from agroforest residues such as barks, coconut husks, and shells. It also studied its application in wood adhesives and wood preservatives.

The Pinoy Tannin Program evaluation and closing event was held in Biel, Switzerland from 13–14 December 2022, where DOST-FPRDI representatives and other delegates were toured around BFH's extraction facilities.

Tannin extract from *Acacia mangium*


Plywood production using tannin-phenol formaldehyde adhesive.


From left to right: First Secretary and Consul at the Embassy of the Philippines in Switzerland Ms. Princess Tomas-Tayao; DOST-FPRDI's Rebecca B. Lapuz, Dwight A. Eusebio, Mylene D. Rizare, and Catherine D. Masacayan (rightmost); and Philippine Coconut Authority's Luisito J. Peñamora.

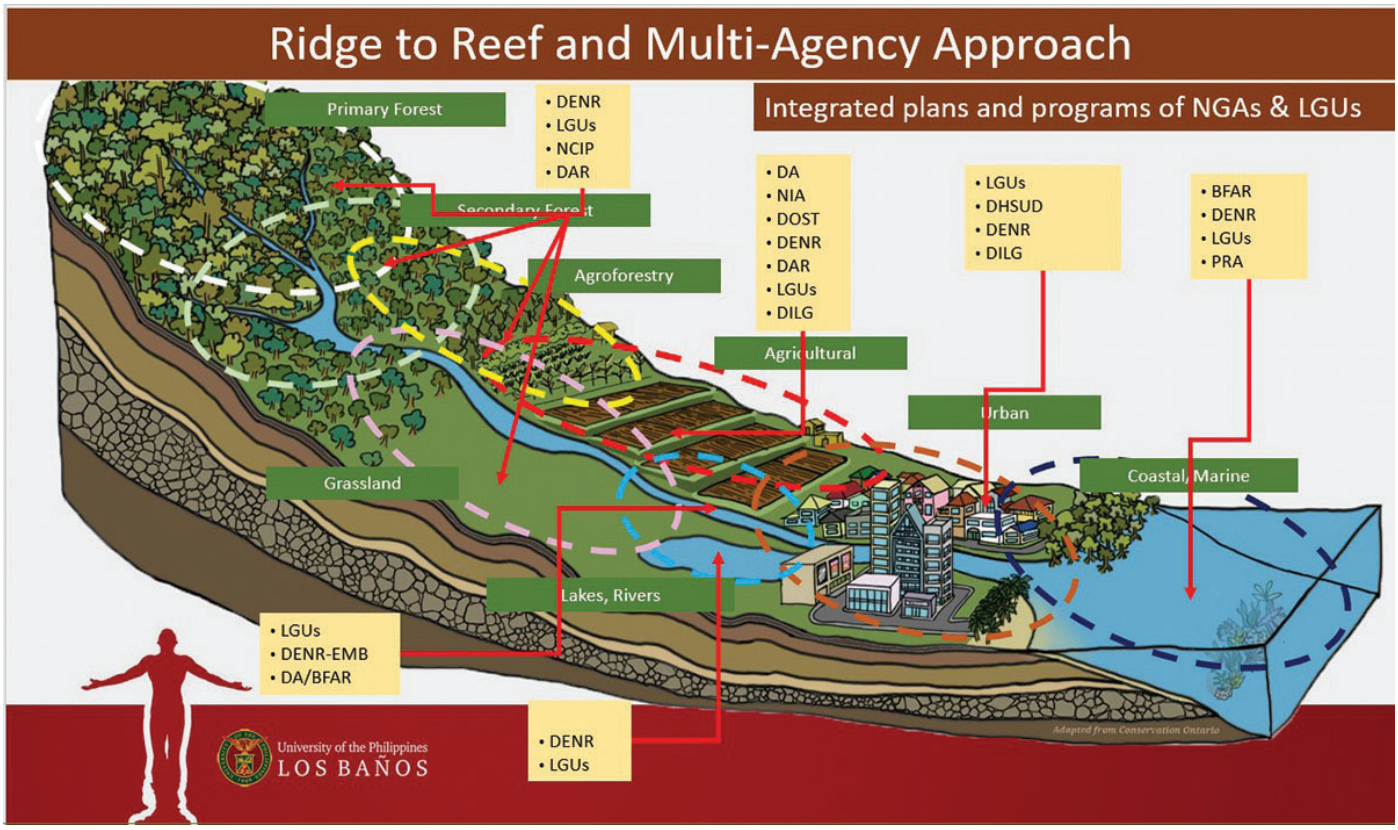


Illustration is lifted from Professor Rex Victor O. Cruz presentation on "Unprecedented Climate Change: Unprecedented Response," during the 2023 Annual Scientific Conference organized by the DOST-NRCP at the Philippine International Convention Center, Manila.

Ridge-to-reef approach: the needed integrated gov't response to climate change, says environmental expert

By Geraldine Bulaon-Ducusin, *DOST-STII*

"There have been many government initiatives over the years in response to climate change, but there's still a lot to do in terms of integrating these plans and programs," said Rex Victor O. Cruz, Professor Emeritus at the University of the Philippines Los Baños.

Although 1.5 °C is a global target, the temperature increase and associated impacts will vary locally, according to the 2019 Study on the Implications of Intergovernmental Panel on Climate Change's (IPCC) Special Report on Global Warming of 1.5 °C by the Department of Environment and Natural Resources (DENR).

There are significant risks associated with 1.5 °C warming, including impact on the poor and the most vulnerable, but risks associated with warming are substantially lower at 1.5 °C than 2 °C warming. Limiting warming to 1.5 ˚C, according to the IPCC, will however require prompt and immediate adaptation and mitigation actions.

Cruz, in his presentation on "Unprecedented Climate Change: Unprecedented Response," at the 2023 Annual Scientific Conference (ASC) cited that the government, especially at the level of local government units (LGUs), already made plans and have existing programs, but these are not fully integrated. He highlighted that the risks and vulnerabilities to climate change across a ridge to reef landscape are interconnected and, hence, requires integrated adaptation and mitigation measures within the ridge to reef/ watershed ecosystem management (R2R/WEM) framework. The ASC is organized by the Department of Science and Technology-National Research Council of the Philippines (DOST–NRCP).

The R2R/WEM framework to promote resilience of human and natural systems entails an integrated land use and development planning process where climate adaptation, mitigation, and disaster risk reduction (DRR) are framed in consideration of its interactions with ecosystem protection, soil,

continued next page

DOST-FPRDI's heat treatment facility now accredited by BPI

By Rizalina K. Araral, *DOST-FPRDI*

Good news to wooden pallet and crate makers located near Laguna: the Department of Science and Technology's Forest Products Research and Development Institute's (DOST-FPRDI) heat treatment (HT) facility is now accredited by the Bureau of Plant Industry (BPI).

The facility uses heat in a kiln dryer to kill insect pests infesting wooden pallets and other packaging materials, making it an effective deterrent to the spread of diseases across national borders.

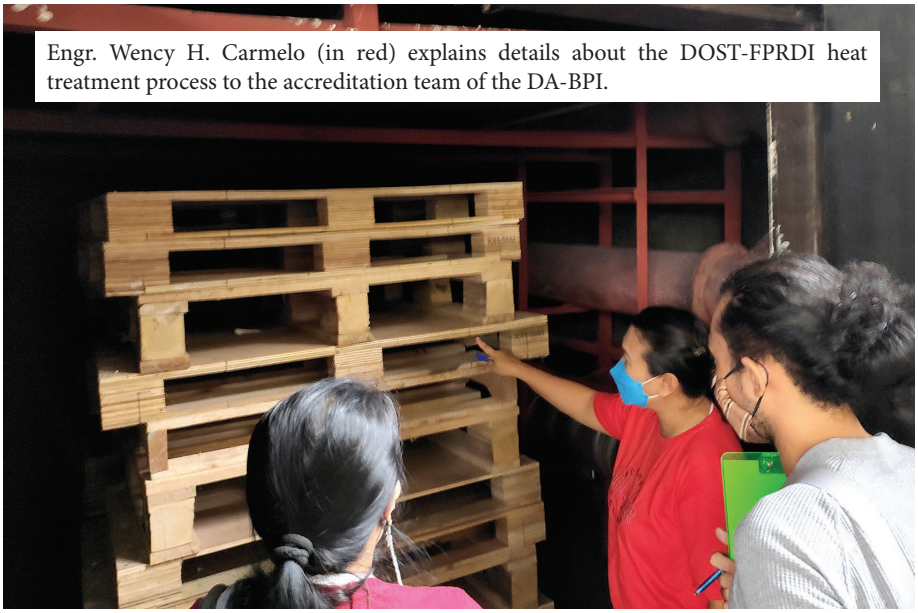
Explains DOST-FPRDI's Engr. Wency H. Carmelo, "To guarantee that invasive insects and diseases are not passed on from one country to another in the global market, the International Standard for Phytosanitary Measures (ISPM) No. 15 requires producers of wooden packaging materials to disinfect their pallets and crates. They can do this either through heat treatment or methyl bromide (MB) fumigation.

"HT is a safer and cheaper means of sterilizing wooden packaging materials compared to MB. High amounts of MB can be fatal and are very damaging to the ozone layer. HT, on the other hand, is relatively harmless and about 50% cheaper."

The ISPM implements very strict policies as insect pests and diseases transported thru global trade have been known to cause massive environmental damage. In the midwestern US, for instance, these "agents of destruction" have once taken over forests and wiped out entire tree species.

According to Carmelo, thru the accreditation of its heat treatment technology, DOST-FPRDI is able to support the country's export industry as it gives wooden pallet makers an effective, safe, and affordable way to meet global sanitary standards.

Interested parties who may want to avail of the Institute's HT service may send an email to Dr. Romulo T. Aggangan, DOST-FPRDI Director, at info@fprdi.dost.gov.ph.



Engr. Wency H. Carmelo (in red) explains details about the DOST-FPRDI heat treatment process to the accreditation team of the DA-BPI.

Ridge to reef (from page 19)

water and biodiversity conservation, socioeconomic development, and other sectoral goals within a landscape. The R2R/WEM-based planning process will also require the engagement of concerned NGAs (national government agencies) and LGUs along with other stakeholders in formulating an integrated plan for the pursuit and achievement of climate change adaptation, mitigation, DRR, and other sectoral goals.

Cruz emphasized the need for an S&T-based adaptation and mitigation response where policies, plans, and programs hinge on change mindsets, building up skills, policy reforms and practices, and multi-agency collaboration. He also suggested that there should be sustained efforts in building knowledge and understanding on the interactions of various ecosystems, impacts of climate change and land use on ecosystems, responses of human and natural systems to adaptation and mitigation, and assessment of risk associated with multiple hazards.

Further, Cruz underscored the crucial need for continuous monitoring of changes in watersheds and ecosystems in response to climate change, land use, and other human activities to build empirical datasets, knowledge, and tools for science-based land use and development planning.

The global warming of 1.00 °C has been reached in 2017. At the current warming rate of 0.2 per decade, global warming of 1.50 °C could be reached and even surpassed between 2030 and 2052 unless proactive and drastic measures are implemented soon. Beyond 1.50 °C rise in average global temperature, Cruz said that we are looking at marked increase in the magnitude of impacts associated with extreme rainfall, floods, droughts, heatwaves, sea level rise, and intense tropical cyclones that will eventually put greater pressure to our lives, especially those living in highly vulnerable communities.

DOST Sec. Solidum: "community media are key partners for SciComm"

By Enrico Belga Jr., *DOST-Office of the Secretary*

Department of Science and Technology (DOST) Secretary Renato U. Solidum Jr. highlighted the important role of community media practitioners in disseminating science news and information during his talk at the 2023 Community Multimedia Summit on Wednesday, 11 January at the Aklan State University - Banga Campus.

The nationwide summit gathered broadcasters, publishers, editors, columnists, online broadcasters, writers, and professional communicators in general from various media organizations nationwide to discuss issues such as food security, climate change, tourism, social media, education and other concerns affecting the national interest.

The three-day event was organized by the PMPCPI (Provincial Multi-Media Press Corps PH Inc.), PAPI (Publishers Association of the Philippines Inc.), POBA (Philippine Online Broadcasters Association), and APCI (Aklan Press Club Inc.). It is considered to be the biggest convergence of the press and social media groups, post-COVID-19 pandemic.

Also present during the event were Rev. Jose Corazon Tala-oc, Bishop of Kalibo; Undersecretary Edwin Cordevilla and Assistant Secretary Bobby Ricohermoso of the PCO (Presidential Communications Office); Juan Dayang, Chapter Chairperson of KBP (Kapisanan ng mga Brodkaster ng Pilipinas) Calabarzon; Roy Bato, Chapter Chairperson of KBP (Kapisanan ng mga Brodkaster ng Pilipinas) Calabarzon; Lydia Bueno, President of the National Press Club of the Philippines; Nelson Santos, President of PAPI (Publishers Association of the Philippines); and Rowen R. Gelonga, Regional Director of DOST-VI.

During his talk, Secretary Solidum highlighted the DOST's efforts and initiatives that are anchored on four thematic areas: wealth creation, through economic development and job creation; wealth protection, through climate and disaster resilience; human well-being, through health, education, access to water and energy; and sustainability, by ensuring protection and conservation of natural resources.

"We at the Department of Science and Technology (DOST) have witnessed how communicators helped us become relevant in the public eye, especially during the height of COVID-19 pandemic where most of the news are about vaccines, clinical trials, VCO (virgin coconut oil), and testing kits, to name a few. We owe the media the public's increased awareness about DOST, which then helped us leverage our projects with our lawmakers and stakeholders," said Secretary Solidum.

"Making sense of science and technology-related news can be a daunting task, and delivering it to the public in layman manner requires keen sense of inquisitiveness and curiosity that only truly dedicated communicators can do."

Secretary Solidum added that engagement with members of the media

continued next page

DOST Sec. Solidum (from page 21)

has always been part of DOST's strategy to inform the public about the agency's efforts in terms of service delivery and improvement of public awareness about the Philippines' science and technology ecosystem in general.

In his presentation to the members of the media, Secretary Solidum further discussed DOST's flagship programs and offerings in the fields of research and development; industry, energy, and emerging technologies; food security and improved agricultural processes; technology intervention for MSMEs (micro-small and medium enterprises), communities, academic organizations, government agencies, research institutions, and local industries; ICT (information and communications technology) tools and technologies for monitoring the weather and geological events; and scholarship opportunities for STEM (science, technology, engineering, and mathematics) students at the secondary, undergraduate, and graduate levels.

For further information on the event or requests for a copy of DOST Secretary Solidum's PowerPoint slideshow and speech, you may email us at osec@dost.gov.ph and epbelga@dost,gov.ph for more details.

DOST introduces sustainable material for school desks, chairs

By Apple Jean C. Martin- de Leon, *DOST-FPRDI*

Sample e-bamboo panel

A sustainable and competitive material may soon replace wood and plastic as school furniture. This, as the Department of Science and Technology (DOST) develops school tables and chairs from engineered bamboo.

Aptly called *Silyang Pinoy*, the school furniture will be mainly produced using engineered bamboo or e-bamboo, and other raw materials. They will also be multi-functional where chairs and tables can easily be transformed into other furniture. This is especially useful in a country where schools are usually converted into evacuation centers during disasters.

"The *Silyang Pinoy* is an important development in providing quality furniture in primary and secondary public schools in the country," says DOST Secretary Renato U. Solidum, Jr. "Our country's geographic location situates us in the pathway of destructive typhoons. This furniture technology will support our educational school system and at the same time, be a sturdier furniture for evacuees who seek shelter in schools during disasters."

E-bamboo is made by binding together fibers, particles, strips or slats of bamboo with the right adhesive. Used worldwide to make attractive panels, floors, furniture, and handicrafts, it is often stronger and less prone to warping than equivalent solid woods.

