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S&TPOST

DOST-PCIEERD, ADMU develop decision support system for groundwater monitoring in Iloilo, Pampanga

Experts and officials underscore the long-term benefits of satellites for a developing country like the Philippines

Towards a just and S&T-driven food system for Metro Manila by 2050

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EDITORIAL



Hope in science for a better normal

The new year always ushers in a fresh start, a new beginning, and despite the dark days of 2020 due to the COVID-19 pandemic, we survived and managed to address the many challenges that confronted us.

Now that 2021 has come, we are starting anew full of hope and aspirations for a better normal. So, this is exactly what we in the Institute are doing; adapting and moving forward by embracing change to survive and thrive, this time around, by giving our publication a brand-new start.

For the first quarter issue of the Post, we are looking forward to a "better normal" where we aim to make our publication more relevant by adapting change for the better; introducing new ideas and innovations that will make the reading experience for our audience more substantive in terms of content, modern design approaches, and in a language that is dynamic and easy to understand.

We want the S&T Post to be alive, a breathing organism that tells stories that will give us hope, that will inspire us, and encourage us to participate and be part of the publication where, simply put, you can get something valuable out of reading our magazine.

We have on our plate some of the stories of hope that mirror what science, technology, and innovation can do to improve our lives: the Textile Gallery, Design and Innovation Hub of DOST-PTRI; the launch of Maya-2 cube satellite developed by three Filipino engineers in Japan; inauguration of DOST-PHIVOLCS' 100th Strong Motion Station in Tanay, Rizal; DOST-FPRDI's Herbarium and Xylarium (Wood Library) with around 20,000 wood samples to aid in research; DOST-MSU-IIT green technology project that converts plant-based raw materials and waste by-products into valuable and renewable polyols and polyurethanes for commercial production of coatings, insulation, and packing foam materials; and the Community Empowerment through Science and Technology (CEST) program in partnership with Malaybalay City and DOST-Bukidnon that supports the cacao processing enterprise of the Malaybalay City Cacao Growers Association (MCCGA).

As the Post takes on a new look inside and out, we pledge to continue to publish more stories of success in our aim to elicit positivism and hope through science. We will not rest on what we have but we will continuously seek improvements so that our magazine will be worth your while; a magazine that will talk to you and be your best source of information and entertainment as well.

NORLY/B. VILLAR Executive Editor





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ABOUT THE COVER

Our cover design for the First Quarter 2021 issue carries the theme of "Hope in Science" that creates an aura of optimism for the new year, full of hope, after a tumultuous 2020 due to the COVID-19 pandemic. Although this dire situation still lingers, the graphic representation of a tree with budding leaves symbolizes the renewed hope of our people because of science that served as an enabling instrument for creating discoveries and finding solutions that will help us win over the pandemic and adapt to a better normal. The choice of vibrant colors for the leaves that hold photos of different scientific activities represent a forward-looking attitude, ever hopeful of overcoming adversities amid the pandemic.

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DOST's textile institute opens collaborative space for designers and textile innovators

By Jachin Jane O. Aberilla, DOST-ST//



The DOST-PTRI Textile Gallery, Design, and Innovation Hub is envisioned to become a maker space where fashion designers, textile manufacturers, textile marketing professionals, researchers, and students can create, experiment, and execute their ideas that will bolster and revitalize the local textile and fiber industry.

THE DEPARTMENT of Science and Technology-Philippine Textile Research Institute (DOST-PTRI) has officially launched its PTRI Textile Gallery, Design, and Innovation Hub and the Philippine Textile e-portal as part of the 2021 TELA Conference with the theme "Fashioning Philippine Textiles in the Now Normal and in the Year of the Creative Economy" on 28 January 2021.

The newly launched textile hub is the place-to-be for all those who need workspace and who want to collaborate with other textile innovators where they can take advantage of the DOST-PTRI's facilities and expertise.

The hub will not only showcase the latest innovation in the textile industry, but it will also be opened for designers, MSMEs, and start-up companies as a collaborative hub where they can come together and showcase the talent and designs, enabling them to develop innovative Philippine textile products.

Miss Universe PH 2020 2nd runner-up and textile advocate, Michelle Gumabao, was given a tour of the textile hub that showcased its many features. It has an exhibition space where DOST-PTRI's products such as natural dyed textiles and woven fabrics from all over the country are displayed.

Likewise, its wide space can also be used by fashion designers and entrepreneurs for product and collection presentations. Moreover, its conference room is ideal for more intimate and virtual meetings. The hub also has co-working spaces that are ideal for product prototyping and technical consultations.

Textile goes digital

The DOST-PTRI also launched its e-portal called the Philippine Textiles Portal (http://philippinetextiles.com/), a project initiated after the Great Women Project II, a collaboration with the Philippine Commission for Women.

The online platform aims to connect people with the handloom weaving and natural dyeing communities. The website houses relevant information such as the history of the Philippines' weaving and dyeing culture, a color library, and a directory of communities and producers of local fabrics that can be matched with both domestic and international buyers.

"This is a physical and also virtual space for collaboration among our various textile stakeholders, whether they be in the National Capital Region or they are designers, social enterprises, entrepreneurs, or our weaving communities and dyeing communities in the provinces and other regions," says DOST-PTRI Director Celia B. Elumba in her opening remarks. "The goal is to reach all textile innovators from all over the country."

The e-portal will also serve as online onestop shop for customers, suppliers, weavers, especially Women's Micro- enterprises/ Women Micro Entrepreneurs (WMEs) to network with each other, thereby widening the market reach of WMES to help them increase their sales.

To know more about the TELA Gallery, Textile Design and Innovation Hub, and Philippine Textile e-Portal, interested parties can send their inquiries ptri@ptri.dost.gov.ph.

DOST-FPRDI rolls out technology through incubation program

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

A LAGUNA-BASED agro-forest farm will soon learn the process of making antimicrobial soaps and hand mists developed by the Department of Science and Technology-Forest Products Research and Development Institute (DOST-FPRDI).

This was set after the DOST-FPRDI partnered with the Laguna State Polytechnic University (LSPU) in providing technical assistance to Adoress Farm.

The initiative is under the National Agri-Aqua Technology Business Incubation (TBI) Program of the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARRD).

DOST-FPRDI's technical expert, Dr Jennifer P. Tamayo, will train Adoress Farm staff in developing the antimicrobial soaps and hand mists using their own plant materials. The Institute will also provide business development services and access to testing laboratories.

Supporting small enterprises

According to Dr. Noel Catibog, Chief of DOST-PCAARRD's Technology Transfer and Promotion Division, TBI hopes to accelerate the transfer and commercialization of researchbased outputs in the country.

"TBI is an innovative process where an institution supports start-ups by providing them necessary technical and business development services," explained Catibog.

The DOST-FPRDI has its own TBI called the "Peak Three."

Established in 2019 with funding grant from DOST-PCAARRD, Peak Three is intended as a support system for small or starting wood and non-wood forest products enterprises.