Through this project, the DOST–Forest Products Research and Development Institute (FPRDI) targets to comply with the price set by the Department of Education (DepEd) to be able to compete with school furniture in the market. Currently, the DepEd spends at least PHP 116,000 for 1-table-1-chair sets for 45 students.

"The Institute has long realized the potential of bamboo and the need to mainstream its use to support the local industry. One of the most economically-important non-timber forest products, bamboo has excellent properties that make it an ideal substitute to wood for furniture, handicrafts, construction material, and chemical products," explained DOST-FPRDI Director Romulo T. Aggangan.

He added, "Supporting bamboo production not only provides economic opportunities for local bamboo farmers and e-bamboo producers; it also helps address the country's wood supply problems."

As efforts pour in to develop technologies for e-bamboo production and promote its use, bamboo growers and users can look forward to better business opportunities in the years to come.

The "Design and Development of Multi-functional School Furniture" project led by Engr. Edward Paul Marasigan is funded by the DOST–Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD). For more information on Silyang Pinoy and e-bamboo production, please email info@fprdi.dost.gov.ph.

DOST-PCHRD scholars share academic journey in Italy at Talakayang HeaRT Beat

By DOST-Philippine Council for Health Research and Development

On 23 February 2023, scholars of the Department of Science and Technology–Philippine Council for Health Research and Development (DOST-PCHRD), Doctors Loraine Kay Cabral and Noel Salvoza, shared their experiences and give insights as foreign scholars in Italy at the second session of Talakayang HeaRT Beat.

Cabral and Salvoza are the first two Filipino scholars under the Ph.D. in Molecular Biomedicine Scholarship Program that was created through an agreement between the DOST-PCHRD, the University of Trieste (UNITS), and Fondazione Italiana Fegato (FIF).

The scholars have been able to publish research papers and present their works in international conferences since they started in 2019. Recently, Dr. Salvoza and his co-authors Dr. Pablo Giraudi, Dr. Claudio Tiribelli, and Dr. Natalia Rosso were given the "Highly Cited Paper Award of 2022" for their review paper titled, "Sex differences in non-alcoholic fatty liver disease: hints for future management of the disease" published at the Exploration of Medicine journal in 2020.

The three-year Ph.D. program is focused on molecular hepatology within the Ph.D. Program in Molecular Biomedicine of UNITS that integrates basic research and clinics focusing on the study of molecular approaches to cancer biology, genetics, jaundice, and metabolic disease.

DOST-PCHRD Executive Director Dr. Jaime Montoya highlighted the objectives of the program and its significance in developing a pool of high-quality human resources in molecular biomedicine.

"We want to open opportunities to deserving Filipino students to study and obtain their Ph.D. degrees in a reputable institution abroad and we are confident in them that they will be able to contribute to the country's global competitiveness and economic development, come up with health research, and boost technological innovation capabilities through training on biomedical research in the future," he said. It is also expected that the scholars will be able to liaise with the FIF in creating a basis for Liver Network integrating basic and clinical research.

Fllipino scholars under this program will receive benefits such as school fees, living allowance, book allowance, outright dissertation grant, travel/health and accident insurance, one round-trip fare from the Philippines to Italy, and the scholars' pre-departure expenses.

Also joining the scholars and Dr. Montoya in the session are DOST Secretary Renato U. Solidum Jr., Undersecretary for Research and Development Dr. Leah J. Buendia, and Institution Development Division Officer-in-Charge Paula Jane de Leon.

Started in 2019, Talakayang HeaRT Beat is a monthly press conference that introduces and provides the latest updates on the DOST-PCHRD's programs and services to the public.

Cebu students take on science news writing, social media content creation

By Allan Mauro V. Marfal, *DOST-STII*

College students from Cebu, who are taking up Biology course, learned the rudiments of popular science writing and tips on creating compelling content about science using social media in a webinar organized by the Department of Science and Technology–Science and Technology Information Institute (DOST-STII).

The learning sessions were conducted in partnership with the Cebu Association of Biology Students Inc. (CABSI) that was held on 22-23 February via Zoom.

Around 65 students from 10 member schools of CABSI attended and participated in various workshop activities of the two-day webinar. These member schools are Cebu Doctor's University, Cebu Institute of Technology-University, Cebu Normal University, MHAM College Inc., Southwestern University PHINMA, University of the Philippines Cebu, University of San Jose-Recoletos, University of the Visayas, and Velez College.

Before the webinar proper started, DOST-STII Director Richard P. Burgos gave his message by saying that Biology has, indeed, many useful and practical applications in our lives and he is delighted to know that CABSI, composed of future medical practitioners and researchers, has been proactively conducting various activities to promote this field of science, especially to the younger generation.

"This e-learning session comes at the perfect time, to equip you with more knowledge and skills in crafting content that would further promote the benefits of biology to every Filipino," said Dir. Burgos.

Lastly, Dir. Burgos compared the heartthrob phenomenon in creating content for science and biology.

"For sure you know the phenomenon of heartthrobs, when the heartthrob passes you, what do you do? Your gaze follows or you take a second look. Sino iyon? That's exactly what kind of effects we want to produce when you create compelling stories," said Dir. Burgos.

On other hand, Joy M. Lazcano, Associate Editor of the S&T Post

continued on next page

The DOST-STII in partnership with the Cebu Association of Biology Students Inc., conducted a two-day webinar on crafting compelling content on science and biology with topics on news and feature writing and social media.

Cebu students (from page 28)

magazine, shared the DOST-STII's Science Journo Ako (SJA) advocacy program that aims to establish a robust ecosystem of grassroots science journalists and communicators advocating and promoting science communication in the country. In addition to that, he said that SJA offers capacity building activities to its partner institutions to build a pool of potential science communicators who will help promote S&T at the grassroots.

The heart of the webinar

After the inspiring talks of DOST-STII officials, the science communication practitioners from DOST-STII started to share their knowledge as the heart of the webinar began to beat.

Jasmin Joyce P. Sevilla, a seasoned in-house writer from the DOST-STII and Managing Editor of S&T Post, discussed in her lectures why we should communicate science to the public. The S&T Post is a quarterly popular science magazine published by DOST-STII.

Sevilla explained that crafting stories that tackle science-related topics could help everyone to understand the benefits and significance of the efforts and commitment of our local scientists, researchers, and engineers to provide timely and appropriate solutions to some of our pressing concerns. She further said that, by featuring Filipino experts, they become inspirations to the youth to pursue courses in science, technology, engineering, and mathematics or STEM.

Sevilla also shared some tips with the student-participants on how they can find a better story angle by identifying the target readers of their stories. She then highlighted the importance of considering several elements in one's articles such as prominence, oddity, and human interest.

In one of her slides, Sevilla emphasized to the students the difference between news and feature stories, thus enabling better appreciation for the craft of science writing.

She explained that when it comes to writing a feature story, it differs from straight news in one respect—it's intent. A news story provides information about an event, idea, or situation. The feature does a bit more. It also may interpret or add depth and color to the news, instruct, or entertain.

She added that, in writing effective science stories, we should keep them simple to help our readers visualize what we are writing or sharing in our science articles.

For the second day of the webinar, Carmela Aguisanda-de Gracia, the resident social media specialist of DOSTv, presented with the participants some tips and tricks in creating engaging content for social media, particularly related to topics on science and biology. Incidentally, DOSTv is the broadcast platform of DOST that is operated and managed by DOST-STII.

de Gracia shared in her presentation the process of creating social media posts about one's organization or activities that one would like to promote, like the need to identify your audience, build your brand, and plan regular and engaging content.

She also reminded the student participants about not overcrowding their posts or graphics with too much text and always alloting time to proofread one's work. de Gracia stressed the importance of accuracy in social media posts because too much errors could affect the credibility of the organization to their target audiences.

Lastly, de Gracia gave student participants a piece of advice for creating engaging content for social media.

"Managing your social media does not need to be a chore. You know your business and your brand better than anyone–be confident with the content you share, and have some fun whilst you're at it," said de Gracia.

Real talk about science communication

At the end of the webinar, some of the participants shared their key takeaways and appreciation for all the lessons that they have learned from the two-day webinar where the value of science communication was greatly recognized.

"This two-day virtual event provided us great opportunities to have a deep understanding of the impact and benefits of crafting easy-to-understand science content," said Mary Jean Lozano, President of CABSI.

"Being a science communicator entails a big responsibility and an honor at the same time, we were given a great opportunity to be of big help to society and it needs the effort to achieve the goal we have which is to help everyone be aware of science and how it should be properly conveyed," said Vincent V. Albiso, a Third-year Biology Major from Cebu Normal University.

"The most valuable insights I have learned from the workshop was the essence of re-learning and having self-awareness about the power of social media. Moreover, learning the proper way of bridging the gap through science to ordinary people using science news and feature articles," said Cyril Mae A. Embalsado, another 3rd-year student and Biology major from Cebu Normal University.

STARBOOKS wins prestigious 2022 Presidential Lingkod Bayan Award

By Rosemarie C. Señora, *DOST-STII*

In the 2022 Awards Rites for Outstanding Government Workers held at the Rizal Ceremonial Hall in Malacañan Palace on 08 March 2023, President Ferdinand R. Marcos Jr. bestows to the Science and Technology Academic and Research-Based Openly Operated KioskS (STARBOOKS) the highest and most coveted Presidential Lingkod Bayan (PLB) Award for 2022.

The Civil Service Commission confers the said award on an individual or group for exceptional or extraordinary contributions resulting from an idea or performance with nationwide impact on public interest, security, and patrimony.

Citation in the award reads:

"For revolutionizing the concept and use of the library with the development of interactive kiosks that host learning media such as text, audio, and videos related to science, technology, engineering and mathematics. The Science and Technology Academic and Research-Based Openly Operated KioskS or STARBOOKS have proven effective in forging bridges of inclusiveness by bringing information and knowledge resources to people and communities at the fringes of society in the country, allowing them to maximize such knowledge for education advancement, disaster readiness, and even entrepreneurial opportunities. Due to their portability, the kiosks can be relocated anywhere in the country, even in off grid sites, conflict areas, and remote indigenous communities."

An innovative library-in-a-box developed by the Department of Science and Technology – Science and Technology Information Institute (DOST-STII), STARBOOKS is a stand-alone S&T information resource tool that contains thousands of digitized science and technology resources in various formats (text and video/audio) designed to reach those with limited or no access to S&T information resources.

It especially aims to provide science, technology, and innovation content to students, teachers, and other stakeholders in geographically isolated communities across the country through its offline, online, and mobile platforms.

The PLB Award is among the three categories, along with the CSC Pagasa Award and the Outstanding Public Officials and Employees or the Dangal ng Bayan (DNB) Award, of the Honor

Awards Program (HAP) which aims to recognize and reward public service exemplars, as well as motivate or inspire civil servants, to improve the quality of their performance and instill deeper involvement in public service.

Mr. Alan C. Taule, Chief Science Research Specialist at DOST-STII and team leader of the STARBOOKS team, said that the award is an affirmation of STARBOOKS' potential and contribution to the education of Filipino students.

"The CSC Presidential Lingkod Bayan Award for STARBOOKS is a testament to its transformative potential in uplifting the science and math skills of our students even under the most trying of economic and social conditions. Thus we are committed to continually improve its content and features to reach more learners from all levels, while adapting to more specialized sectoral needs in the coming years," he said.

Across rivers and mountains

An African proverb say that it takes a village to raise a child. For STARBOOKS, this actually rings true.

In an appreciation post by Ms. Marievic V. Narquita, the STARBOOKS Unit head, the award recognizes the efforts of all the people who have been part of the project since 2011, including the former and current STARBOOKS deployment officers in the regions and provinces, as well as the generous partners who contributed various educational materials and donated computer sets and other hardware requirements for the beneficiaries all over the Philippines.

The STARBOOKS deployment officers are the hands and feet of the project who, together with the core STARBOOKS team, travel kilometers of paved and unpaved roads, and crosses rivers, seas, and mountains to physically bring the donated computer sets, and at times even solar panels to serve communities with no electricity, to deserving students living in geographically isolated and disadvantaged areas.

They also serve as the STARBOOKS' focal persons and trainers assigned per region in the country to primarily assist schools in the use and maintenance of received kiosks.

Icing on the Cake

Prior to receiving the PLB Award, STARBOOKS has received numerous awards and recognition in and out of the country such as the Presidential Citation for Innovative International Library Projects from the American Library Association (ALA) at the San Francisco Public Library in the United States (2015), Outstanding Library Program by the Philippine Association of Academic and Research Librarians during their 43rd Annual General Assembly (2015), two Anvils namely the Silver Anvil for Public Relations Tool and the Gold Anvil for Public Relations Program (2017), and finalist in the 2017 Government Best Practice Recognition by the Development Academy of the Philippines, among others.

As of March 2023, there are 6,403 actual sites of STARBOOKS.

House of Representatives seeks to modernize DOST-PHIVOLCS

By DOST-Department of Legislative Liaison Office

MANILA- Albay 2nd District Representative Joey Sarte Salceda has filed House Bill No. 6921 seeking to modernize the Department of Science and Technology–Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS).

The PHIVOLCS Modernization Act aims to enhance the capability and human resource complement of the agency to better provide timely and quality information and services for warning, disaster preparedness, and mitigation of events arising from volcanic eruptions, earthquakes, tsunami, and other related geotectonic phenomena.

"There is a need to augment and enhance the monitoring and warning capabilities of PHIVOLCS."

Dr. Teresito C. Bacolcol, the newly Appointed Director of DOST-PHIVOLCS further explained that the country has 24 active volcanoes and 27 potentially-active volcanoes. Of the 24 active volcanoes, only 10 are currently being monitored, and only two of these 10 are equipped with all the required station types.

"There is a need to increase the density of the Institute's seismic stations to better understand future earthquake occurrences."

Dr. Bacolcol explained that DOST-PHIVOLCS has also mapped numerous active faults dividing densely populated cities, and in the last 10 years, these faults have generated a total of seven major earthquakes and several strong earthquakes. Adding that many of these earthquakes are damaging. There is, therefore, a need to increase the density of the Institute's seismic stations to better understand future earthquake occurrences.

The DOST-PHIVOLCS chief also cited that the growth of basic research and number of employees conducting hazard mapping has been hampered by an increasing demand for hazard and risk information from various private companies and government agencies.

"There is a need to augment and enhance the monitoring and warning capabilities of PHIVOLCS."

He mentioned that various NGAs (national government agencies) are also requesting the agency to conduct assessments on various government projects using the technologies that the agency developed. These requests continue to put a dent to an already lean staff of the institute.

These challenges would be addressed through the passage of the PHIVOLCS Modernization Law.

First, the bill mandates the upgrading of DOST-PHIVOLCS equipment, facilities, and system. This will allow the institute to provide useful and more accurate volcanic and seismological data and localized warning and information services to be used in decision-making in disaster preparedness.

Second, the bill also provides better incentives for institute personnel and additional plantilla positions to expand its pool of experts. This includes the creation of a new salary scale, a retention incentive, and an enhanced human resource development program.

If passed into law, the institute will have more volcano and seismic monitoring stations equipped with state-of-art systems and facilities to ensure early warning of volcanic activity and to better understand future earthquake occurrences. This also includes an enhanced technology-based data center consistent with international standards and additional competent personnel to foster a more responsive information dissemination collaboration with the LGUs (local government units) to help in the disaster planning, preparation, and disaster mitigation in the communities.

DOST-PHIVOLCS is a service institute of the department mandated to mitigate disasters that may arise from volcanic eruptions, earthquakes, tsunami and other related geotectonic phenomena.

Since the creation of the Commission of Volcanology in 1952 under Republic Act No. 766, DOST-PHIVOLCS has gone through several reorganizations through Executive Order 784, series of 1982 involving the transfer to the National Science and Technology Authority (now DOST) and the transfer of Seismology from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration by Executive Order 984, series of 1982. From a non-staffed Commission, DOST-PHIVOLCS has emerged as an Institute that is more responsive and attuned to the vision of the Philippine government for a resilient community.

PNRI-PHIVOLCS collaboration to boost R&D initiatives on seismology and volcanology thru nuclear science

By Allan Mauro V. Marfal, *DOST-STII*

The Philippine Nuclear Research Institute (PNRI) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS), both attached agencies of the Department of Science and Technology (DOST), recently signed a memorandum of understanding (MoU) to strengthen research collaboration on the applications of nuclear science and technology in the fields of volcanology and seismology.

The ceremonial signing, held on 25 January 2023, at the DOST-PHIVOLCS Auditorium in Quezon City, signals the joint initiatives of the two DOST agencies to harmonize their efforts to address disaster risk reduction and management. This is aligned with the current administration's thrust to pursue the OneDOST4U advocacy to better improve delivery of public service.

Under the MoU, the DOST-PNRI and DOST-PHIVOLCS will focus and venture together on projects related to the fields of geochemistry, isotopic techniques, volcanism, active faults, geothermal, and volcano-hydrothermal.

Both institutions agreed to share its respective pool of experts, resources, equipment, facilities, and other information relevant to the project.

"Through this MoU, we will be able to freely use each other's resources to continue to answer scientific questions that both DOST-PHIVOLCS and DOST-PNRI are facing. We hope to gain knowledge, data and information from the works that will be implemented within the scope of the MoU. Likewise, DOST-PNRI researchers are encouraged to build the capacity of DOST-PHIVOLCS researchers through shared research activities such as sample preparation, analytical works, and training," said DOST-PHIVOLCS Director Teresito C. Bacolcol.

DOST-PNRI Director Carlo A. Arcilla (2nd from right) and DOST-PHIVOLCS Teresito C. Bacolcol (2nd from left) lead the signing of MoU between two DOST agencies as they work together towards strengthening research collaboration on the applications of nuclear science and technology in volcanology and seismology. Meanwhile, serving as the witnesses from these agencies were DOST-PNRI's Atomic Research Division Chief Lucille V. Abad (right) and DOST-PHIVOLCS Volcano Monitoring and Eruption Prediction Division Chief Ma. Antonia V. Bornas (left). Photo from DOST-PNRI.

He added that it is a good opportunity for the returning Ph.D. and M.Sc. graduates of DOST-PHIVOLCS to continue their research using the same analytical equipment they have used during their stay in the universities. At the same time, DOST-PNRI will also benefit from the volcanologists and seismologists through the sharing of ideas they have on certain projects that DOST-PNRI researchers are working on.

Meanwhile, after the ceremonial program and signing, scientists and experts from the DOST-PNRI visited the Geochemical Laboratory located at the DOST-PHIVOLCS office in Quezon City.

After the MoU ceremony, scientists from the DOST-PNRI visited the Geochemical Laboratory located at the DOST-PHIVOLCS office in Quezon City. (Photo from DOST-PNRI)

Investment in modern volcanology and seismology is an investment in human lives, economist-lawmaker says

By Kristine Zamora, *DOST-Department of Legislative Liaison Office*

"The economic costs of volcanic and seismic activity can be steep."

This is according to Albay 2nd District Representative Joey Sarte Salceda during his sponsorship speech at the House Committee on (S&T) meeting on PHIVOLCS Modernization bills last 21 February 2023.

Salceda explained that in the 1992–1996 period, when volcanic eruptions and seismic activity were especially damaging for the Philippines, some estimates suggest that losses were at USD 2 billion, which at today's prices should now be around USD 6.25 billion, or a staggering PHP 343 billion. The foregone income from Taal activity in 2020 alone could have hit as high as PHP 6.6 billion, according to NEDA estimates.

"A modern PHIVOLCS will help us get a clearer picture of the dangers we face."

Salceda stressed that through the passage of the PHIVOLCS modernization law, the agency shall reform its human resource capabilities, enhance equipment and systems, and thereby provide streamlined services that are at par with international standards, to local government units (LGUs) and the public. Through the information provided by PHIVOLCS on activities of volcanoes, earthquakes, and tsunamis, as well as other geotectonic phenomena, LGUs can plan ahead and impose restrictions for the safety of the communities.

He emphasized that an investment in Department of Science and Technology–Philippine Institute of Volcanology and Seismology (PHIVOLCS) is an investment in the safety of the people and all other areas exposed to the dangers of volcanic and seismic activity.

Salceda added the need to harmonize the efforts of DOST-PHIVOLCS and LGUs to plan human settlement and infrastructure better. He cited the Mayon Volcano in Albay which is an active volcano, of which five municipalities and all three cities of Albay have some part of them, which is in Mayon Volcano itself. Significant population clusters in Albay remain exposed to volcano-related risks, he added.

Enhanced collaboration between LGUs and DOST-PHIVOLCS is one of the key components of the proposed PHIVOLCS Modernization Act. The proposed bill seeks to ensure that advisories and geohazard maps issued by DOST-PHIVOLCS are incorporated in LGUs' disaster planning, preparation, and mitigation, among others.

If passed into law, a regular public awareness campaign on the hazards of volcanic eruptions, earthquakes, tsunamis, and disaster risk reduction procedures will be designed and implemented by the LGUs together with DOST-PHIVOLCS.

In addition, teaching volcanic, seismic, tsunami, and other related hazards will be included in regular school curriculum for provinces and municipalities directly affected by these hazards.

DOST-PHIVOLCS is a service institute of the DOST mandated to mitigate disasters that may arise from volcanic eruptions, earthquakes, tsunami, and other related geotectonic phenomena.

DOST chief says Filipinos must already know and appreciate what earthquake disaster means

By Allan Mauro V. Marfal, *DOST-STII*

"Of all natural hazards, earthquakes cause the deadliest disasters, accounting for 58% of total disaster deaths between 2000-2019," a released statement by Mami Mizutori, Head of the United Nations Office for Disaster Risk Reduction, given after the February 2023 twin earthquakes in Turkey and Syria.

In connection with this statement, Secretary Renato U. Solidum Jr. of the Department of Science and Technology (DOST) believes and expects that by now, most Filipinos must have a deeper understanding and appreciation of what earthquake disaster means.

It is likely that we know someone, if not ourselves, who experienced the impacts of devastating earthquakes in the Philippines in the last two decades, Solidum said.

The Science chief emphasized this in his message during the First Quarter Nationwide Simultaneous Earthquake Drill (NSED) for the year 2023, as he shared what knowledge Filipinos already possess regarding earthquake impacts. The quarterly conduct of the nationwide earthquake drills each year is an effort of the government to promote disaster preparedness and resilience among Filipinos.

Sec. Solidum said that most of us are aware that ground shaking does not kill, it is the collapsed houses, buildings, and infrastructures that kill. He also added that many Filipinos know that collapsed houses, buildings, and infrastructures oftentimes is a result of flawed construction practices–meaning two things: old buildings that no longer meet current standards and the other where new buildings are unfortunately constructed that do not conform to current building standards.

Personnel from the DOST-PHIVOLCS join and participate in the First Quarter NSED for the year 2023 Photos from the DOST-PHIVOLCS.

Lastly, Sec. Solidum said that if we believe and accept that bad construction practices cause collapsed structures during earthquakes, then destruction and death due to the earthquake are preventable, if bad practices are replaced by good practices.

"Destruction and death due to earthquakes are preventable. Let us allow the tools of science to assist us in making earthquake-resilient communities to prevent destruction and death," reiterated Sec. Solidum.

Meanwhile, Sec. Solidum also shared some of the digital innovations and applications and tools that facilitate the interactive use of hazard and risk information for decision-making and action. It includes How Safe is My House, a self-assessment tool that every homeowner should take; the FaultFinder, which tells us how far away our home or workplace or school is from a source of the earthquake; the HazardHunter, which tells us what are the natural hazards that can affect our neighborhood; and the GeoanalyticsPH, a tool that shows us in

continued on next page

House Speaker Romualdez meets DOST officials for priority programs

By Kristine Zamora, *DOST-DLLO*

To lay down priority programs and policies of the Department of Science and Technology (DOST) and seek support from policy champions, DOST officials led by Secretary Renato U. Solidum Jr. paid a courtesy visit to House Speaker and Leyte 1st District Representative Martin G. Romualdez on 22 February 2023 at the House of Representatives, Quezon City.

Secretary Solidum emphasized the need to enhance the capacity and capability of the Philippine Institute of Volcanology and Seismology (PHIVOLCS) to better provide services critical to disaster planning, preparation, and mitigation, among others.

As the national agency dedicated in providing information on the activities of volcanoes, earthquakes, and tsunamis, as well as other geotectonic phenomena, DOST-PHIVOLCS, plays a key role in the disaster preparedness of the country, together with Local Government Units (LGUs).

Highlighted in the discussion is the country's vulnerability to geological and hydrometeorological hazards which include earthquakes, volcanic eruptions, tsunamis, and the need to come up with viable solutions to combat the impact of these hazards.

The passage of the PHIVOLCS Modernization law, as identified by DOST, is one of the concrete and sustainable solutions to this national concern.

Speaker Romualdez assured support in passing laws that will uplift the lives of Filipinos through Science, Technology, and Innovation. Incidentally, last 05 December 2022, the House of Representatives approved HB (House Bill) 6452 or the Virology and Vaccine Institute of the Philippines or VIP Act with Speaker Romualdez as one of the principal authors of the measure.

Present during the meeting were House Committee on Science and Technology Chair and Aklan 1st District Representative Carlito S. Marquez, Pampanga 4th District Representative Anna York Bondoc, Office of the House Speaker intern and Presidential son William Vincent Marcos, DOST Secretary Renato U. Solidum Jr., DOST-PHIVOLCS Director Dr. Teresito C. Bacolcol,

Philippine Nuclear Research Institute (DOST-PNRI) Director Dr. Carlo Arcilla, and Department Legislative Liaison Office (DLLO) Director Lita Suerte Felipe.

Currently, there are seven bills filed on PHIVOLCS Modernization in the House of Representatives. These are HB 3587 filed by 1-PACMAN Partylist Representative Michael L. Romero; HB 6457 by Ilocos Norte 2nd district representative Angelo Marcos Barba; HB 6921 by Albay 2nd District Representative Joey Sarte Salceda; HB 7031 by Kabayan Partylist Representative Ron Salo; HB 7102 by Aklan 1st District Representative Carlito Marquez; HB 7121 by Batangas 6th District Representative Ralph Recto; and HB 7142 by Pampanga 4th District Representative Anna York Bondoc.

DOST chief (from page 32)

maps and figures the hazards assessment of our neighborhood.

Also included in the innovations from DOST-PHIVOLCS is PlanSmart, which gives national and local planners the necessary information needed for their development planning needs; and Rapid Earthquake Damage Assessment System (REDAS), which teaches our local planners to build the exposure database and the scenarios of earthquake, tsunami, and landslide hazards that they will use in their CLUPs or comprehensive land use plans.

"DOST continues to develop various applications to make science more accessible in decision-making for prevention and mitigation and encourage everyone to use them as our good practice," Sec. Solidum concluded.

To know more of the tools that will help in keeping everyone informed of the hazards and preparatory measures to take, all are encouraged to download the special book on The DOST Innovations: Web and Mobile Applications for Disaster Risk Reduction Management. It is a user guide for accessing, utilizing, and applying DOST web and mobile applications for disaster risk reduction and management. You can navigate these innovations and access our risk information to support the country's resilience initiatives. To download, you may click this link: http://bitly.ws/AQNE

PHIVOLCS-REDAS awarded DAP's Government Best Practice Recognition 2022

By DOST–PHIVOLCS

The Department of Science and Technology-Philippine Institute of Volcanolgy and Seismology (DOST-PHIVOLCS) bested 219 entries from 125 government agencies/units in the Government Best Practice Recognition (GBPR) 2022 award of the Development Academy of the Philippines (DAP). PHIVOLCS's Best practice entry is "Empowering Philippine Stakeholders on Hazards Monitoring, Damage Assessment, Warning, and Local Advisory through the Use of Rapid Earthquake Damage Assessment System (REDAS)." The entry is one of the Top Five winners of the GBPR, which is an initiative of the DAP's Productivity and Development Center aiming to promote, showcase, and share knowledge on outstanding and innovative practices demonstrated by the public sector organizations.

In August 2022, the team submitted their entry by answering questions related to summary of the best practice entry, background of the problem and solution, milestones, and testimonials. After months of screening process, 14 finalists from 125 government institutions were chosen as finalists and were asked to present their best practice entry to the panel of judges for the final screening. Aside from PHIVOLCS, it is noteworthy that three other DOST agencies were shortlisted as finalists: PCAARRD (Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development), STII (Science and Technology Information Institute), and TAPI (Technology Application and Promotion Institute) (Figure 1).

The final screening was held from 1-2 December 2022 in a forum titled "Public Sector Quality and Productivity Improvement Forum (PSQPIF) 2022" through ZOOM platform. Prior to that, participants were asked to showcase their best practice in an eight-minute video presentation and said video was presented to the panel of judges followed by a "question and answer" (Q&A). For the DOST-PHIVOLCS entry, Dr. Maria Leonila P. Bautista, Mr. Ishmael C. Narag, and For. Jordana Marie L. Argamosa attended the program, whereas Dr. MLP Bautista answered the Q&A portion.

On the first day of the two-day program, opening remarks were given by the DAP President Atty. Engelbert C. Caronan Jr. For the PHIVOLCS-REDAS entry, Department of Trade and Industry Competitiveness Bureau Director Lilian G. Salonga, one of the judges, posed the question to Dr. M.L.P. Bautista, REDAS Program Coordinator: "As a very good proof of concept, could you cite any concrete instance or specific case wherein the REDAS was utilized, and can you expound on the results that were achieved?" Dr. Bautista responded by citing the different stakeholders like LGUs (local government units), private sector, SUCs (state universities and

	BEST PRACTICE ENTRY	AGENCY
1	Community-Based Sustainable Tourism in Palaui Island Protected and Seascape, Sta. Ana, Cagayan	Cagayan Economic Zone Authoriy
2	Empowering Philippine Stakeholders on Hazard Monitoring, Damage Assessment, Warning and Local Advisory through the Use of Rapid Eartquake Damage Assessment System (REDAS)	DOST-PHIVOLCS
3	Enhancing Technology Transfer and Commercialization through the DOST-PCAARRD Innovation and Technology Center (DPITC)	DOST-PCAARRD
4	Gender and Development (GAD) Mainstreaming	DA-PhilRice
5	Mandaue City eBPLS: Transcending Expectations	LGU-Mandaue
6	Manila Police District Mobile Linrary Ang Guro kong Pulis	PNP
7	Marinduque Veterinay Field Hospital	Provincial Veterinary Office of Marinduque
8	Nang Dahil sa Kahon" (Plastic Bags to Family Food Pack Boxes) The Innovations of DSWD's Regional Resource Operation Section	DSWD-VIII
9	Persons wiht Disability Affairs Office (PDAO) - ZamboSur Best Practices	PDAO-PWD
10	Pre-Commercialization Due Diligence Mechanism of the DOST-Technology Application Instituite (DOST-TAPI)	DOST-TAPI
11	Publishing of ASEAN Citation Indexed (ACI) Refereed Journals at Southern Leyte State University	SLU
12	Science and Technology Academic and Research-Based Openly Operated KioskS (STARBOOKS)	DOST-STII
13	Social Pension Information System (SPInS)	DSWD - CARAGA
14	Your Mental Health Matters: The Quezon City Community-Based Mental Health Program (CBMHP)	Quezon City Government

Fourteen finalists of the GBPR 2022: four of which came from DOST.