Among its services are assistance through various wood and non-wood processing technologies; linkage with investors; assistance in intellectual property protection; mentoring on business management, marketing, and finance; and technology training and testing services.

First of its kind

Catibog shared that the partnership between two or more TBIs—such as the case between DOST-FPRDI and LSPU-is the first of its kind in the country.

Known as co-incubation, this collaboration is seen to bring "access to a wide range of services, larger pool of technical experts, and network of investors and partners; better benefit-sharing of knowledge, facilities,

and equipment; and higher promotion of technology commercialization."

The partnership among DOST-FPRDI, LSPU, Adoress Farm, and DOST-PCAARRD was sealed during the TBIs Co-Incubation MOA (memorandum of agreement) online signing ceremony held last 26 January 2021 via Zoom.

According to DOST-FPRDI Director Dr. Romulo T. Aggangan, the co-incubation initiative is an "excellent pathway for State Universities and Colleges, and Research and Development Institutes to commercialize their technologies and collaborate in research and product development."

"We are encouraging start-ups or small wood and non-wood forest products enterprises to check out DOST-FPRDI's TBI. The Institute will be glad to assist you in moving your business to the next level," he ended.

Interested parties may contact DOST-FPRDI Director Dr. Romulo T. Aggangan at info@ fprdi.dost.gov.ph or fprdi@dost.gov.ph.



Forest Products Technology Business Incubator





The partnership among DOST-FPRDI, LSPU, Adoress Farm, and DOST-PCAARRD was sealed during the TBIs Co-Incubation MOA online signing ceremony held last 26 January 2021 via Zoom.

DOST-PCIEERD, ADMU develop decision support system for groundwater monitoring in Iloilo, Pampanga

Text and photo from DOST-PCIEERD

RESEARCHERS FROM the Ateneo de Manila University (ADMU) have developed a decision support system in monitoring the groundwater quality and quantity to mitigate the adverse impacts of flood and drought in selected sites in the Philippines.

Spearheaded by Dr. Ma. Aileen Leah G. Guzman, in collaboration with Dr. Andrew Barkwith of British Geological Survey, the Philippine Groundwater Outlook (PhiGO) developed a web-based tool that contains information about well sites, daily reading of groundwater quality and quantity data, and a concise and clear description of the parameters collected by the groundwater monitoring system. Aside from the gathered data, the project will also assess, simulate, and analyze the effects of flooding, drought, population change, climate change, and massive urban development in groundwater to produce a near realistic groundwater outlook for the next 50 years

In a few clicks, residents of Iloilo City and Pampanga can have instant access to the automated and real-time monitoring of groundwater resources in their areas, which were recognized as part of the nine highly urbanized water critical cities (including Metro Manila, Metro Cebu, Cagayan de Oro, Iloilo, Zamboanga, Angeles, Baguio, Bacolod, and Davao) in a study done by the National Water Resources Board (NWRB) and Japan International Cooperation Agency with water constraints.

Through the collaboration, the locally developed sensors will be integrated with the UK-developed sensors to create a hybrid sensor monitoring water level and quality. Advanced modelling tools and techniques for groundwater assessment will also be shared and transferred to Philippine (PH) local experts.

The website holds information that is required to develop new platforms in other water-critical regions in the country. With this information tool, government, decision makers, businesses, and local communities can come up with local plans and programs in managing the water resources

Department of Science and Technology-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD) Executive Director Dr. Enrico C. Paringit underscored the importance of groundwater monitoring efforts



The Philippine Groundwater Outlook (PhiGO) website.

in improving the country's water quality and ensuring a constant water supply.

"This web-based platform, developed by our brilliant Filipino researchers for easy access to comprehensive, reliable, and detailed information on the groundwater level across the Philippines, is a game-changing solution that is beneficial; enabling the whole society to utilize available data to better predict and plan for the future of our groundwater resources," said Paringit.

PhiGO is a three-year joint project supported by DOST-PCIEERD and the Natural Environment Research Council of the United Kingdom (UK) under the PH-UK Newton Agham Joint S&T (Science and Technology) Cooperation Program on Understanding the Impacts of Hydrometeorological Hazards in the Philippines. It is focused on delivering consistent, accessible, and transferrable assessments of climate and population change on regional groundwater resources and their subsequent influence on flood, drought risk, and socio-economics.

For more information, you can visit the website, https://admuwater.com/phigo, send an email to the PhiGO team at gmp.nwrb@ gmail.com or call them at +63-2-426-6001 loc. 5605.

Invention and innovation services keep afloat despite the pandemic – DOST-TAPI

By Jund Rian A. Doringo, DOST-TAPI

THE TECHNOLOGY Application and Promotion Institute of the Department of Science and Technology (DOST-TAPI) celebrated its thirty-four years of providing financial and technical assistance in the promotion of technology for transfer and commercialization on 10 February 2021.

With the theme "Bringing Excellence in Innovation and Invention despite the Global Challenges," the virtual celebration highlighted DOST-TAPI's accomplishments for 2020 amidst the pandemic.

Dubbed as the marketing arm of the Department for its promotion services, DOST-TAPI has made contributions toward the adoption of various inventions and technology innovations.

"I am very keen with our contributions as an institution, consistently pursuing relevant programs in providing assistance to our clients. We have stayed focus on our commitment even during the coronavirus disease pandemic," said DOST-TAPI Director Edgar I. Garcia during the welcome remarks.

During the Director's report, it was revealed that the Institute has filed 446 intellectual properties at the Intellectual Property Office of the Philippines in 2020.

Moreover, a total of PhP10.3 million was provided as financial assistance to support seven micro, small, and medium entrepreneurs (MSME) under the Institute's Venture Financing Program.

DOST-TAPI has also created a new program specifically designed to help the government's initiatives in combating the current COVID-19 pandemic in the country.

A total of PhP3.4 million was allotted for entrepreneurs who have COVID-19-related products and services.

In November 2020, the first online National Science and Technology Week was conducted through the Institute's efforts, which was participated by 12,684 registered visitors.

"With all things in place, I am confident that DOST-TAPI can face, hurdle, and survive more challenging years in the pursuit for productivity and competitive excellence in the context of invention and innovation development, technology commercialization, and promotion," added Director Garcia.



DOST Secretary Fortunato T. de la Peña gave his inspirational message during the DOST-TAPI 34th anniversary on 10 February 2021 (screenshot from Zoom meeting).

Meanwhile, DOST Secretary Fortunato T. de la Peña posed questions for the Institute during his Inspirational Message.

"Are we looking for inventors or do they look for us? How many have succeeded in commercialization after availing our assistance? How do we extend our assistance in IP application in the academe? Which of our TECHNICOM (Technology Innovation for Commercialization)assisted beneficiaries have availed of our research and development programs?," asked Secretary de la Peña.

He thanked DOST-TAPI's efforts for the past years and emphasized that the Institute can do so much more in bringing science for the people.

The celebration then proceeded with the awarding of the Director's Award for Excellence to recognize employees for their achievements, exemplary performance, dedication, and valuable contributions.

The following are the recipients of the 2020 Director's Award for Excellence:

 Best Delivery Unit – Invention Development Division (IDD)

- Outstanding Division Chief Atty. Marion Ivy D. Decena
- 1. Outstanding Senior Technical Staff
- Mylene A. Alano (IBOD)
- Caezar Angelito E. Arceo (IDD)
- Eilleen S. Fernando (TIPD)

Outstanding Junior Technical Staff

- Theda Mae A. Dumali (IBOD)
- Richelle C. Malaay (IDD)
- Christoper C. Gealan (TIPD)

Outstanding Senior Administrative Staff

- Israel Jacob R. Zaragoza (OD)
- Lourdes C. Palileo (FAD)

Outstanding Junior Admininstrative Staff

- Janice W. Cornel (OD)
- Mary Ann S. Nicdao (FAD)

For more information on DOST-TAPI's programs and services, please contact 8837 2071 local 2157 or email info@tapi.dost.gov. ph.

DOST-FPRDI preserves priceless wood samples through digitization

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

TREASURES COME in many forms and sizes.

For the Department of Science and Technology-Forest Products Research and Development Institute's (DOST-FPRDI), a "treasure" may be an assortment of wood blocks that for many years now have been contributing to archaeology, the wood-using industries, and the country's anti-illegal logging campaign. The oldest of these blocks is 117 years old.

The DOST-FPRDI's herbarium and xylarium (wood library) houses around 20,000 wood samples gathered from both local and foreign sources. A go-to place for archaeologists, foresters, and students for their wood identification needs, it has the most complete wood collection in the Philippines with more than 4,000 tree species to date and about 108 contributing countries.

"After the American occupation in the early-1900s, American experts left their collection of wood specimens gathered from their exploration of Philippine forests at the then Bureau of Forestry. During World War II, it was transferred to the Philippine Forest School (now University of the Philippines Los Baños College of Forestry and Natural Resources), then to the DOST-FPRDI," recalled Forester Glenn B. Estudillo of the Institute's Material Science Division-Anatomy and Forest Botany Section.

"This is a very rare and valuable collection since some of the collected species no longer exist in the natural forests. We have to protect them because it will be hard to stockpile and impossible to replicate this collection again," he said.

To better preserve the wood collection, DOST-FPRDI experts have recently began digitizing each sample. The process involves an inventory of the specimens and capturing high-resolution (20x) images using a digital microscope. The information and photos are uploaded and a QR code is assigned to each specimen for indexing and easy access.

For. Estudillo examines a wood sample using a digital microscope.

A quick scan of the QR code will generate information such as the scientific, local, and family names, voucher number, wood sample's place of origin, name of the person who collected it, and date of sampling.

"Every time we identify a piece of wood, we cut a thin portion off the sample. Doing this repeatedly will eventually 'shrink' the samples. Digitization will allow us to identify the wood species while preserving the wood blocks," explained Estudillo.



For. Estudillo examines a wood sample using a digital microscope.



The oldest wood sample at FPRDI's Xylarium is a 1903 Yakal collected in Tayabas, Quezon by W.H. Wade.



A quick scan of the QR code will generate information such as the scientific, local and family names, voucher number, wood sample's place of origin, name of the person who collected it, and date of sampling.

Wood identification is the scientific process of establishing the identity of a wood specimen based on its anatomical, local, and structural properties.

"With the aid of highly-magnified photos, one can identify the species faster and more accurately than simply using the naked eye and a hand lens. Digitization also allows for greater accessibility because anyone with an internet connection and a smart phone will be able to access DOST-FPRDI's digital wood library," he shared.

The Institute's wood identification service has been instrumental in the government's antiillegal logging campaign as it serves as basis for charges filed against loggers and shipowners that transport illegally-cut timbers. Assigning a QR (quick response) code to each wood sample is an idea that For. Estudillo co-developed with his son Aeron Casey.

It also helps archaeologists understand how our ancestors lived by identifying wood specimens recovered from their study sites. Likewise, it is crucial to clients in the construction, local, and handicraft sectors who need assurance on the identity of their wood materials.

Estudillo concludes "In this digital age, DOST-FPRDI promises to adapt in order to preserve these priceless specimens. We are currently in the process of completing the digitization while also applying for a copyright. We hope to share our digital wood library to the public soon."

DOST-FPRDI champions earth-friendly technologies

By Rizalina K. Araral, DOST-FPRDI Photo from DOST-FPRDI

BECAUSE OF its name, the Department of Science and Technology's Forest Products Research and Development Institute (DOST-FPRDI) is sometimes misunderstood as being anti-environment. Some people think that the agency's mandate promotes deforestation, the alleged culprit behind the devastating floods that hit the country in 2020.

It is not true, of course, that the Institute endorses deforestation. While it did study premium timber and catered to the needs of the forest-using industries during its earlier years, it began in the 1980s to study other related natural products. As the country's wood supply began to dwindle due to reckless logging, the agency had to look for substitute raw materials for its clients in the housing, pulp and paper, handicrafts, and furniture sectors.

Substitute raw materials

Thus, over the next decades, DOST-FPRDI researchers have probed all kinds of possible replacement to forest timber. These include bamboo; industrial tree plantation species (ITPS); senile coconut wood and rubber wood; *abaca*; and agricultural residues such as coconut coir, tobacco stalks, tea leaves, corn stalk, and rice straw. They have also studied fiber plants, dye plants, forest woody vines, as well as tree gums, resins, oils, and exudates, among others.

"Because of our name, our work has sometimes been misunderstood by the public and even by policy makers," says Institute Director Romulo T. Aggangan. "During Senate Budget Hearings, some lawmakers would ask about the relevance of what we do, considering that the country has very little forest cover left, and these have already been made off-limits to all kinds of logging. We then have to explain to them what we do and what we have done so far."

Tree plantation species, lumber dryer, moisture meter

Over the years, DOST-FPRDI wood anatomists, chemists, and forest products engineers have studied the properties and uses of 15 kinds of ITPS, such as *Falcata* and *Gmelina*. Because of this, many managers in the wood-based industries now understand how to saw, machine, dry, finish, and treat these nonforest raw materials. Fast-cycle trees grown in plantations are good substitutes to forest timber for construction and many other industrial uses.

DOST-FPRDI's studies on tree plantation species promotes the establishment of tree farms and the use of products harvested from them. Properly harvested and processed, wood products help limit the effects of global warming as they are known to be effective carbon absorbers. They can help trap excessive carbon from the atmosphere, which is a major cause of climate change.

Another contribution is the furnace-type lumber dryer (FTLD). Explains Aggangan, "This is like a big oven which can dry natural raw materials fast and right, resulting in quality wooden furniture which don't shrink or crack, and handicrafts which are not attacked by molds."

In 2018, Connor Group, one of the world's top merchandise-sourcing firms, hailed the Institute for its role in raising the quality of Philippine handicraft exports thru the FTLD.

"Another helpful technology is the lowcost wood moisture meter, which helps our clients know how much water a piece wood contains. This is important to ensure the quality finished product," says Aggangan.