Q&A portion during the GBPR competition wherein DTI CB Director Salonga posed a question to REDAS Programme Coordinator Dr. MLPB Bautista about the best practice entry of the DOST-PHIVOLCS.

colleges), NGAs (national government agencies), etc. and how they use the various modules of REDAS. Dr. Bautista also added "So many requests come in every now and then because REDAS is the only software in the Philippines that can tell us the impacts ahead of time. So, if we wanted to know how many buildings will be damaged, how many people might die or get injured, or get the economic loss, it is only REDAS that can do that for them. If we would like to compare it with what COVID did to us, had we known the impacts of COVID ahead of time, maybe our preparedness would have been more science-based."

The following are the top five winners of the GBPR 2022 as announced by DAP Senior Vice President Magdalena L. Mendoza: Community-Based Sustainable Tourism in Palaui Island Protected Landscape and Seascape, Sta. Ana, Cagayan (Cagayan Economic Zone Authority); Empowering Philippine Stakeholders on Hazards Monitoring, Damage Assessment, Warning and Local Advisory through the Use of Rapid Earthquake Damage Assessment System (REDAS) (DOST-PHIVOLCS); Gender and Development (GAD) Mainstreaming (DA-PhilRice); Mandaue City's eBPLS: Transcending Expectations (LGU Mandaue, Cebu); and Marinduque Veterinary Field Hospital (Provincial Veterinary Office of Marinduque). Acceptance speeches from head of the organizations were given after every announcement and a photo opportunity was also given to the participants. Dr. Teresito C. Bacolcol, of DOST-PHIVOLCS accepted the award and said: "We would also like to express our sincerest gratitude to our stakeholders who continuously give feedbacks and appreciations to further improve the tool and system and inspire us to do more and stay true to the institute's vision of helping develop communities safe from and resilient to volcanic eruptions, earthquakes, tsunamis and other related hazards."

DOST-PHIVOLCS representatives Dr. M.L.P. Bautista (upper middle) and For. J.M. Argamosa (lower leftmost) with DAP's S.V.P. Mendoza (upper leftmost). PHIVOLCS Dr. T. C. Bacolcol (rightmost) giving the acceptance speech.

DOST-PAGASA's IBF, a gamechanger in weather forecasting

By Joy M. Lazcano, *DOST-STII*

For over a century, the country had been frequented by strong typhoons and history would tell us how, in the past, typhoons had indelibly made its mark into the Filipino consciousness.

In the last 20 years or more, Typhoons Yolanda (Haian) in 2013, Odette (Rai) in 2021, Pablo (Bopha) in 2012, Glenda (Rammasun) in 2014, and Ompong (Mangkut) in 2018 brought a combined amount of PHP263 million in property and economic losses to the country. As a sidebar, the country experiences about a handful of 21 typhoons on average. Yet, it seems that the public cannot draw the impacts that these destructive typhoons bring year-in and year-out.

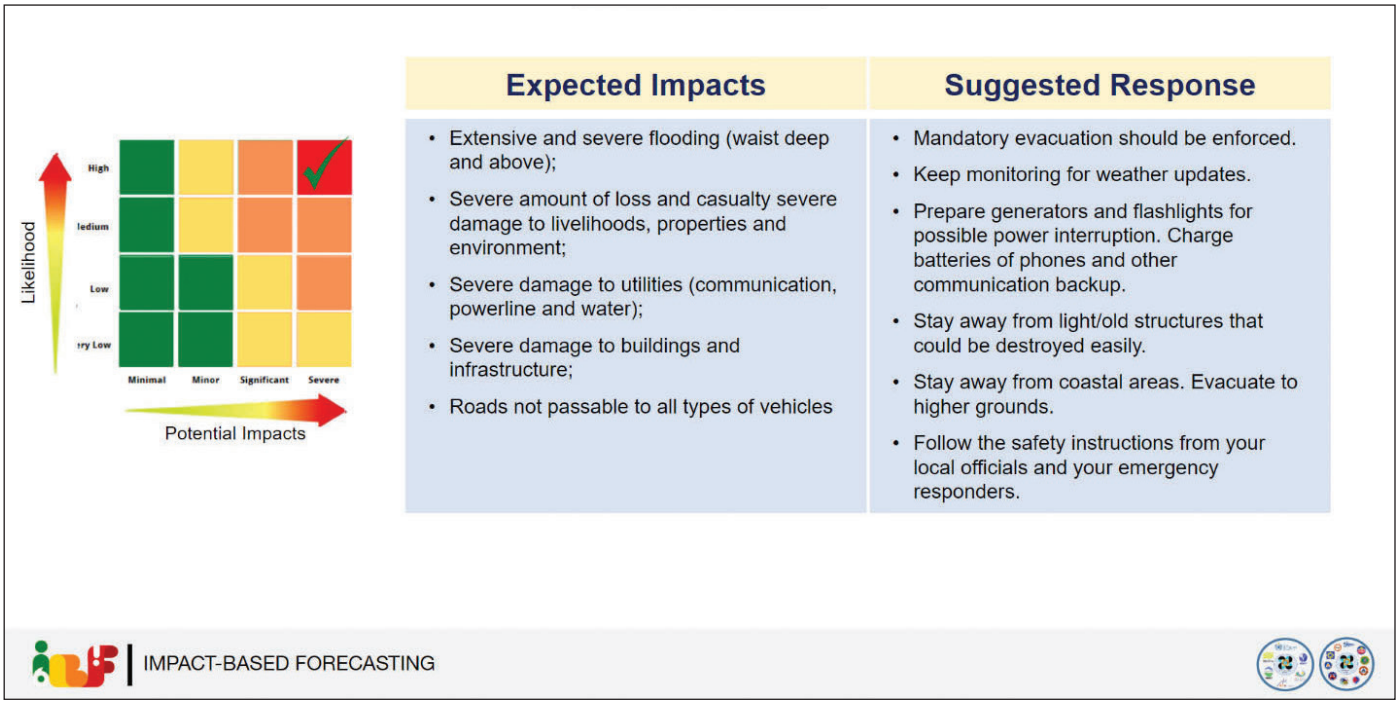
At this time and age, one can only see a ray of hope in the darkest of times as the Department of Science and Technology-Philippine Atmospheric, Geophysical, Astronomical Services Administration (DOST-PAGASA) is now transitioning into Impact-Based Forecasting (IBF).

Launched in December last year, IBF handles weather forecasting information differently from the conventional method of telling what the weather will be. It attempts to translate hazard information into potential impacts thus shifting information from "what the weather will be" to "what the weather will do." This way, the public will have better understanding and appreciation of the weather forecast, so they can do the appropriate action.

In an interview at CNN's The Final Word last February, Engr. Lorenzo A. Moron, DOST-PAGASA assistant weather services chief, explained that with the experience during Typhoon Yolanda, the World Meteorological Organization has strongly advocated the shift from the conventional weather forecasting to impact-based.

"PAGASA provides conventional forecasting, which is quite technical, and people don't usually understand this information," says Moron. "So, this IBF attempts to provide easy to understand information that are pitched in the language of the public by providing the impacts instead of providing information."

He expounded that it is no longer enough to provide accurate weather information as the public are demanding on what to do to ensure their safety and protect their properties. And IBF would



The risk matrix with the corresponding impacts and suggested response. (Presentation slide courtesy of Engr. Moron)

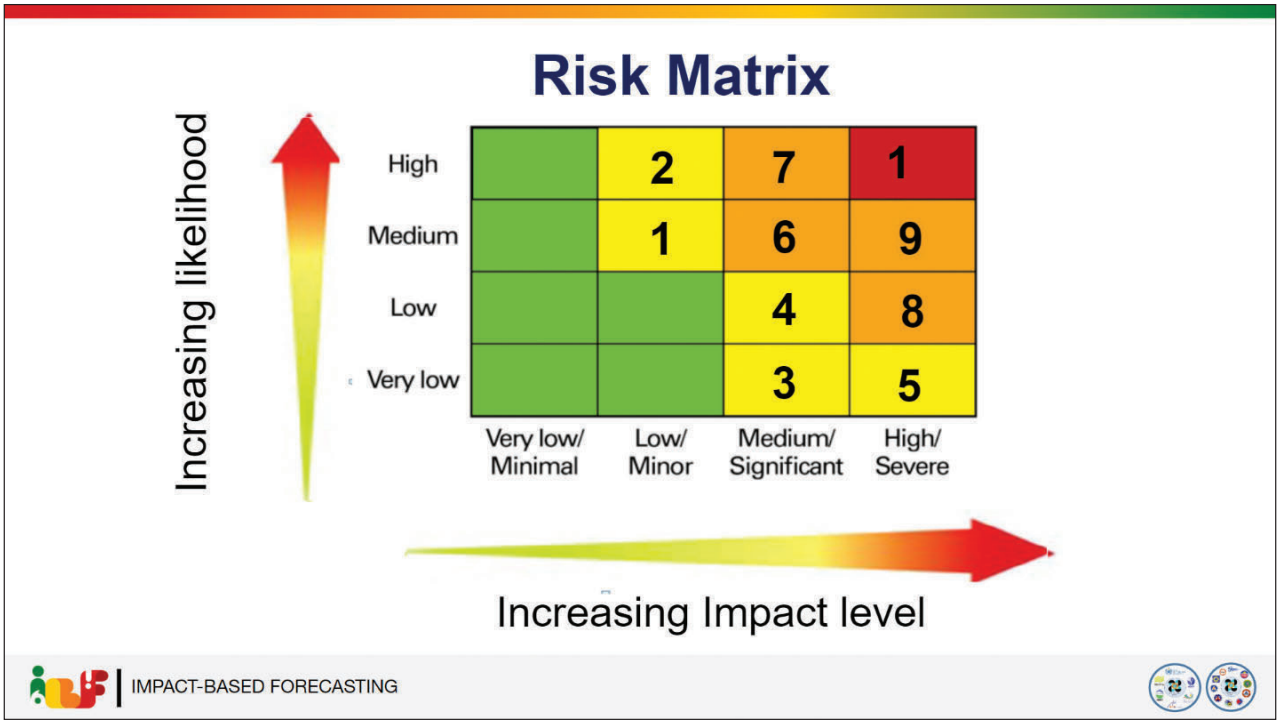
provide descriptive information on the effect of any meteorological event that would enable the public to visualize its effect before disaster happens.

Aside from providing an accurate weather forecast, DOST-PAGASA is now analyzing data by providing a risk assessment using a risk matrix where risks have corresponding impacts to humans and to property.

The matrix will have a corresponding response matrix laid on color-codes representing the severity of the risks and hazards.

In a separate interview, deputy administrator for Research and Development Esperanza O. Cayanan said that the weather bureau "needs to improve descriptions of the possible impact of cyclones in forecast advisories." Cayanan said that there is a need to highlight the impacts rather than the description of the rainfall. This was expressed in reference to Typhoon Paeng in 2022 where it left at least 121 death and more than PHP896 million in agricultural, livestock, and poultry losses.

Currently, DOST-PAGASA is refining its IBF and validation to communities is ongoing. "We have to do thorough validation before we rollout the system. Although Moron did not mention the weather bureau's target implementation, he assures the public that improved forecasting and better coordination with the local government units will be borne out of this initiative.



The risk matrix used by DOST-PAGASA forecasters in determining the risk and impact levels before a typhoon event hits a specific area. (Presentation slide courtesy of Engr. Moron)

DOST-supported stroke rehabilitation invention "AGAPAY" gets first international patent

By DOST–PCHRD

The Filipino invention AGAPAY for upper extremity rehabilitation received its first international patent last 11 January 2023.

Developed with support from the Department of Science and Technology –Philippine Council for Health Research and Development (DOST-PCHRD) and implemented by the De La Salle University–Institute of Biomedical Engineering & Health Technologies (DLSU-IBEHT), the AGAPAY project seeks to aid the motor rehabilitation and physical therapy of stroke and injured patients. The application for the invention was filed last May 2021 with the support from the DOST–Technology Application and Promotion Institute (TAPI).

The latest prototype of the device is activated using high power direct-current motors attached to an adjustable and lightweight frame and is fused with a real-time biofeedback system that records neuromuscular activity. This design enables the technology to be cost-effective and efficient. The device can also perform active and passive motion exercises through gamification using integrated haptics and a graphical user interface.

Currently, there are no robotic exoskeletons being manufactured locally. The development of this device will provide an alternative and affordable option for Filipino patients and could set a standard for robotic rehabilitation technologies in the country.

"This patent from Singapore is a step closer to commercializing Filipino-made technologies in the international setting," DOST-PCHRD Executive Director Dr. Jaime Montoya said. "This development is also a testament to how our own researchers are capable of generating technologies that are responsive to the needs of our communities and at par with international standards," he added.

The project team is now looking for potential industry partners to manufacture the device. Interested parties may reach out to Dr. Renann Baldovino (AGAPAY Project Leader) at renann.baldovino@dlsu.edu.ph and/or Dr. Nilo Bugtai, Director of DLSU-IBEHT at nilo.bugtai@dlsu.edu.ph/n.bugtai@yahoo.com.

2 firms in Pangasinan adopt DOST-FNRI's E-Nutribun

By Monique C. Esguerra, *DOST-I*

Two (2) bakeries in Pangasinan adopted the Enhanced Nutribun or E-Nutribun of squash and carrot variant, developed by the Department of Science and Technology–Food and Nutrition Research Institute (DOST-FNRI).

The new adaptors are Ferdinand N. Jamias of *Bantog Samahang Nayon* Multi-Purpose Cooperative in Asingan and Luzviminda Cabreros of Regino's Bakeshop in Bautista, Pangasinan. DOST Provincial Science and Technology Office in Pangasinan (PSTO–Pangasinan) facilitated the signing of technology licensing agreement with DOST-FNRI on 14 January and 6 February 2023.

Said technology adoptors underwent the virtual technology transfer training with other adoptors nationwide on 20 January, 23–24 January for the squash variant, and 10 and 13 February for the carrot variant. During the training, DOST-FNRI discussed the modules on food safety, 5S, and good manufacturing practices and focused on the production of E-Nutribun and actual demonstration of the technology.

Enhanced nutribun or E-Nutribun is a technology developed by DOST-FNRI, reformulated the ingredients of the traditional nutribun with a softer texture, likable taste, easier for children to hold and bite, and healthier because it contains micronutrients, particularly iron and vitamin A. Currently, E-Nutribun is available in five variants: squash, carrot, purple sweet potato, orange sweet potato and yellow sweet potato.

PSTO–Pangasinan will continue to monitor the two bakeshops to ensure that their production of E-nutribun complies with DOST-FNRI standards as the agency commits to provide them with technical assistance when they need it.

DOST Balik Scientist discovers antimicrobial compounds for new antibiotics from Philippine biodiversity

By DOST–Office of the Undersecretary for Research and Development

A Department of Science and Technology (DOST) Balik Scientist makes headway in drug discovery and development in the country by isolating antimicrobial compounds to be used in formulating new antibiotics.

Dr. Julius Adam V. Lopez is a DOST *Balik* Scientist hosted by the University of San Agustin (USA) in Iloilo City. His work focused on capacity-building initiatives in handling the nuclear magnetic resonance (NMR) technology among Filipino researchers in the Visayas and Mindanao region. Through this initiative, he was able to isolate and elucidate the structure of novel and/or bioactive compounds from cultured marine actinomycetes in the biobank of USA using the NMR.

Specifically, Dr. Lopez used the NMR to purify the marine samples and identify β-lactamase inhibitors, which prevent antimicrobial resistance and improve efficacy of antimicrobial treatment. This study has been done under the PHILMARINE (Philippine marine) beta-lactamase inhibitor project, also in USA.

DOST Secretary Renato U. Solidum Jr. expressed his excitement about the potential impact of Filipinos gaining knowledge on using the NMR, stating that: "Advancing our efforts in drug discovery and development and building the NMR competency within the Visayas and Mindanao regions shall help us address perplexing health issues and opens avenues for locally available, accessible, and practical solutions. The NMR is a powerful tool to study molecular structures and dynamics of complex systems and widen our understanding of the world we live in, which includes discoveries of anti-cancer drugs and antibiotics."