Recent accomplishments

In recent years, the Institute has trained countless aspiring business people on handmade papermaking, innovated wine barrels from tree plantation species, and developed machines for making engineered bamboo, one of the promising housing materials in the country today. It has also set up a state-of-the-art processing plant for converting old and unproductive rubberwood into quality furniture–a big help to rubber farmers in Zamboanga Sibugay.

At present, it is studying how to optimize the *abaca* fiber for making high-end industrial products, how to upgrade our bamboo musical instruments, how to make the most of forest woody vines as handicraft raw materials, among others, and how to develop fragrances and flavors from forest products.

DOST-FPRDI likewise runs world class testing laboratories for furniture, plywood, pulp, and paper, and also conducts wood identification, physical and mechanical properties, and biomass energy tests on forestbased and related products.

Pro-environment

"Come to think of it, our name is a misnomer," says Aggangan. "It doesn't exactly reflect who we are, because we do so much more than



DOST-FPRDI's studies on tree plantation species promotes the establishment of tree farms and the use of products harvested from them. Properly harvested and processed, wood products help limit the effects of global warming as they are known to be effective carbon absorbers. They can help trap excessive carbon from the atmosphere which is a major cause of climate change.

study 'forest products.' We do not study forest timber anymore, but instead look for ways to wisely use many native plants and related natural materials to meet our clients' needs. Much of what we do shows our aim to help protect –and not destroy–the planet."

For example, he explains, in its bamboo projects, the Institute not only supports the bamboo-based industry; it also promotes bamboo farming. Putting up more plantations worldwide can help stabilize the earth's climate by limiting the effects of global warming. More than any other plant, it can absorb massive amounts of carbon from the atmosphere, which is a major cause of global warming.

"The same is true with tree plantation species," he adds. "As we do more studies on them, we promote the setting up of more tree farms and the use of products harvested from them, which are known to be effective carbon absorbers."

In their current projects, Aggangan adds, DOST-FPRDI researchers are looking for more earth-friendly ways of doing things—for example, more energy-efficient sawmilling, drying and machining methods, and less toxic methods of preserving wood.

"In the coming years," reveals Aggangan. "We will continue to work towards the competitiveness of our client industries while promoting sustainability. These two things competitiveness and sustainability—should always go together. No matter how fantastic, scientific innovations will mean nothing if they damage the environment."

DOST IV-A partners with other DOST agencies to fast track tech commercialization



LAST FEBRUARY 19, Department of Science and Technology-CALABARZON, in partnership with the DOST-Philippine Council For Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD) and DOST-Technology Application and Promotion Institute (DOST-TAPI), conducted the "Webinar on the Assessment of Technology and Investment Readiness Level of RDIs/SUCs' Technologies."

This webinar is part of DOST's StARTT Strategy to Accelerate and Revitalize Technology Transfer program and aims to impart guidelines to research and development institutes (RDIs) and state universities and colleges (SUCs) in CALABARZON on whether their technologies and investments are already geared towards their commercialization phase.

Russell M. Pili, Chief Science Research Specialist and the Chief Technology Transfer Officer of the Research Information and Technology Transfer Division and Engr. Edward Paul Apigo, Senior Science Research Specialist of the Research Information and Technology Transfer Division of DOST-PCIEERD, were the resource speakers for the event. The program was divided into two sessions. The morning session consisted of the opening ceremonies and the overviews and mechanics of the Technology Assessment and Workshops. The workshops and group reportings were conducted in the afternoon session.

To start the program, Ms. Emelita P. Bagsit, Officer-in-Charge for the Regional Director of DOST-CALABARZON, gave her opening message in which she emphasized that the webinar is an initial preparation for the Technology Transfer Day, where the actual technology pitching and matching will take place.

"This activity is just a teaser; we are preparing something even bigger for us here in CALABARZON," she shared. "Soon, we are hoping for DOST-PCIEERD and DOST-CALABARZON to forge other partnership projects through their PREP or Preparing Researchers to Entrepreneurs Program for the researchers, and the KTTO-IMPACT Training Program for University Technology Transfer Officers." In collaboration with DOST-PCIEERD, these programs are set to pilot in the region.

Afterwards, Engr. Edgar I. Garcia, DOST-TAPI Director, who was not able to attend the event, extended his support through a recorded message. Echoing Ms. Bagsit's message, Engr. Garcia further emphasized the importance of the webinar for technology generators, especially in their decision making in the development and transfer of their technologies.

Meanwhile, Gilda de Jesus, Science Research Specialist II of the Provincial Science and Technology Center Cavite (PSTC-Cavite), introduced the participants. The attendees were researchers from various RDIs, SUCs, Provincial Directors from PSTCs, and staff from DOST-NCR and DOST-CALABARZON.

The program proper began with Ms. Pili's overview on the different stages of technology assessment before commercialization through a step-by-step diagram of DOST-PCIEERD's Commercialization Sessions. Using a graph, she also discussed each Technology Readiness Level (TRL) and Investment Readiness Level



(IRL), and their integration in each stage of the assessment. After the discussion, Ms. Pili answered questions from the crowd.

"Commercialization is a journey and *iba-iba tayo* ng journey so you don't need to compare yourself with others," she reminded, "You need to be honest in determining the weakness of your technology so that people can help you with a translation plan—from a research output into a product."

To give an overview on prioritizing assets in technology assessment, Engr. Apigo walked the participants through the importance of prioritization, ranking opportunities, and some projects they worked with and helped commercialize. He also discussed in detail each criterion found in the Technology Assessment Scorecard. Furthermore, to prepare the participants for the afternoon workshops, Ms. Pili thoroughly discussed each TRL and IRL level and how to measure them.

For the afternoon workshops, participants were grouped according to their technology's sectors and were put into their respective breakout rooms together with their moderators. The workshops aim to assess their technologies based on the metrics discussed earlier using the TRL/IRL Assessment Scorecard. Group reports and consultations with Ms. Pili and Engr. Apigo were done afterwards. After the reports, Eng. Apigo further sought key insights from the participants through a SLIDO exercise.

Nona Nagares, a participant from the Southern Luzon State University Lucena, assessed her technology, "Method of Producing

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Mushroom Chili Garlic Sauce and Product" using the TRL/IRL Scorecard. "Madaling maintindihan ang mga forms na pinagamit at nakita agad namin kung ano na'ng status ng aming technology," she said. "Madali ring maintindihan ang mga speakers dahil nagbibigay sila ng mga halimbawa."

However, she also expressed her struggle with the event being virtual. "Sa kabilang banda, dahil nga pandemic, hindi maiiwasan na online meeting ang gawin," she added, "Dahil dito, minsan hindi gaanong makapagconcentrate dahil may mga distractions na nararanasan."

To cap the day, Pili also presented a case study on The Rapid Electric Vehicle Charger or CharM and the processes her team underwent—from its assessment to its commercialization and licensing phase. She

further emphasized, "Remember that people can only benefit from the technologies that they can use so ito sana ang hanapin natin while we are perfecting our technologies."

For the closing ceremony, DOST-CALABARZON awarded Pili and Engr. Apigo their Certificates of Appreciation while de Jesus gave the closing remarks. This webinar-workshop is just the start of a series of activities, which will also include technology coaching, mock pitching, and the actual technology pitching day set on the following month.

PRIORITIZING ASSETS

ENGR. EDWARD PAUL H. APIGO, MS IN INNOVATION AND BUSINESS SENIOR SCIENCE RESEARCH SPECIALIST, DOST PCIEERD

Experts and officials underscore the long-term benefits of satellites for a developing country like the Philippines

By Allan Mauro V. Marfal, DOST-STII



ON 14 March 2021 at around 7:20 PM, Maya-2, a cube satellite (CubeSat) made by Filipino engineers studying in Japan, was released to space from the International Space Station (ISS) to take on its mission.

Maya-2 can remotely collect data using San S&F (store and forward) mechanism and capture images and videos using an on-board camera. Its 1.3kg frame is also equipped with an automatic packet reporting system message digipeater (APRS-DP), attitude determination and control units for active attitude stabilization and control demonstrations, Perovskite solar cells, and a latchupdetection chip.

In his statement, Department of Science and Technology (DOST) Secretary Fortunato T. de la Peña shared his gratitude and excitement on the successful launching of Maya-2. He said that the accomplishment made possible by Filipino and young researchers and engineers should make us confident that we can do more in the area of space technology. "I have high hopes that we as a people will be able to benefit more from developments in this area—all towards making the quality of life of our people better," said DOST Secretary de la Pena.

DOST Sec. de la Pena added that developing and launching our satellites would provide long-term benefits for the country, even if it is entailing a huge cost. Those images captured by these satellites could be a strong basis for policy recommendations, project implementation, and decision-making to various sectors.

He added that moving forward, these projects are seen to further intensify the efforts of the country to harness the power of satellite technology for other purposes like those in agriculture, forest cover and natural resources inventory, weather forecasting, and disaster damage assessment and monitoring, among others.

Maya-2 (Philippines), together with CubeSats Tsuru (Japan) and GuaraniSat-1 (Paraguay), was designed and developed under the 4th Joint Global Multi-Nation Birds Satellite (BIRDS-4) Project of the Kyushu Institute of Technology (Kyutech) in Japan. Their primary purpose is a technology demonstration, from which the learnings will be used as an educational platform. This latest development follows the CubeSat's launch to the space station aboard a Cygnus NG-15 rocket (S.S. Katherine Johnson) on 21 February 2021, together with CubeSats Tsuru (Japan) and GuaraniSat-1 (Paraguay).

The three Filipino engineers were sent to Kyutech by the DOST- Science Education Institute (DOST-SEI) to pursue doctoral degrees as part of a scholarship program done in cooperation with the STeP-UP (Space Science and Technology Proliferation through University Partnerships) Project of the STAMINA4Space Program. They are Mark Angelo Cabrera Purio, Izrael Bautista, and Marloun Sejera.

This new milestone continues to nurture the longstanding partnership between two Asian nations as Maya-2 being the Philippines' fourth successful attempt to send a satellite to space in collaboration with Japan.

BIRDS Project Principal Investigator Dr. Mengu Cho shared that the primary goal of this project is to foster human resources to initiate indigenous space programs in nonspace-faring countries.

"After seeing the infant space programs in many countries, I can say that the Philippines is one of the best examples of a success story for Maya-2, three students from the Philippines are engaged and play key roles in the entire BIRDS-4 project. I am sure that they can be an important asset to the future Philippine space program," said Dr. Cho.

Meanwhile, Kyutech Assistant Professor George Maeda said that of all the BIRDS partners, none is more serious about developing in-country "human resources" than the Philippines.

"Before you can make a spacecraft, you have to train engineers who know how to make them. The point is understood in your country. The fruit of knowledge acquired at Kyutech is taken to the Philippines and then applied to help others—this "multiplication of knowledge" is precisely what we want to occur. This is what education is all about. It means to spread knowledge. Replace darkness with the light on a broad scale," said Prof. Maeda.

DOST-SEI Director Josette T. Biyo stressed that Maya-2's successful deployment to space is living proof that the investment made in these scholarships is well worth it. She said that they exemplify the perseverance of Filipinos and the brilliance of our science scholars. Maya-2 proves that the country's space program and science scholarships are investments worthy of people's support.

After the scholars complete their studies, they have their eyes set on furthering the proliferation of the knowledge they gained in

Japan and bring it back to the Philippines.

Engr. Purio said that aside from returning to his alma mater, Adamson University, to impart what he learned in Japan, he envisions setting up our own ground station in the university to continue our efforts to support spacerelated activities while involving our students by providing them hands-on training.

As for Engr. Bautista, hopes to contribute to the growing space industry back home. He plans to continue what he has learned in Japan, from his research in Perovskite solar cells to satellite systems engineering, to hopefully providing meaningful output for the Philippines.

Screenshots of the BIRDS-4 CubeSats being deployed from the ISS. Captured from the JAXA livestream.



PH's 2nd cube satellite now in orbit

By Raissa Ancheta, DOST-PCIEERD Photos from DOST-PCIEERD

MAYA-2, THE Philippines' second cube satellite, was successfully released into orbit by the International Space Station on Sunday, 14 March 2021, along with Paraguay's GuaraniSat-1 and Japan's Tsuru.

Developed under Japan's Kyushu Institute of Technology's 4th Joint Global Multi-Nation Birds Satellite (BIRDS-4) Project, these cube satellites were launched on 21 February 2021 at the National Aeronautics and Space Administration Station in Virginia, United States through the S.S. Katherine Johnson Cygnus spacecraft at 1:36 AM PST.

Maya-2 was designed and built by Filipino scholars assisted through the STeP-UP (Space Science and Technology Proliferation through University Partnerships Project of the Space



Filipino-made cube satellite, Maya-2.

Technology and Applications Mastery, Innovation, and Advancement (STAMINA4Space) Program, with funding support from the Department of Science and Technology (DOST).

"The successful launch of Maya-2 makes me feel proud. The accomplishment made possible by our young researchers and engineers should make us confident that we can do more in the area of space technology. I have high hopes that we, as a people, will be able to benefit more from developments in this area—all towards making the quality of life of our people better," said DOST Secretary Fortunato de la Peña.

Maya-2 engineers Izrael Zenar Bautista, Mark Angelo Purio, and Marloun Sejera confirms that upon deployment of the CubeSat, they will immediately start carrying out the satellite's missions.

At just 1.3 kg, Maya-2 has a camera that captures images and videos, an APRS-DP (automatic packet reporting system message digipeater), attitude determination, and control units for active attitude stabilization and control demonstrations; Perovskite solar cells; and a Latchup-detection chip. Gathered data from the demonstrated components will be used to evaluate these technologies for future space missions.

Further, it can collect data remotely through a store-and-forward mechanism and gather data for applications such as weather and infectious disease analysis through ground sensors. Maya-2 was developed and improved using the knowledge gained from developing its predecessor.