DOST Undersecretary for Research and Development (R&D) Leah J. Buendia added "We need to strengthen and optimize our country's R&D portfolio in drug discovery and development. Through expertise engagement like the DOST *Balik* Scientist Program, we can be part of R&D milestones such as creating the first team of Filipino NMR spectroscopy experts who all have the capacity to discover and formulate new drugs. This engagement will also create a big difference in the earning potential of local pharmaceutical and biotechnology companies."

DOST *Balik* Scientist Dr. Julius Adam V. Lopez has extensive experience in natural products chemistry and NMR spectroscopy. He took his doctor's degree in Hokkaido University, Japan. By using advanced NMR techniques, Dr. Lopez then led the discovery of new cytotoxic cyanobacteria termed as wewakazole B and new fatty acids amides (columbamides), which are the fundamental blueprint or structures for several medicinal drugs.

In this engagement with the USA, Dr. Lopez developed an NMR training module with both theoretical and practical aspects of the NMR spectroscopy. He served as trainer on theory and practical skills for researchers from the academe and industries such as USA, Mindanao State University–Iligan Institute of Technology, Central Mindanao University, University of Southern Mindanao, and DOST Regional Office VI.

Widening the skillset among Filipino researchers, especially for researchers outside Greater Manila in using the NMR creates significant implications for the development of new antibiotics and other drugs. The presence of an NMR in the Visayas will fasttrack isolation and identification of novel compounds as these address logistics requirements of spending cost to ship samples to Manila.

The *Balik* Scientist program is an initiative of the Department of Science and Technology and is part of the Philippine government's efforts to build a strong science and technology ecosystem in the country.

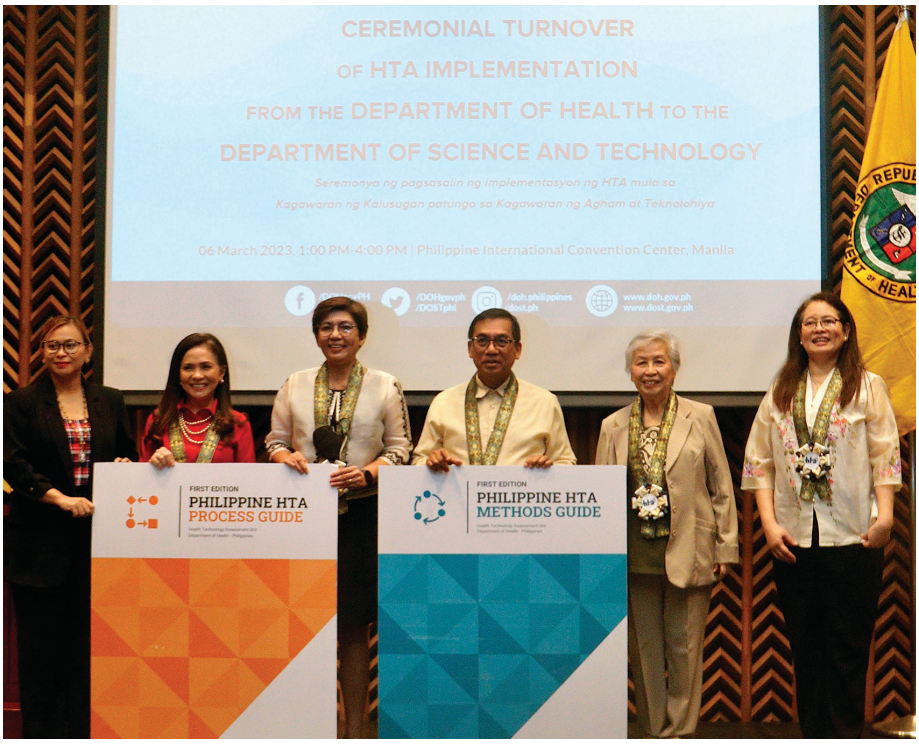
The enactment of the *Balik* Scientist Act in June 2018 paved the way for DOST to grant returning Filipino scientists with competitive benefits such as daily subsistence allowance, health insurance, and roundtrip airfare. For those interested to become a *Balik* Scientist, you may contact the DOST *Balik* Scientist Program Management Office through email at bsp@dost.gov.ph.

DOST *Balik* Scientist Dr. Julius Adam Lopez (far left), hosted by the University of San Agustin in Iloilo, trains Filipino researchers.

DOH transfers operations of HTA to DOST, recognizing partnership and network for strengthened health technology capacity

Joint Press Release | 06 March 2023

The Department of Health (DOH) officially transferred the operations of the Health Technology Assessment (HTA) Philippines to the Department of Science and Technology (DOST) through a ceremonial turnover of the HTA Council and HTA Division from the DOH to the DOST on 06 March 2023 at the Philippine International Convention Center, Pasay, Metromanila.



DOH Officer-in-Charge-Secretary Maria Rosario Singh-Vergeire and DOST Secretary Renato U. Solidum Jr. spearheaded the said event, in compliance with the UHC Law mandate on the transfer of the HTA Council as an attached agency to the DOST within 5 years after its establishment.

UHC legislators, Senator Pia Cayetano and former representative of the 2nd district of Taguig City, Governor of Quezon, Hon. Angelina "Helen" Tan who previously chaired the Committee on Health of the House of Representatives for six years, also gave their messages of support as champions of UHC and HTA Council. DOST Undersecretary for Scientific and Technical Services Maridon O. Sahagun and DOH Assistant Secretary for Health Regulation Team Atty. Charade Mercado-Grande whose offices the HTA Division directly reports to, also participated in the turnover.

Even during its establishment during the COVID-19 under the management of the DOH, the HTA Council and the HTA Division were able to produce several assessment topics and recommendations. With their transfer to the DOST, the HTA Research Network will be established, which will further strengthen the HTA capacity for the country by partnering with external entities who will help develop and implement training programs and will conduct HTAs. In the long run, the HTA Philippines envisions performing early HTA, which advances the conduct of assessments of health technologies at the early stages of clinical research and can guide the innovation development process.

DOST Secretary Solidum expressed the Department's commitment to strengthen the implementation of the HTA process through research, capacity building, and partnerships.

At present, the HTA Philippines is in partnership with the Philippine Council for Health Research and Development for the conduct of selected assessments from the 2023 HTA priority topics through commissioning with external research entities.

The DOH and the DOST shall continue to work together on their mandates, capacity building, and overall continuity of the current efforts with the leadership of Dr. Marita Reyes, the HTA Council Chairperson, and Ms. Anne Julienne Genuino-Marfori, the HTA Division Chief.

"Rest assured that the Department of Health (DOH) will continue to provide assistance to the DOST for the smooth transfer of the HTA to the latter. Through a whole-of-government and whole-of-society approach, we will continue to develop and improve our health systems to cater for the needs of every Juan and Juana," said OIC Secretary Dr. Maria Rosario Singh-Vergeire.

Nearing deployment of 1,000 units

DOST hopes RxBox to be commercially available soon

By Rosemarie C. Señora, *DOST-STII*

In far-flung areas in the Philippines where the mere access to healthcare remains a struggle because of the travel time and costs it will entail for our *kababayans* to go to the nearest hospital, rural health units are at the forefront of ensuring that basic health services are delivered using available resources they have.

But even with these efforts, there are cases where healthcare professionals still struggle to properly diagnose patients because of inaccuracy and lack of biomedical devices.

This is where RxBox comes in.

To provide better access to life-saving healthcare services, University of the Philippines (UP) Manila and UP Diliman developed RxBox and in 2016, deployed prototypes to 115 geographically isolated and disadvantaged areas (GIDA) nationwide. As of this year, 80 provinces have GIDAs (88.89% of the total provinces in the country), according to the Department of Health GIDA Information System.

RxBox is a multi-component program that includes biomedical devices, electronic medical record system, and training designed to support maternal and child health care and identification. It can reduce the overall cost of healthcare by enabling health workers to diagnose, monitor, and treat patients within the rural health facility.

Among the built-in medical sensors in RxBox are blood pressure monitor, pulse oximeter, electrocardiogram, fetal health monitor, maternal tocometer, and temperature sensor.

With the success of the initial deployment, a succeeding project was drafted initially titled "Roll-Out of 1000 RxBox Telehealth Devices in Selected Rural Health Centers in the Philippines," which aims to deploy 1,000 units of RxBox to selected rural health centers in the country. The Department of Science and Technology–Philippine Council for Health Research and Development (DOST-PCHRD) funded the project with DOST-CALABARZON tasked as the lead implementing agency of the said project.

Cooperating agencies include the DOST regional offices, Department of Health (DOH)–Knowledge Management and Information Technology Service, DOH regional offices, UP Manila, UP Diliman–Electrical and Electronics Engineering Institute, Philippine General Hospital (PGH), and Ionics EMS., Inc. which is the partner-manufacturer of the RxBox units.

Some of the RxBox units were deployed to PGH and considering the needs brought about by the COVID-19 pandemic, the DOST Executive Committee has approved the repurposing of the succeeding RxBox Project and is now called, "Roll-out of 1,000 RxBox Telehealth Devices in Selected Healthcare Facilities in the Philippines," which aims to deploy RxBox units specifically to selected COVID-19 referral centers and other healthcare facilities which will meet the selection criteria.

To further support the project and to respond to the limitations imposed during the pandemic, UP has made training videos for the conduct of remote training, and remote onboarding was conducted for the training teams in all the regions.

A Fruit of Collaboration

As of the latest count in January 2023, there are 781 units deployed in the whole country, with 32 units deployed in

CALABARZON alone. The remaining units are targeted to be deployed by the end of March 2023.

To celebrate the near end and successful conduct of the project, the DOST-CALABARZON led the RxBox 1000: Summit 2023 with the theme "Smarter Healthcare, Healthier Communities" held in Tagbilaran City, Bohol on 02 March 2023. Regional coordinators, project implementers, and stakeholders attended the event.

In her message, DOST-CALABARZON Regional Director Emelita P. Bagsit thanked the men and women behind the RxBox project.

"We will all share the journey, struggles, and successes of the project. This event is a success story of various people coming together, using their great minds and their drive to create a better and brighter Philippines, and most importantly to celebrate our *kababayans* in GIDAs that benefited from the RxBox technology," she said, adding that she is enthusiastic in the future commercialization and technology transfer of the project.

DOST-VII Regional Director Engr. Jesus F. Zamora Jr. echoed the same sentiment, saying that the RxBox is a game-changer for those living far from hospitals.

Dr. Mark Johnuel M. Duavis, a Doctor to the Barrios deployed to Batuan Rural Health Unit, said that RxBox responds to the need for healthcare's accessibility, equity, and affordability. With its built-in medical sensors and system, he added that it helps in initial assessment of the patient before transmitting their electronic medical record and transporting the patient to the facility for proper management and diagnosis.

"Congratulate ourselves. We acknowledge that it is not a perfect system, but we aim not for perfection but usefulness. We have heard testimonies of how the RxBox touched and made a difference to their lives," he said.

"Health is wealth"

Further, DOST Secretary Renato U. Solidum Jr. in his message, said the RxBox project is "a testament to what we can accomplish together as one—guided by our vision to bring science, technology, and innovation closer to our communities."

He said that the recent COVID-19 pandemic has highlighted the need to address the problem of access to quality healthcare, which the RxBox was developed for even before the start of the pandemic.

"Through the RxBox multi-stakeholder project, we have immensely contributed to saving lives especially during the height of the pandemic. Through our courageous and dedicated employees, we were able to reach far-flung and isolated places to deliver S&T interventions. This entails working closely with the communities that we serve and respond to their needs. This project will continue to transform healthcare and people's lives as long as we continue to work as one," he said.

He also added that Filipinos often overlook the importance of health, but we must keep in mind that the greatest asset and most important natural resources of any country is its citizens.

"As the old adage goes, "health is wealth." The overall health of every citizenry determines the long-term progress of their country. People are the wealth generators, so we must take care of them," he said.

Incidentally, Sec. Solidum said that affordable healthcare and strengthening primary healthcare in underserved communities are among the priorities of President Ferdinand R. Marcos Jr.

"We at DOST share these goals and will continue to be instrumental in developing innovative solutions that will prepare our country to withstand another pandemic should there be a similar experience in the future, and to promote the health and well-being of our kababayans. The DOST, through the DOST- PCHRD together with our partners in government, academe and private sector, will continue to support health research and development (R&D) and help strengthen the health industry of the country."

'Totally worth it'

In his message, DOST-PCRHD Executive Director Jaime C. Montoya said that seeing many rural communities benefit from the project made it "totally worth it."

Spanning the administrations of four Philippine presidents and four DOST secretaries, Montoya said that efforts from the conceptualization of the RxBox Project in 2009 up to the actual deployment is really worth it, definitely worth it.

"If there is a technology that really benefits the Filipino people, this is it. The RxBox really captures the concept of Universal Health Care. This is what science is for," he said.

RxBox, he said, is a good example of the whole-of-country approach–that everyone has to converge for the grassroots.

What now?

With the end of the project nearing, Dr. Montoya said that the only way to reach each and every Filipino is the full-blown commercialization of the RxBox.

He shared that the project is in the most crucial part now–its commercialization–that would ensure wider access and use of the RxBox system for public and private users.

He boasted that RxBox has shown that it can adapt to the changing times and respond to the changing needs of the communities. He specially cited that it was able to help achieve the sustainable development goal of reducing maternal and child mortality and, most importantly, the restrictions imposed due to the COVID-19 pandemic.

With this, he issued a call for the Department of Health to help achieve the vision of pushing for the commercialization of the technology.

"I'm very confident that DOH, being already our partner, will be able to help us and most importantly also the LGUs because they can actually acquire their own RxBox unit," he said, adding that DOST and PCHRD will continue to oversee the RxBox journey.

Lastly, Sec. Solidum revealed that the Department will be proposing a new RxBox deployment project under its Smart and Sustainable Cities and Communities program to sustain the traction it has so far gained.

Image by macrovector on Freepik

DOST-PCHRD highlights projects on digital health solutions leveraging on partnerships

By DOST–PCHRD

The Department of Science and Technology- Philippine Council for Health Research and Development (DOST–PCHRD) showcased the projects on digital health solutions leveraging partnerships with the public sector and the communities as part of its 41st anniversary celebration on 17 March 2023.

Aligned with the anniversary theme "PCHRD Beyond XL: Transforming Healthcare through Digitalization," the technical session titled, "Bringing Digital Solutions Closer to the People" featured the DOST-PCHRD-supported projects RabCast or Remote Retinal Evaluation Collaboration in Health: Diabetic Retinopathy (REACH-DR), and Local Government Unit-mandated eHealth Networked Services for Universal Health Care (UHC LeHNS). The speakers, representing each project, discussed how each digital technology impacts healthcare among Filipino communities.

DIGITALIZATION IN THE FIGHT AGAINST RABIES

The RabCast, initiated by the University of the Philippines Mindanao, is a forecasting tool developed to guide the formulation of rabies control strategies in Davao City. It uses a dashboard called RabDash, which displays genome informatics, model predictions, and data analytics that can be accessed by the Davao City Veterinary Office (CVO) and other authorities.

According to RabCast project leader Dr. May Anne E. Mata, the technology helped in the efficient monitoring of the spread of rabies in the city. "CVO needs reliable surveillance data and a tool that will assist them in their decision making, especially in strategic planning," she said. By digitizing rabies surveillance, the technology addresses the possibility of errors in manual data gathering, lack of manpower, gaps in relating the rabies cases with intervention efforts, and lack of information of the spread of rabies in the city.

The RabCast team conducted the soft launching of the technology in partnership with the Davao *Sangguniang Panglungsod* last November 2022, where CVO personnel were trained on how to use the RabDash.