DOST and the STAMINA4Space Program are looking forward to the continued expansion of the Philippines' capabilities and innovations in the space technology applications sector with the development of more Filipino-made satellites. They have corroborated that Maya-3 and Maya-4 are targeted to be launched within 2021.

As the monitoring agency of the STAMINA4Space Program, DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD) is optimistic that these STA initiatives will bring positive change to the country.

"As a leader and preferred partner in enabling game-changing innovations in the emerging technology sectors, the successful release of Maya-2 into orbit is testament that Filipino scientists and engineers are capable of uplifting the lives of Filipinos through research and development (R&D)," said DOST-PCIEERD Executive Director Dr. Enrico C. Paringit.

DOST, MSU-IIT use green technology to produce polyols and PU products

Text and photo from DOST-PCIEERD

RESEARCHERS FROM the Mindanao State University-Iligan Institute of Technology (MSU-IIT) convert plant-based raw material and its waste by-products into valuable and renewable polyols and polyurethanes (PU) for commercial production of coatings, insulation, and packing foam materials.

This sophisticated green technology of Dr. Arnold A. Lubguban and his team at MSU-IIT's BioProducts Research Laboratories (BPRL), in collaboration with the Department of Science and Technology – Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD), uses renewable feedstock to produce highly functional polyols and PU-based bioproducts for commercial applications such as rigid insulation foams, semi-flexible packaging foam materials, and waterborne anti-corrosive coatings. The partner industries include Chemrez Technologies, Inc. and Nuevochem Specialties, Inc.

"One of our innovations provides baseline data and methods for the commercialization of biomass-based polyols (Phase 1) and PU foam insulation sheets (Phase 2) through an environmentally friendly process that is also characterized by reduced production costs because the raw materials are readily available by-products or waste products," said Lubguban.

DOST-PCIEERD Executive Director Dr. Enrico C. Paringit underscored our pivotal role of becoming a good corporate neighbor and a responsible steward by providing innovative solutions that will preserve and sustain our natural resources for future generations.

"Our main goal is to fully harness the potentials of science, technology, and innovation and constantly improve what is essential to the lives of those we serve," Paringit remarked. "We will constantly provide new opportunities and invest in more efficient and environmentally sustainable greener technologies to build a more livable community," he continued.

This year the project team will focus on the pilot scaling and optimization of their bio-based polyols to about 40 liters for PU insulation, coatings, and packing applications.

The "Production of Bio-Based Polyols and Polyurethanes for Industrial Applications," is a 36-month program with two project components that are aimed at developing bio-based polyols and PUs from renewable resources. For more information, please contact Dr. Arnold A. Lubguban at aalubg@ gmail.com or check out their Facebook page (https://web.facebook.com/BPRL.msuiit).

Project staff performing optimization experiments on the production of rigid foams.



DOST-PCIEERD, TikTok ink partnership to strengthen Pinoy innovation promotion

Text and photos from DOST-PCIEERD

FILIPINO TIKTOK users will now learn more Filipino scientific achievements and developments as the Department of Science and Technology Research and Development – Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD) partnered with TikTok to boost promotion of Filipino-made technologies.

During the virtual launch, DOST-PCIEERD inked a memorandum of understanding (MOU) with TikTok to promote Filipino technologies through its science communication TikTok account @pinoyscience.

DOST-PCIEERD Executive Director Dr. Enrico Paringit said this collaboration is a big boost for the scientific community as it continues to reach out to Filipino netizens and garner support to innovations developed by Filipino researchers.

"Communicating science to the public has always been a challenge for our researchers. As a leader and partner in enabling innovations, we are excited with this collaboration with TikTok as a new avenue for us to share distinctly Pinoy innovations through this social media platform," he said.

This partnership with TikTok is a six-month collaboration where TikTok will be providing training for researchers on how to use the platform for science communication, promotion of Filipino technologies, and conduct contests for the Filipino TikTok community.

The first contest is through the #PinoyInnovator hashtag challenge which intends to show how creative and resourceful Filipinos are. Through this challenge, common household items will be creatively used to develop a nifty innovation. The winners of the challenge will be hailed as the "Pinoy Science Innovator 2021." They will be announced in April 2021.

Another contest that will be launched is the #PinoyScience hashtag challenge, which challenges TikTok users to explain the science behind DOST PCIEERD's supported scientific projects.



pinoyscience Science

3 Following 33.6K Followers 263.3K Likes The official social media campaign of DOST-PCIEERD *P* pcieerd.dost.gov.ph



Pinoy Science TikTok Account (tiktok.com/@pinoyscience).



Ceremonial signing of the Memorandum of Understanding led by DOST-PCIEERD Executive Director Dr. Enrico Paringit (lower-right) and TikTok Philippine Public Policy Head Mr. Kristoff Rada (lower left).

The #PinoyScience hashtag challenge will run from April to July 2021. Three winners will be announced every month starting May 2021.

"We are grateful for the opportunity to partner with the DOST PCIEERD to help promote awareness and understanding for science and innovation, as well as inspire the Filipino youth to discover their creativity and talents. Inspiring creativity and bringing joy is at the heart of what we do at TikTok," said Kristoffer Rada, TikTok Head for Public Policy.

"TikTok is committed to helping facilitate education and learning in the Philippines. Through our #LearnOnTikTok series, we will be working with creators to produce more educational content on the platform," he added.

Follow DOST-PCIEERD at https://www. tiktok.com/@pinoyscience. For inquiries on this partnership or request for collaborations, send an email to pinoyscience.dostpcieerd@ gmail.com.

PH freshwater fishing sustainability efforts on track despite setbacks

By Allyster A. Endozo, *DOST-STIl* Screenshots from NAST webinar



The Department of Science and Technology- National Academy of Science and Technology gathered some of the country's leading aquaculture experts and scientists in a webinar. 1. Acd. Rafael D. Guerrero III during his lecture on commercial freshwater fishes in the Philippines. 2. Webinar moderator Dr. Angel B. Encarnacion (upper-left) with reactors: Dr. Armi G. Torres (upper-right), Engr. Eduardo V. Manalili (lower-left), and Dr. Ma. Theresa M. Mutia (lower-right). 3. Key freshwater fishes (from <u>fishbase.se</u>; from left to right): Nile tilapia, "tawilis," and "ayungin."

AQUACULTURE SCIENTISTS discussed their take on local freshwater fishing sustainability in a webinar titled "Commercially-caught Freshwater Fishes in the Philippines: Status, Issues, and Recommendations," that was broadcast on 15 January 2021.

The event, organized by the National Academy of Science and Technology (NAST) of the Department of Science and Technology (DOST-NAST), was moderated by Dr. Angel B. Encarnacion, Senior Fishing Regulation Officer of the Bureau of Fisheries and Aquatic Resources (BFAR).

For his part, Academician Rafael D. Guerrero III of DOST-NAST's Agricultural Sciences Division highlighted the economic importance of freshwater fishes, the production of which amounts to 164,845 metric tons or about half of the total fish catch in the Philippines in 2018.

Bicol, Northern Mindanao, and MIMAROPA posted two- to three-fold increases in output, that rose 12% overall nationwide from 2005–2018. On the other hand, for the same period, CALABARZON, Ilocos, and Eastern Visayas suffered major downturns ranging from 7–80%.

The Nile *tilapia* accounted for half of the PHP 3-billion catch value in 2017 as it boasted a 75.2% climb in production from 2016. On the other hand, the critically endangered *tawilis* enjoyed a 50% upsurge, but the endemic *ayungin* posted an alarming 70% depletion rate in the same year.

Dr. Guerrero pointed to overfishing, pollution, invasive species, and environmental degradation as key threats to the sustainability of freshwater fishes across the country—mainly indigenous species and those in upland and land-locked areas.

Through the PhP 209.28-million "Balik Sigla sa llog at Lawa" program of BFAR, Dr. Guerrero is hoping to improve conservation, poverty alleviation, and food security in rural communities to complement ongoing revitalization and repopulation initiatives.

Another factor that needs to be considered to ensure a sustainable fishing industry is the mindset of both the fisherfolks and those that buy their produce. "The idea here is that we may change the behavior of our fisherfolk and consumers to attain sustainability," said Dr. Armi G. Torres of Quantitative Aquatics Inc. Torres further stressed the value of information, education, and communication materials like posters to address this issue.

For Dr. Ma. Theresa M. Mutia, Chief Aquaculturist at the National Fisheries Research and Development Institute, continuous data collection and monitoring of catch are vital in establishing the status, trends, and policy recommendations for inland fisheries.

Moreover, Engr. Eduardo V. Manalili— Director of DOST-Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development's Inland Aquatic Resources Research Division highlighted the agency's ongoing biodiversity conservation efforts.

These projects focus on populations of *ludong* in *lsabela*, *palos* in Cagayan and Bicol, *tawilis* in Taal Lake, and *biya* in Oriental Mindoro's Naujan Lake. A new project on *ayungin*, according to Engr. Manalili, is already in the pipeline.

The DOST-NAST serves as the premier recognition and advisory body on science and technology (S&T) in the Philippines. Through its programs and projects, DOST-NAST recognizes outstanding achievements to promote national productivity in S&T research.

Towards a just and S&T-driven food system for Metro Manila by 2050

By Allyster A. Endozo, DOST-ST//

"A FARMER sheds a drop of sweat for every grain we get in our plate," as told in an old Philippine proverb. "It is either the fish or the fisherman that gets caught in the sea," as another one went. Adages such as these were never spoken out of spite but as reflections on one's existence day by day. Such experiences are as real as they can be; for the ones who provide for our lifelong sustenance, it can even be a matter of opulence or suffering.

Despite the critical roles that they perform, farmers and fisherfolks consistently rank as the poorest in the country—with poverty incidences of 31.6 and 26.2% in 2015, respectively. With this in mind, the government faces an uphill battle as it aims to stamp out extreme poverty entirely, in fulfillment of both the National Economic and Development Authority's *Ambisyon Natin* 2040 and the United Nations' Sustainable Development Goals by 2050.

The Philippines hauled roughly 5.2 M tons of fish in 2010, good for a top 10 spot globally. However, it ranked dead last out of seven Southeast Asian nations with a paltry 1.87% per year in total crop productivity from 2001–2013. Moreover, its average farm mechanization level sat at 1.23 horsepower per hectare (hp/ha) in 2010—a pitiful display

compared to Japan's 7 hp/ha, South Korea's 4.11 hp/ha, and China's 4.10 hp/ha.

In 2015, an average Filipino family spent around 42% of its annual budget on food or PHP 20,144 per person—mostly on food items such as grain crops (11.7%), meats (5.4%), and seafood (5.0%). Daily food requirements are expected to balloon as the national population is set to climb by 1.43 million yearly to about 142 million by 2045. Metro Manila itself is set to become the 12th most populous city worldwide with nearly 23.5 million people by 2050.

As if crippling poverty is not enough, many farmers and fisherfolks nationwide have to grapple with decades of sluggish financial, material, and policy support from the private and government sectors. They even face the daunting task of feeding millions, aside from their own families, in the coming years. They, of all people, should truly deserve to benefit from a more just food system—a modern system driven by science and technology (S&T).

In a recent webinar, Dr. Mudjekeewis D. Santos of the National Academy of Science and Technology's (DOST-NAST) Agricultural Sciences Division spoke about the current food system that burdens our farmers and

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Webinar moderator Dr. Eufemio T. Rasco (upper-left) with the panelists: Dr. Mudjekeewis D. Santos (upper-right), Mr. Raul Socrates C. Banzuela (lower-left), and Dr. Reynaldo V. Ebora (lower-right).

fisherfolks. Local fisheries, he said, are especially vulnerable to climate change amid high exposure to natural calamities, high sensitivity to man-made outcomes like habitat destruction and pollution, and low adaptive capacity.

Dr. Santos brought to light the challenges of engaging stakeholders in both sectors. The youth are now less receptive to pursuing careers in agriculture, which is perceived as a "poor man's sector." This is compounded by low revenue due to a distribution system dominated by "middlemen," as well as the conversion of farmlands into built-up areas. The "red-tagging" of laborers protesting for better conditions is also a perennial issue.

For Dr. Santos, the adoption of existing technologies and enhancement of institutional capacities can make a difference in strengthening the agricultural value chain. For instance, food apps could help resolve the issues in marketing and logistics. Stakeholders may even simultaneously yield seafood and plants *via* innovative aquaculture, which had a 52.9% share of the 4.36 million tons of fish produced in 2018 ahead of capture fishing.

Dr. Reynaldo V. Ebora—Executive Director of DOST—Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development—highlighted the Department's National Harmonized R&D Agenda and Industry Strategic S&T Programs as key programs aimed at increasing productivity and reducing losses, infestations, and mortalities in agriculture, aquatic, and natural resources.

Dr. Ebora likewise ascribed the Science for Change Program, which aims to bolster regional innovative capacity through improvements in human resources, research and development infrastructure, technology acquisition, and commercialization. He, however, identified gaps in digital inclusivity, value-adding products and services, sustainable resource management, and entrepreneurial training as priority issues to be addressed.

Mr. Raul Socrates C. Banzuela, Executive Director of PAKISAMA (*Pambansang Kilusan ng mga Samahang Magsasaka*), showcased the success of Pecuaria Development Cooperative Inc. (PDCI), an agricultural cooperative based in Bula, Camarines Sur. PDCI, which follows an inclusive development model for its nearly 800

CONTINUED ON NEXT PAGE

Modernized agriculture: Bringing S&T in Bukidnon

By Nova Belle Calotes, *PSTC-Bukidnon* Photos from PSTC-Bukidnon

ACCORDING TO a published report from the Philippine Statistics Authority, Bukidnon shared the largest farms in Region X. It has 120 thousand farms that utilized 322.8 thousand hectares of land for agriculture—the largest among the provinces.