DIGITALIZATION IN DIABETES EYE CARE

Aiming to establish an inclusive telemedicine screening program for diabetic retinopathy (DR), the REACH-DR project by the Philippine Eye Research Institute, in collaboration with the Queen's University of Belfast of the United Kingdom, implemented a validated artificial intelligence algorithm for DR screening. The technology intends to increase access to DR screening to improve eye care among patients with diabetes.

"Optimal medical control of diabetes with appropriate eye care can reduce the risk of vision loss by over 96%," said project leader Dr. Paolo Antonio Silva. "Routine and lifelong eye examinations are crucial in achieving these outcomes," he added, emphasizing the importance of accessible and inclusive eye care programs in communities.

The project found that the algorithm deployed by the REACH DR team can accurately screen the presence of DR, supporting prompt eye care referral and positive outcomes for patients.

DIGITALIZATION IN PURSUIT OF UHC

Derived from the eHealth TABLET for Informed Decision-Making of Local Government Units or eHATID LGU (local government unit) project which developed an electronic medical record systems for geographically isolated and disadvantaged areas (GIDAs), the Ateneo de Manila University Institute of Philippine Culture launched the Smarter and Integrated Local Health Information Systems (SMILHIS).

The SMILHIS is an LGU-managed interoperability layer designed to enhance the information management of local health systems and enable informed decision-making by local chief executives. The eHATID has partnered with the LGUs of Pulilan, Bulacan; Cagayan de Oro City; and Province of Pangasinan.

"What we are trying to do is to integrate all of those [digital technologies] and to provide an architecture that will enable the LGUs to maximize the use of all of the technologies they currently have," said eHATID project member Philip Christian Zuniga.

Furthering assistance to LGUs in the integration of digital health solutions, the team expanded eHATID and redesigned the eHatid to comply with the implementation of the UHC. Accordingly, the UHC LeHNS or Local Government Unit-mandated eHealth Networked Services for Universal Health Care was born. The project initiated major reforms such as the establishment of provincial-level and city-level health information systems that facilitate information exchange between the province's health institutions.

Rice, vegetables, and meat, the top 3 most wasted foods among Filipino households

By Geraldine Bulaon-Ducusin, *DOST-STII*

Rice, vegetables, and meat were the top three most wasted foods among Filipino households, based on the study "Does plate waste matter?: a two-stage cluster survey to assess the household plate waste in the Philippines" of the Department of Science and Technology–Food and Nutrition Research Institute (DOST-FNRI).

The factors attributed to rice, vegetables, and meat plate wastage are larger household meal portion size, greater number of household members, and higher wealth status.

This study, which used the data from 20,151 Filipino households who participated in the 2018 Expanded National Nutrition Survey (ENNS), also found that households with the highest rice consumption were more likely to have rice wastage compared to households with the lowest consumption. It appears that there are more foods wasted in households with five or more members, and those residing in rural areas. Rice wastage is also more common in households with a household head whose age ranges from 50–69 years old than those with a younger household head.

On the other hand, households with the highest vegetable consumption were more likely to waste vegetables compared to those with the lowest consumption. This implies that households incur more wastes when higher quantities are purchased, which most probably are not consumed and ends up being thrown away due to spoilage.

Households composed of five or less members were found to have greater chances of wasting vegetables, which mirrors the results of a previous study, which found that larger households were more efficient in meal consumption.

On the contrary, fish, meat, and poultry plate waste was less likely in households with less than or equal to five members than in households with more than five members.

Households belonging to the richest quintile were found to have greater plate waste compared to the poorest quintile. Past studies exhibited the same, where higher income households were found to waste more food than lower-income households. This may be explained that higher-income households consume diets that tend to include more perishable items. Some of the waste can be explained by food spoiling before the household had a chance to eat it.

In the Philippines, plate waste is closely linked to hunger incidence and threatened food security. The Global Hunger Index of 2018 scored the Philippines 69 of 119 countries, with a serious level of hunger incidence.

"Millions of Filipinos under poverty and experiencing food insecurity are struggling to be fed, and the food that is simply thrown away or discarded might actually be enough to feed them," Dr. Imelda Angeles-Agdeppa, lead researcher, Director IV, and Scientist IV of DOST-FNRI, said.

Plate waste also generally emits a portion of the total global greenhouse gas emissions that impact on global warming. Dr. Adgeppa cited that the results reinforce the need for new strategies to focus on reducing plate waste, which is beneficial from a nutritional, economic, and environmental point of view.

The study suggests that a more effective strategy for reducing food waste may be to train people to prepare and select less food (portion and meal size reduction) and to formulate more policies tackling waste-reduction programs.

Dr. Agdeppa emphasized that both public and private sectors have a role to play to address global food shortages and food wastes considering that more people are getting hungry globally despite the availability of food sufficient for everyone.

The ENNS is a cross-sectional, population-based survey that characterizes the health and nutritional status of the Filipino population which was conducted by the DOST-FNRI from February–December 2018.

US-Japan Cooperative Medical Sciences Program (USJCMSP)

2023 International Conference on Emerging Infectious Diseases

By DOST-Office of the Undersecretary for Research and Development

The U.S.-Japan Cooperative Medical Sciences Program (USJCMSP) 2023 International Conference on Emerging Infectious Diseases was recently held from 7–10 March 2023, at the Acacia Hotel Manila in Alabang, Muntinlupa City. The conference was graced by notable guests, including DOST Secretary Renato Solidum Jr., Minister of Economic Affairs Mr. NIHEI Daisuke, Economic Council of the US Embassy Mr. David Gamble, and Co-chairperson of the USJCMSP Dr. Diane Griffin and Dr. Hiroshi Kiyono.

Over four days, the conference provided a platform for experts to engage in discussions on emerging infectious diseases that are particularly significant in the Asia-Pacific region. The conference's main focus was on acute respiratory infections, cancer, cholera and other bacterial enteric infections, immunology, mycobacterial diseases, and parasitic diseases, among other subjects.

The first day of the conference offered several engaging sessions, including discussions on the impact of COVID-19 on bacterial infections, pre-existing immune response to co-infections, and neglected parasitic diseases and their re-emergence in Southeast Asia. The second day commenced with a tribute to Dr. Charles Carpenter and Dr. Mitsuaki Nishibuchi, followed by discussions on zoonotic infections and drug Resistance in Bacterial and parasitic pathogens, intestinal microbiota, and infection with parasites and cancer-related ailments, and the Impact of microbiome and chronic helminth infection on other diseases.

On 9 and 10 March, concurrent panel meetings were held on several important topics, including Acute Respiratory Infections, Cholera, Mycobacterial, Cancer, and Parasitic Diseases.

The event gathered over 200 on-site participants from the United States, Japan, Thailand, Bangladesh, India, the Philippines, and other regions in the Pacific Rim. To accommodate speakers and participants who were unable to attend in person, the event was also live-streamed on Zoom.

The diverse representation of attendees from different regions contributed to the richness of the discussions, and the live-streaming option made the event more accessible to a wider audience.

Overall, the event was a great success, providing a valuable opportunity for knowledge sharing and collaboration among healthcare professionals and experts from different regions of the world.

Joint Immunology- Mycobateria Panel Meeting on 10 March 2023.

Cholera Panel Meeting on 10 March 2023.

DOST Region I pushes PPAs and CEST program to LGU–Santo Tomas

By DOST–I

The Provincial Science and Technology Office (PSTO) La Union of the Department of Science and Technology Regional Office I (DOST-I) conducted an advocacy meeting with LGU (local government unit) Santo Tomas to push for the implementation of the Community Empowerment Thru Science and Technology or CEST program in the area.

The activity was attended by LGU officials headed by Engr. Severino C. Carbonel, Municipal Mayor, and other unit heads of this town to know more about CEST and how it will benefit their communities.

Jonathan M. Viernes, PSTO Director of La Union, presented the DOST programs, projects and activities and discussed the science and technology interventions that could be adopted by the communities to help the small and medium enterprises or SMEs, as well as the entire municipality.

In addition, Decth-1180 P. Libunao, CEST Program Leader, introduced the CEST program, the brief background, objectives, and implementation processes. Libunao emphasized that the implementation of the CEST program in the Municipality of Santo Tomas will be a collaborative effort with several partners– namely, the local government unit (LGU), national government agencies (NGA), non-government organizations (NGO), and state universities and colleges (SUC) to create a bigger impact for the project.

On behalf of the Municipality of Santo Tomas, Hon. Marietta C. Carbonel, Municipal Administrator, welcomed DOST-I to the municipality and expressed her gratitude to for choosing Santo Tomas as partner LGU for the implementation of this kind of project that will help alleviate poverty incidence and assist the marginalized sector in the municipality. Also, Engr. Severino C. Carbonel, Municipal Mayor, signed the conforme letter accepting the CEST Program in the municipality to start the implementation.

After the presentation, an open forum was conducted for the pre-identified one beneficiary *barangay* and became the venue to set schedules of activities to kick-off CEST in Santo Tomas. During this session, PD Viernes also discussed the criteria why Santo Tomas was chosen as the partner municipality for the implementation of the CEST program for the year 2023.

Present during the meeting were department heads and representatives from the MPDC (Municipal Planning and Development Council), MEO (Municipal Engineering Office), MAO (Municipal Agriculture Office), MSWDO (Municipal Social Welfare and Development Office), MTO (Municipal Treasury Office), MCR (Municipal Civil Registrar), and MDRRMO (Municipal Disaster Risk Reduction and Management Office).

CEST is one of the flagship and gender-responsive programs developed by DOST in support of the government's national program on poverty alleviation, which aims to empower the most economically challenged communities and improve the quality of life through Science and Technology. The program, running for several years now, focuses on five priority entry points such as health and nutrition, water and sanitation, basic education and literacy, economic enterprise and development and disaster risk reduction management and climate change adaptation to help communities improve the quality of life using science, technology, and innovation.

DOST-I staff explains the process flow of the program to give the participants a comprehensive view of CEST and how they can benefit from it.

LGU-Tampilisan converts solid wastes into useful products through technology

By **MVJBaliña,** *DOST–IX*

Some 15 personnel from LGU (local government unit) Tampilisan have successfully completed the hands-on training on the use, operation, and maintenance of bioreactor and plastic densifier technologies in Tampilisan, Zamboanga del Norte.

The four-day training activity was organized by the Department of Science and Technology Regional Office IX through its Provincial Science and Technology Office in Zamboanga del Norte (PSTO-ZDN), and in cooperation with DOST's Industrial Technology Development Institute (DOST-ITDI). Experts from DOST-ITDI—namely, Engr. Pierre Jordan Mendoza, Engr. Benjamin Santos, and Joannalene Tuazon—served as resource persons and trainers.

Participants of the training from LGU-Tampilisan prepare the solid waste for processing using the bioreactor and plastic densifier provided by the DOST-IX.

Al Rey M. Catubig, MENRO (Municipal Environment and Natural Resources Officer) designate of LGU-Tampilisan, said they are very happy that DOST has prioritized their municipality in the deployment of these technologies. “Now, we can properly and efficiently manage our collected solid wastes and convert them into compost and bricks,” he said.

He added that the implementation of these technologies will greatly improve their solid waste management program and brings about significant changes in Tampilisan through the support of its local officials. He further stated that the municipality will now be able to reduce the volume of solid waste and turn it into useful products.

The training activity is part of a package of interventions provided by DOST-IX to LGU-Tampilisan through the initiative titled “Upgrading the Solid Waste Management Program of LGU Tampilisan through Adoption of Bioreactor and Plastic Densifier Technologies.” The project was funded through DOST’s Small Enterprise Technology Upgrading Program (SETUP) with total funding assistance amounting to PHP 2,005,000.00.

SETUP is a flagship program of the DOST that provides innovation funds and technical support to small and medium enterprises (MSMEs) to improve productivity, reduce production costs, and enable MSMEs to level up their operations.

The project funded the acquisition of key equipment such as a 1-ton capacity bioreactor and plastic densifier. Both technologies were developed by DOST-ITDI.

The bioreactor converts biodegradable waste into organic compost, which can be used as a soil conditioner for urban gardening or farming. It uses an inoculant to break down organic matter in solid wastes and hasten the decomposition process.

Plastic densifier, on the other hand, processes non-biodegradable waste such as plastic cellophane and Styrofoam into usable flowerpots and decorative blocks.

Tampilisan is a 4th class municipality located in the province of Zamboanga del Norte. Like most municipalities in the country, Tampilisan also faces serious concerns on solid waste management. In the past, the municipality struggled to properly dispose its solid waste collected from the different communities. This led to the accumulation of collected garbage, which poses serious environmental and health hazards. With the technology introduced by DOST, the environmental problems of the communities will now be addressed appropriately.

For more information about DOST programs, please call PSTO-ZDN at (065) 908-0117 or email us at psto-zdn@ro9.dost.gov.ph or visit our Facebook page at www.facebook.com/DOSTRegion9.

LGU-Tampilisan now produces flowerpots made from the collected solid wastes from different communities, thereby turning discarded garbage into useful products.

DOST–Ilocos Region kicks off community empowerment program in Aringay, La Union

By Joseph T. Eisma, *DOST–I*

The backbone of the economy rests on the communities when they become productive, secured, and enabled. Realizing the need to make our communities, down to the *barangay* units, the Department of Science and Technology (DOST), for the past years, has pushed the Community Empowerment through Science and Technology (CEST) program in the regions to make the citizenry self-reliant and capable of contributing to the development of their communities.

In view of this, the DOST Regional Office No. I (DOST-1) through the Provincial Science and Technology Office–La Union (PSTO-LU), conducted a two-day community needs assessment (CNA) for the implementation of the CEST program at Barangay Sta. Lucia and Samara last 20 and 21 February.

This initiative is done in partnership with the Don Mariano Marcos Memorial State University (DMMMSU) and the Bureau of Fisheries and Aquatic Resources Provincial Fisheries Office–La Union (BFAR PFO-LU).

Hon. Benjamin O. Sibuma, Municipal Mayor, welcomed all the participants and expressed his gratitude to DOST, DMMMSU, BFAR, and other partner agencies for the implementation of the CEST program. “I’d like to welcome everybody to our humble municipality and thank you for coming here and sharing science and technology to our endeavor—specifically, *Barangay* Sta. Lucia and Samara,” said Mayor Sibuma.

On the other hand, Jonathan M. Viernes, Provincial Director of PSTO-LU, delivered a message on behalf of the Officer-In-Charge of the Office of the Regional Director, Dr. Teresita A. Tabaog, and thanked the local chief executive and his staff for accepting the CEST in their municipality. Viernes reiterated the criteria for why the two barangays were chosen as one of the project beneficiaries. “We from DOST are very thankful to LGU for your hospitability and cooperativeness to implement the project, we are hoping that this project will become successful.”

Meanwhile, Decth-1180 P. Libunao, CEST Project Leader, presented the overview of the program and discussed the process of the needs assessment at the LGU level to the *barangay* level to determine and find out the needs of the community for science and technology interventions.

During the consultative meeting, key informants from the different department heads/representatives of LGU Aringay presented the current status of the two *barangays* from an LGU-level point of view along with the five CEST entry points: health & nutrition, education, livelihood, environmental protection and conservation, and disaster risk reduction and management. Also, key informants from the two *barangays* joined the focus group discussion to share their knowledge and ideas about the current situation in their respective *barangays*.

The consolidated data from the five CEST entry points will be presented to Mayor Sibuma before the conduct of participatory planning in the municipality.

The CEST program envisions a Filipino society having an active role in decision-making as part of a greater community to build progressive and empowered communities through science and technology interventions.

3 barangays in Santiago Island, Bolinao to benefit from DOST's CEST Program

By Monique C. Esguerra, *DOST–I*

There are three *barangays* in Santiago Island, Bolinao, Pangasinan that are set to benefit from the Community Empowerment through Science and Technology (CEST) program being implemented by the Department of Science and Technology Regional Office No. I (DOST-I) this year.

CEST beneficiary-*barangays* identified by the local government unit (LGU) of Bolinao are Barangays Goyoden, Dewey, and Binabalian.

The DOST-I, through the Provincial Science and Technology Office (PSTO) Pangasinan launched the CEST Program in Bolinao, Pangasinan through the conduct of community needs assessment on 23–24 February 2023. This initiative is in partnership with the Pangasinan State University (PSU) and Bureau of Fisheries and Aquatic

Resources Provincial Fisheries Office Pangasinan.

The DOST-I core group led by CEST Project Leader Decth-1180 P. Libunao spearheaded the CAN, together with DOST-PSTO Pangasinan Director Engr. Arnold C. Santos, BFAR Fishing Regulation Officer II Jean Garcia, PSU Director for Extension Services Office Dr. Armando D. Junio, and PSU experts.

PD Engr. Santos mentioned that the participation of the key informants provided for the sharing of information on appropriate interventions to help the communities. On the other hand, Libunao provided a summary of the program and addressed the LGU level to the *barangay* level to identify and ascertain the community's needs for science and technology interventions.

There were 75 key informants who participated in the said activity, which consists of the leaders of associations and organizations in the *barangay*, education representatives, health workers, and LGU representatives.

The activity also aimed to identify the community's situation in terms of livelihood generation, health and nutrition, basic education, environmental protection, and disaster risk reduction that are the entry points under the CEST Program. This initiative, likewise, targets a wider implementation of the program as part of its effort to sustain the initiatives in transforming marginalized communities to combat poverty and promote resiliency through science and technology.

Consolidated data will be presented to the DOST, BFAR, and PSU core group members to craft technology-based interventions to address each community's concerns. Through CEST, the entire community will be involved in the development of society through science, technology, and innovation or STI.

CEST is one of the flagship programs of the DOST that is being implemented by the regional offices and PSTOs to provide STI interventions suited to the unique needs of the different communities in the country with the end in mind of empowering communities to be self-sufficient and productive.

Thraustochytrid explored as alternative fish feed to boost production of sources of essential fatty acids

By Nicole Bianca J. Catli, Zander Karl N. Herrera and Fedelia Flor C. Mero, *DOST-PCAARRD*

Humans and aquaculture species derive their dietary intake of essential fatty acids mainly from marine fishes. Essential fatty acids are important in bodily functions of the heart, skin, and cognitive health. However, sources are limited. To address this, alternatives are being explored to enable the production of sufficient quantities of essential fatty acids.

Such alternatives are the aspired outputs of the Department of Science and Technology–Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARRD)-funded project, which aims to develop a microbial production system through biomass production with enhanced polyunsaturated fatty acids (PUFA) production in thraustochytrid biomass (TB). Traustochytrids are single-celled decomposers that produce important enzymes and are widely-distributed in marine ecosystems.

TB will be used as a substitute for animal or plant oil and as an alternative feed/ingredient to farmed fish and seafood products, thereby ensuring a more stable supply of essential fatty acid sources for humans.

Thraustochytrids are non-photosynthetic, heterotrophic marine microalgae. Aside from marine habitats, they are prevalent in estuarine environments, specifically in mangrove forests, where they are found abundantly on decaying mangrove leaves. These single-celled microorganisms are of biotechnological interest due to their ability to produce high concentrations of PUFAs such as the essential fatty acids DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid) in their biomass.

In other countries, thraustochytrids are cultivated using cheaper culture media, organic residues, and wastewater streams in food and beverage industries. This DOST-PCAARRD-funded project aims to adopt and produce the technology to contribute to the realization of the country's own robust and sustainable fishery. As an added benefit, the project also uses improved wastewater treatment technology towards a zero-liquid waste discharge.

The project uses dairy wastes. These are dairy products that do not meet quality standards or are unfit for human consumption. These are usually treated for discharge to bodies of water due to their high levels of salinity and biochemical oxygen demand (BOD). Through this project, dairy wastewater will be used in carbon recycling systems to cultivate the fatty acid-rich thraustochytrids.

The 3-year collaborative research project, which started in April 2022, is being implemented by the University of

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Field sampling of fallen senescent mangrove leaves from mangrove forests of CALABARZON.

Retired UPLB Professor Eduardo P. Paningbatan and UPLB–Institute of Plant Breeding researchers conducted EPP and SNAP trainings, respectively, in Payatas, Quezon City

Urban gardening technologies for food security benefit 1,013 households in NCR

By Misty Mae M. Evangelista, *DOST-PCAARRD*

With the public still adjusting to the effects of the coronavirus (COVID-19) pandemic and as it adapts to the new normal, the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD) continues with its mission to provide science and technology solutions to food security and stability.

A total of 1,013-household beneficiaries in 29 communities in National Capital Region (NCR) were trained on various urban agriculture technologies such as enriched potting preparation (EPP), simple nutrient addition program (SNAP hydroponics), and mushroom culture. These innovations are outputs of the completed DOST-PCAARRD-funded project, "Improving Food Security in Selected Areas in the National Capital Region in Response to COVID-19 Crisis through Urban Agriculture," led by DOST–National Capital Region (NCR) Director Jose B. Patalinjug III and by Senior Science Research Specialist Elvin B. Almazar. The project was monitored by PCAARRD's Agriculture Resources Management Research Division.

Various communities in NCR benefited from the 29 trainings and 14 webinars on the know-hows of urban gardening technologies. They also received 12,670 EPP and 1,300 SNAP kits. Aside from establishing communal gardens, trainees were taught to repurpose plastic bottles and containers into "super *paso*," which can be used to plant different herbs and spices in their respective backyards and vacant community spaces.

The constituents of *Barangay* 412 Zone 42, District IV in Manila are recognized for their efforts in food security in their households and in their educational institutions. Trained participants eagerly shared their EPP and SNAP kits with the officials from Claro M. Recto High School, headed by Principal Raffy V. Caballes. The project complemented the Department of Education's *Gulayan sa Tahanan* Program, which aims to develop affordable, nutritious, and delicious recipes from the students' produce in communal gardens and greenhouses. Utility workers and teachers have also benefited from the project.

Apart from the local community and schools, other community groups such as foundations/non-government organizations, and police districts and city jails also took advantage of the wide array of information available to establish their own vegetable communal gardens, whether for personal consumption or for sharing with their neighbors and other beneficiaries.

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Balik Scientist primes first embryo-transfer goat production in the PH

By Michelle Caparas and Jesselle Laranas, *DOST-PCAARRD*

Balik Scientist Miguel Mervin S. Pajate (3rd from left) and DOST-PCAARRD Deputy Executive Director Melvin B. Carlos (center) are joined by the staff of the Livestock Research Division (LRD) and the Institution Development Division (IDD) (image credit: IDD, DOST-PCAARRD).

For the first time in history, the Philippines will venture into embryo transfer for the production of the Cagayan Valley Signature Goat breed through the management of *Balik* Scientist Dr. Miguel Mervin S. Pajate, a renowned veterinarian based in Dubbo, New South Wales, Australia.

Through the project "Innovative Systems in Advancing Technology-based Goat Production" funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD), Dr. Pajate was brought in as a short term *Balik* Scientist to train Isabela State University (ISU) veterinarians and researchers on the embryo transfer technique—including oocyte collection, grading, transfer, and preparation for freezing.

Led by Dr. Jonathan N. Nayga of ISU, part of the project's goals is to upgrade the ISU Embryo Transfer Laboratory and enable the use of such techniques, particularly to support the production of the Cagayan Valley Signature Goat, a meaty-type goat breed proven adoptable to the conditions of the region.

The embryo transfer technique allows one to acquire the genetics of a superior animal and transfer it to an inferior animal as a surrogate. It can also stimulate the superior animal to produce multiple embryos, which can be transferred to a surrogate. An embryo can be frozen for 40 years and can still be transferred to make a surrogate animal pregnant. This technique enables genetic improvement of the population to happen faster than natural mating. This endeavor is anticipated to have a tremendous impact on the agriculture sector.

"With embryo transfer, you can have your pure-breed goats as early as next year," Dr. Pajate said.

"I call the technology a 'time machine,'" he added as it can shorten the time of breeding genetically-improved population. As a *Balik* Scientist, Dr. Pajate willingly shares his expertise and fervently hopes that this technology, which he has been doing in Australia primarily with sheep, will be adopted by the goat industry in the country to help

Marker of the ET Laboratory in ISU (image credit: IDD, DOST-PCAARRD).

boost production of chevon products. According to him, his engagement with the *Balik* Scientist Program (BSP) may just be a one-time thing, but it could be the start to changing the industry.

Dr. Pajate holds a master's degree in Tropical Veterinary Science from James Cook University of North Queensland and a Postgraduate Certificate in Small Animal Practice from Murdoch University. Prior to working in Australia from 2008, he worked as an animal production specialist and had his own veterinary clinic in the country. He was invited to serve a Balik Scientist, through the BSP, which taps the ingenuity of scientists and experts of Filipino descent and residing and working abroad, to strengthen the science and technology capabilities of local researchers and scholars in addressing critical and emerging concerns in the agriculture, aquatic, and natural resources sector.

Tagging and inspection of equipment procured for the ET Laboratory (image credit: IDD, DOST-PCAARRD).

Thraustochytrid explored (from page 54)

the Philippines Los Baños (UPLB) and the University of the Philippines Visayas as part of the e-Asia Joint Research Program, together with Hiroshima University, Japan and Institut Teknologi Sepuluh Nopember, Indonesia. The team was previously headed by Dr. Veronica P. Migo in its first year, and currently led by Dr. Jewel A. Capunitan from the Department of Chemical Engineering, College of Engineering and Agro-Industrial Technology, UPLB.

Urban gardening (from page 55)

The concept of paying forward is alive and strong in terms of disseminating useful information to more people. Attendees from different groups and communities trained as focal community leaders served as mentors in conducting the seminars.

The project is part of the GALING-PCAARRD (Good Agri-aqua Livelihood Initiatives Towards National Goals),, which was introduced by the DOST-PCAARRD as a response to the challenges that the COVID-19 pandemic posed to the agriculture, aquatic, and natural resources sector.

The program aims to help communities become more self-sufficient and have a sustainable food supply despite trying times. DOST-PCAARRD, together with its partner agencies, aims to address food security, combat malnutrition, and reduce hunger by providing low-cost and nutritious food from backyards and communal gardens.

A woman of Science: Marieta Bañez-Sumagaysay

Making basic research visible in all regions through funding, technology, and storytelling

By Geraldine Bulaon-Ducusin, *DOST-STII*

"When I was interviewed by the executive director search committee in September 2015, they asked me about my plans. I only had one – make NRCP visible in all regions and make an army of scientists and artists in all the provinces of the country. I had my "hugot" because I came from the province (Leyte) and NRCP was not known, as in, never heard, by most in the academe."

This was shared by Marieta Bañez Sumagaysay (MBS), former director of the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP) and currently Professor 12 of Economics, Univarsity of the Philippines (UP) Visayas Tacloban College, when she was asked how NRCP was able to leap significantly in terms of membership, R&D outputs, and visibility under her leadership.

MBS (LIKE BTS) HAS AN ARMY, AN ARMY OF RESEARCHERS

Through increased funding for basic R&D of researchers all over the country, storytelling, digitization, and digitalization, the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP), under the leadership of MBS was able to make the presence of basic research felt in all regions.

In 2017, MBS brought up the idea of National S&T Experts Pool (NSTEP) and Basic Research Information Translation for Empowerment in the Regions (BRITER) program before the NRCP Secretariat, and she was grateful that these ideas were well received.

NSTEP and BRITER projects are under a program titled, "Support for the promotion of a science culture in the regions for global competitiveness" which, in 2020, got a 3-year DOST-GIA funding.

Being the council's head, MBS wanted all her units to have its own budget to meet its targets.

"They cannot give what they don't have in them to give. So, provide a good budget, and expect impactful outputs," she thought.

The small General Appropriations Act (GAA) or budget was inadequate to support the council's projects. NSTEP was handled by the Technical Capacity Development Section (TCDS), and BRITER was managed by the Research Information Dissemination Division (RIDD).

NSTEP project, which was instrumental in the realization of her goal - to build an army of researchers, scientists, and artists in all parts of the country has five components: membership promotion; experts' engagement; small R&D grants for starters and budding researchers; professional development; and awards.

NSTEP was able to distribute R&D spending equitably, particularly to those who have less or no access to funding. It made R&D more inclusive, because while national priorities are important, regional priorities may be unique and must likewise be addressed through research; and the project succeeded in improving the scientific productivity in the regions.

BRITER, on the other hand, has three components: basic research for informed policymaking; enhancing science culture for all; and research dissemination in local and international platforms. BRITER translated scientific research results into various formats dove-tailed to various audiences.

It is intended to influence policy and decision making by using science and evidence and encourage the younger generation to appreciate science through their exposure to knowledge products that are laymanized, popular and relatable to their lived experiences. The project also advocates the fusion of science and the arts through research-based knowledge products.

Both NSTEP and BRITER plus the RDLead program under the DOST's Science for Change Program (S4CP) redefined NRCP, engaged its members both as mentors and influencers, and heightened the importance of basic research in the country.

USING TECHNOLOGY TO ACHIEVE GOALS

NRCP's digitization and digitalization, thanks to RIDD (and Andrew of MIS), was started in 2018 and by 2022 they had various sub-systems under the Scientific Knowledge Management System (SKMS). Among their "firsts" include: online nomination and election of Division Chairs and Regular members in 2019 even before the pandemic; online application for membership; online submission and review of manuscripts for the NRCP Research Journal; online generation of membership data/profile; online application for thesis/manuscript grants; online requests for NRCP members' engagement (NEEP); online submission of research proposals; digitization of library materials which are uploaded in the LMS, and a dedicated portal which enable the executive committee to readily generate data.

Despite these technological developments in the council's products and processes, MBS admitted that more still needs to be done. These unfinished businesses that are now in progress are the following: online recruitment and hiring process; online submission and evaluation of Support to Research Dissemination in Local and International Platforms (RDLIP) applications; processes for the Accounting, Budget, and Supply; and one for Governing Board Resolutions and important documents.

PITCHING FUSION OF ARTS AND SCIENCE, A DIFFICULT MOVE THAT WORKED

MBS knew from the start that DOST's mandate and practice are biased and in favor of the natural/physical sciences.

"That is a given, and being an economist, I always work on givens and constraints, and find ways to maximize the results of whatever is the available resource. The efforts were not all mine. It took the Secretariat's efforts, too, and later on, the support from the higher NRCP and DOST management for the science and arts fusion to happen."

MBS admitted that it was hard at first to put forward the science-arts fusion perspective. This was similarly the case with her gender and development (GAD) in science advocacy. Initially, she would even hear remarks like "*gender na naman yan*" or "*hindi yan* science ang social science" or "*hindi yan mapopondohan ang arts*."

When GAD became one big DOST program, she saw this as an opportunity to synthesize social science, arts and natural/physical sciences since the government is mandated to have GAD in S&T. MBS accepted invitations (many times, volunteered) to talk on engendering S&T.

Since her student days, she wondered how to make the arts and science co-mingle into one for economic development. Although she didn't know the answer then, as an Economics student she felt there must be answers somewhere.

Her [typhoon] Yolanda experience strengthened her resolve to contribute to integrating technology, social science, and the arts. She believes that rebuilding and building back better is not all about scientific technologies and scientific innovations.

"Cultural nuances matter a lot for the success in the implementation of projects," MBS pointed out.

When MBS started doing research, she felt uncomfortable with what she observed in the field, seeing the men and women in farming and fishing communities who were not using the equipment provided by government because it did not fit their needs. They were never consulted. Is it like a "one technology fits all?"

The economic sectors' productivity is not improving because of the mismatch of needs and technologies. More so, the technologies are not coupled with other enabling mechanisms, like access to markets and access to financing, or are not coupled with studies on the new technologies' acceptability and people's willingness to pay for shared facilities.

Projects are being conducted in silos. Conceptualization of projects are detached from the users of the output. And project proposal preparation is non-inclusive.

The social sciences (governance, politics, economics, sociology, psychology) and the arts provided a platform for delivering messages in a way suited to the communities' needs and was one of the solutions that I bridge the gap of mismatched needs.

STORYTELLING IN SCIENCE

Back when she was the Director of the Leyte-Samar Heritage Center of UP Tacloban, MBS gathered young faculty members and they published a book, "*Hira Manding Karya,*" a collection of local legends and tales of Eastern Visayas, all gathered from the source in the mother tongue. They used the book in their story telling sessions with selected public elementary school pupils. The story teller (i.e., *Manding Karya* who is a-la *Lola Basyang*) wears a costume. Story tellers, both faculty and students, were trained.

"When I entered NRCP, I knew that I wanted to do the same, but this time the material will be about the journey/lived experience of scientists and artists, particularly the NRCP Achievement Awardees. This is part of BRITER, being another platform to inspire the young to become achievers --- scientists and artists. iShare (thanks to Renz who came up with the title) becomes NRCP's brand of digital storytelling," MBS narrated how iShare began.

Storytelling in government communication may have been happening for quite some time in more economically progressive countries, but not quite in this country and NRCP's use of storytelling in sharing basic R&D results and researchers' career journey made S&T more relatable.

MBS recounted how, in the province, stories are narrated to kids by grandparents on many occasions such as to send kids to sleep during siesta time (after lunch), before going to bed at night, or just at any time of the day when kids are gathered in the house specially during rainy days when kids cannot play outside the house. The stories had moral lessons. Her grandparents (and parents, too) have this story telling format:

- Who has heard about .....
- Who would like to listen to my story about .....[The story]
- Who among the characters would you like to be? Why?
- Who among the characters you wouldn't want to be? Why not?
- Did you like the story?
- Tomorrow, I will tell you another story about ...., or what story would you like to hear?
- [The following day, there will be a short review of the previous day's story....]

She imitated this storytelling "format" when she became a mother. But her husband, according to her, was the better bedtime storyteller because he had lots of imagined characters (with uniquely coined names) that surprisingly figures out in a rather common story which their three kids enjoyed, taking part in building the fictitious characters.

AFTER NRCP, ADVOCACY CONTINUES

After her stint at NRCP, MBS went on sabbatical at UP Tacloban. But she's still currently busy in her GAD advocacies, such as organizing UP webinar on "Women and girls in science for the SDGs (WAGSS)" where she invited the NRCP scientists: NS Lourdes Cruz, Dr Doralyn Dalisay (a Balik Scientist), and Dr Rosalinda Torres (one of the eight Filipino scientists in Asia's top 100 scientists). They also had Ms Hillary Andales the PSHS-Eastern Visayas winner of the Junior Challenge who is now finishing her master's degree in astrophysics at the Massachusetts Institute of Technology.

The speakers talked and narrated their stories about challenges as women scientists, and how their scientific findings contribute to sustainable development goals. Her speakers all mentioned the importance of the social sciences in what they do.

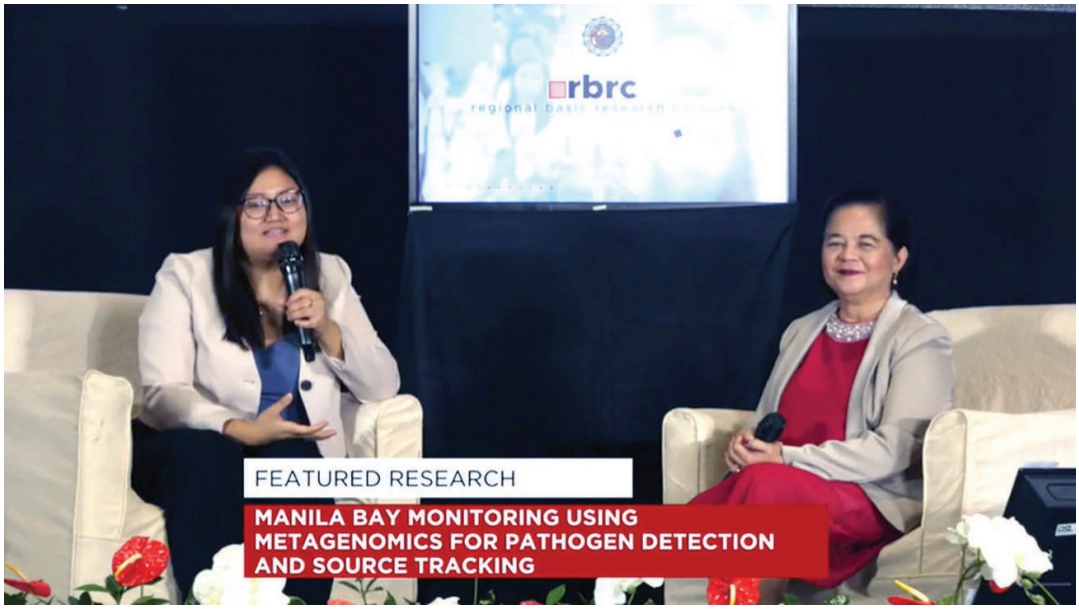
MBS now serves as Chair of the Asian Fisheries Social Science Research Network (AFSSRN, until 2024), where she leads the members to host panel sessions in national and international conferences. These are efforts to mainstream social sciences and gender in fisheries technologies, curriculum, and scientific research. These are just a few of her numerous activities as a woman scientist and gender advocate.

MBS' advise to the young Filipinos who want to become a scientist and a leader in the future is, "Have a pen and paper even at your bedside table, or better still, your mobile phone. Write immediately the ideas (crazy as they may be) that excite you, each time they pop up in your mind. Get back to it when you wake up. Enjoy the ride. Have time to dance and sing. Always ask: what's new?"

A woman of science: Marieta Bañez-Sumagaysay

Creating an environment for more women to flourish both as scientists and mothers

By Geraldine Bulaon-Ducusin, *DOST-STII*



Dr. Marieta B. Sumagaysay (right) spearheaded the promotion of basic research during her stint as the former Executive Director of DOST-NRCP

"There can be no sex discrimination in an environment where merits count and where skills outweigh any sex-related factors, and this gave me the resolve to contribute in making this kind of environment happen for more women in science," Marieta Bañez Sumagaysay, former Director of the Department of Science and Technology–National Research Council of the Philippines (DOST-NRCP) and currently Professor 12 of Economics at the University of the Philippines (UP) Visayas Tacloban College, said of her early work experience in the field of sciences.

The science influencers in the family

It was as if her path was already carved out even before she was born. Her parents were both in the sciences. Her father, a researcher and published zoologist, worked mostly in his laboratory at the Schistosomiasis Research and Control, whereas her mother was an elementary teacher in Math and Science. And if that was not enough, her paternal grandfather, a school superintendent, would always challenge his grandchildren to beat his performance in elementary mathematics, when after the war in the 1940s, he boasted to be the sole student who received a grade of 100% in his class.

Marieta Bañez-Sumagaysay or MBS studied at the Leyte Research and Development High School (LRDHS), belonging to the first batch of only 80 selected students, LRDHS was a project of the National Science and Development Board (now DOST), the Department of Education and Culture, and UP.

The LRDHS had a science curriculum, and it came long before the Philippine Science High School was established in Region VIII. The project ended after eight years.

After high school, as much as she wanted to be in the field of science like her father, she cannot withstand the suffering of white mice in her father's laboratory, and the fumes and odor of chemicals were giving her headaches. Thus, mathematics became her next choice.

"I wanted to become a mathematician, but the courses available in the province were limited and, as an eldest child in the brood of five, I knew that my parents who were both government earners may not be able to afford my college education in Manila; my National State Scholarship award covered only for tuition fees and book allowance, so I decided on Economics," MBS said.

It was 1977 then, and MBS was getting more exposed to the communities and was active in local youth and religious organizations, so she decided to enroll in Economics, which also has mathematics in it and a community perspective to boot.

Early career in science and gender advocacies

When she was in college, there were more female students in her Economics class than males, but the instructors were mostly males.

"The gender divide was not so distinct, and I found myself in the same happy situation when I was taking my two masters degrees—one in Economics, the other in Business Management," MBS reminisced her college days.

As a teacher and a researcher, MBS did not experience sex discrimination in hiring, promotion in rank, getting research funds, conducting field work, occupying leadership positions in professional organizations, as well as in the academe.

"Merits counted. This made me realize that there can be no sex discrimination in an environment where merits count and where skills outweigh any sex-related factors, and this also gave me the resolve to contribute in making this kind of environment happen for more women in science."

MBS started holding an administrative position when she was just 29 years old—as Chairperson of the Division of Arts and Sciences with more than 50 faculty members, many of whom were her former teachers. This position as chair served as her platform to advocate for science.

Their early science advocacy led them to establish a small Natural History Museum for the scientists'/biologists' collections. They spruced up the science laboratories to ensure its safety and, with limited budget, they started with simple things like installation of chemical fume hoods.

This was also the time when the women's movement in the Philippines was gaining ground. They started the Women's Help Desks and conducted a number of gender sensitivity training. Back then it was difficult to invite attendees, as it was something new and potential participants did not know what it was for. This started her advocacy on gender in teaching, research, extension work, and institution building.

As a gender and development champion, she confessed, though, "I wasn't and still isn't really good to talk on topics related to violence against women and children and women's rights. I've always been interested in women's economic empowerment by giving equal access to and control of economic resources to women."

Ten years after her first stint as chair, she became the Dean of UP Tacloban College, a position that gave her more avenues for linkages and partnerships and afforded her more opportunities to promote science and gender in science.

There seems to be some milestone in her life every decade, so in the next ten years, in 2010, MBS became the Director of the Leyte-Samar Heritage Center.

And not one to leave without a trace, with the help of botanists, biologists, and science communicators in the college, they established the *Haysod* Garden. "*Haysod*" is a Waray term for spices. The trimmed and picturesque garden of local spices provided a guided tour for the students. They were given a catalog with the origin, usage, and recipes for spices. Unfortunately, the *Haysod* Garden was destroyed during Typhoon Yolanda.

Trade-offs on having a career and of being a mother

While most women may find juggling dual or even multiple roles to be tough, MBS thinks otherwise.

"It wasn't difficult to be a mother and a career woman at the same time. I would even want to go through it again." She is grateful to be blessed with a lawyer-son, who is now Vice Consul at the Philippine Embassy in Bahrain, and two daughters who are both medical doctors. Thanks to family support and the enablers. How did she manage to excel at both? Her strategy lies in time management and focusing on doable goals and quick wins given the family's resources. Despite her work, MBS had time to drive her three kids to school, attend their school events, and was even a Parents-Teachers Association (PTA) officer, who helped establish a cooperative for a high school where her two daughters finished secondary education.

As her career progressed, MBS was due for a doctoral degree abroad, but since she didn't want to leave behind her three kids who were all younger than seven years old, she decided to take her Ph.D. at the Leyte Normal University (LNU). This, despite their notion in the province that if one were to get a Ph.D. degree, one needs to go to the University of the Philippines Diliman or abroad. But MBS was not willing to trade-off the opportunity to raise and watch her kids grow while she's getting a PhD outside Tacloban. So, she decided to get her Ph.D. at the LNU.

"As an economist, I live by the Economics principles of opportunity costs and of maximizing utility/output given scarce resources. I understand the trade-offs; you cannot have your cake and eat it, too. Decisions regarding career are conscious decisions," MBS said on the choices she had to make as a career woman and mother.

The decision to obtain a Ph.D. at LNU came at a price and MBS was willing to trade-off not getting an automatic promotion in

rank at UP after getting a Ph.D. from LNU. UP has a set of reputable universities with which Ph.D. graduates are given automatic rank promotion.

"I didn't get any promotion after completing my Ph.D. This meant I had to be doubly good in my research and publication, so that I can earn merits for a promotion in rank. I was confident that LNU can very well equip me with the skills I needed as a researcher. Its roster of graduate faculty is at par with UP, having degrees in UP and foreign universities."

MBS knew that there are other ways by which to go up the academic ladder: short-term trainings, membership/officership in professional organizations, and a lot of research.

Her Schloss Leopoldskron stint was a non-degree short-term training. This provided her the necessary skills she needed academically and allowed her to be away from her growing kids only for a short time. The multi-cultural setting was also a perfect environment for diverse views and perspectives, where one can think out-of-the-box, imagine crazy ideas which may actually start with new scientific work. It was also an avenue where collaborations can be forged.

Her strategy of reaching the top of the academic ladder worked, as MBS now holds the highest UP academic rank of Professor 12, the only one in her College. Her story gives hope to the young faculty members, making them see that opportunities abound where they can do scientific work, promote science, and translate scientific findings into chewable bits for utilization of stakeholders.

With the way her life as a working mother had turned out, MBS has no regrets. While she may not have become a pure scientist, she became a social scientist and a science administrator, which provided her opportunities for the promotion of pure and applied science, not only for knowledge generation but for the use of communities.

"As a social scientist, I knew all along that I can help in the integration of the natural/physical and the social science/humanities," MBS reflected.

Making basic R&D happen in more universities and regions in the country

When MBS became the Executive Director of DOST-NRCP in November 2015, she knew that her task was to promote basic research and she did that exactly.

"The challenge in 2016 was so great–how to produce impactful results given the very low research budget. NRCP was then funding projects of less than PHP 1 M–even as low as PhP 300,000 if only to fund more of its more than 3,000 NRCP members. What impact can we expect?" MBS honestly depicted the basic research situation when she joined the council.

Under MBS' leadership, and together with the Secretariat and with the approval of the Governing Board, NRCP came up with issue-based NIBRA (National Integrated Basic Research Agenda) 2017–2022, and this served as NRCP's guide for prioritizing research proposals for funding, as ably implemented by the Research and Development Management Division (RDMD-REMS). From NRCP's GIA (Grants-In-Aid) amounting to PHP 12 M in 2016, this jumped to PHP 117 M in 2022. And from having 3,927 members in 2015, the NRCP's membership now stands at 5,111.

And after seven years and two months as executive director of NRCP, on secondment, MBS is now back at the academe as Professor 12 of Economics effective 01 January 2023, but she's on sabbatical leave this year, however. And while on sabbatical, she's still busy with her various science and gender-related engagements in various professional organizations.

MBS' advice to young Filipinos is this: "Stay focused. Seek for and be keen on opportunities that are for the taking."

She cautioned them that "You cannot have your cake and eat it, too. There will be trade-offs and opportunity costs while building a career. Remember to make conscious decisions by choosing options that will maximize your gains given the constraints and the limitations."

Lastly, MBS invites the young to remember that "Women and girls hold half of the sky and half of the seas. Claim it!"

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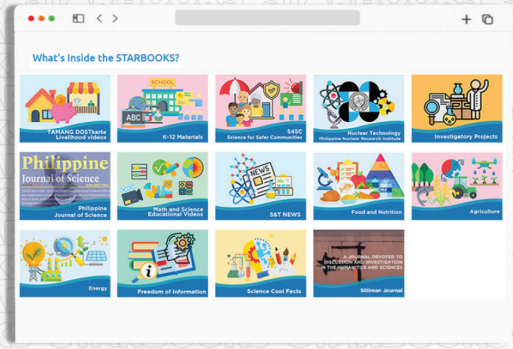

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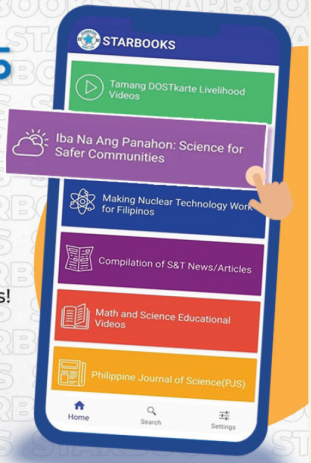

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