With this, the province is called the "land of the bounty." Predominantly planted with vegetables and pineapples, new industries are rising, such as coffee, cacao, bamboo, and dairy. Some of these are already starting anew in the international community.

The Department of Science and Technology (DOST)-Bukidnon aims to create harmony and convergence between science, technology, and innovation and agriculture to bring more bounty, increase productivity and efficiency, and create more employment and investment opportunities in the province. DOST continuously supports the Agriculture sector by providing various technical interventions. Cacao and dairy small-scale farmers are among the recent recipients of DOST interventions through its Community Empowerment through Science and Technology (CEST) program.

In partnership with the Local Government Unit of Malaybalay City, DOST-Bukidnon turned-over a complete set of cacao processing equipment to the Malaybalay City Cacao Growers Association. The set includes a roasting machine, grinder, stainless steel table, sealers, digital weighing scale, and more. The agency will also equip the beneficiary with hands-on training on tablea and chocolate making, good manufacturing practices, and food safety. They are also pre-listed to join other free sets of training for product development. The DOST envisions that this project will encourage more farmers to go into farming and entrepreneurship to adapt and soon participate in the global fairtrade.

The Dalwangan Malaybalay United Dairy Agrarian Reform Cooperative also recently received a set of equipment from processing to the packaging of their dairy products such as fresh milk, milk bars, and cheese. The budget allocation to provide the complete set of dairy equipment totaled about a million and a half. Malaybalay City Mayor Florencio T. Flores, Jr. expressed his utmost support in the City's first and only dairy processing. Both the projects are part of the continuous embarking of S&T in all areas of Bukidnon through the CEST program.

CEST is the agency's program specifically dedicated to alleviating poverty by providing appropriate science and technology interventions in the following entry points: Economic Development, Health and Nutrition, Disaster Risk Reduction and Management and Climate Change Adaptation, Human Resource Development, and Environmental Protection.

For more information on CEST and other DOST programs, one may visit DOST-Bukidnon on weekdays from 8:00 AM until 5:00 PM at Vicente Neri St., Capitol Compound Brgy 9, Malaybalay City, or email at dostbukidnon@ region10.dost.gov.ph.



DOST Bukidnon in partnership with City Agriculture office grants an automated packaging machine to DAMAUDARC through CEST.

TOWARDS A . . . from p18

members, cultivates 120 of its 817 ha of land for the organic production of nutritious red, black, and brown rice.

Based on PDCI's experience, Mr. Banzuela cited organizational development based on sound policies and systems as necessary in the management and even education of its members. The full value chain, he said, must also be ensured to them—from technology adoption and business processing to marketing, distribution, and dividends. Lastly, partnerships with state and non-government organizations are needed for cooperatives to flourish. Mr. Banzuela stressed the importance of an "enabling environment" with a strong civil society, constitutional and agrarian reform impetus, and people-oriented governance with no vested interests as key for grassroots enterprises to thrive. He underscored community organizers, institutionalized partnerships, and the movement from prototype to commercial scale as integral investments in constructing a just food system.

Yes, S&T programs and policies can potentially advance the present food system into an equitable structure for the marginalized.

Dr. Aries A. Arugay—Professor of Political Science at the University of the Philippines Diliman—hints that collective action by civil society can catalyze this transformation in tandem with government continuity, efficiency, and inclusivity. The question now is if every piece of the puzzle will fall into its right place.

Well into the digital age, we citizens can either harness the power of social media to organize or simply resort to hollow "hashtag activism."

DOST-PHIVOLCS installs 100th Strong Motion Station in Tanay for quake monitoring and safe environment

By Allan Mauro V. Marfal, DOST-ST// Photos by Henri A. de Leon, DOST-ST//



THE DEPARTMENT of Science and Technology-Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS) installed the 100th Strong Motion Station on 23 February 2021 at the Municipal Hall of Tanay in Rizal Province to help local government and nearby areas to have earthquake-resilient structures and safe environment.

The said installation in Tanay is part of the DOST-PHIVOLCS' effort to expand its Philippine Strong Motion Network (PSMNet), which is equipped with strong-motion accelerographs strategically located in densely populated areas and near active faults. DOST Undersecretary for Scientific and Technical Services and DOST-PHIVOLCS Officer-in-Charge Dr. Renato U. Solidum, Jr. underscored how PSMNet is capable of faithfully recording large ground motion during high-magnitude earthquake related-incidents. He said that it can provide critical information about the earthquake rupture process, characterize the type of materials underneath the soil, and determine the ground motion effects to buildings and ground failure such as landslides and liquefaction.

Usec. Solidum believes that the installation of the 100th Strong Motion Station



(From left) Tanay Vice Mayor Rafael A. Tanjuatco, Tanay Mayor Rex Manuel C. Tanjuatco, together with DOST-PHIVOLCS Senior Science Research Specialist Dr. Rommel N. Grutas, grace the inauguration of the 100th Strong Motion Station in Tanay Municipal Hall, Rizal Province. The latest strong motion station is part of the PSMNet, one of the country's key earthquake monitoring systems. Data from this network can provide critical information about the earthquake rupture process, understand the generation and propagation of seismic waves near the source, characterize the type of materials underneath the soil, provide information about site effect and response, and determine the ground motion effects to buildings and ground failure such as landslides and liquefaction.

is beneficial to the Tanay Local Government and DOST-PHIVOLCS.

"For Tanay, this will help you characterize the type of materials underneath the ground and it will provide you very specific response in the ground during the earthquake. *Ito po ay kailangan para maka-disenyo ng tamang dingding, tamang* infrastructure in your area so that they can be more earthquake resistant *panlaban sa malalakas na lindol,"* said Usec. Solidum.

(It is necessary in designing the right structure in your area so it can resist and withstand strong earthquakes.)

Meanwhile, in the case of DOST-PHIVOLCS, Usec. Solidum said that such information and data from PSMNet can be used to develop an effective earthquake early warning system and hazard assessment and eventually to provide policy recommendations to mitigate the potential impacts of the earthquake not only in Tanay, Rizal but also in other nearby areas.

"Lubos kami nagpapasalamat sa DOST-PHIVOLCS sapagkat ang bayan ng Tanay ang napili nilang pagtayuan ng kanilang 100th Strong Motion Recorded Station. Ang mga datos na makakalap dito ay magsisilbing gabay sa aming mga disaster risk reduction managers at engineers hinggil sa nararapat na disensyo ng mga gusali at istraktura rito sa amin sa Tanay at magiging matatag sa oras ng malakas na lindol," "said Tanay Mayor Rex Manuel C. Tanjuatco.

(We are very thankful to DOST-PHIVOLCS for choosing Tanay as the site for the 100th Strong Motion Recorded Station. The data that will be collected will serve as a guide to our disaster risk reduction managers and engineers on the right structural and building designs that can withstand strong earthquakes).

Usec. Solidum shared that the project started in 1992 with only four strong-motion instruments within Metro Manila. Afterward, DOST-PHIVOLCS, with support from the national government and in collaboration with the Japanese government and academe such as the Tokyo Institute of Technology, continuously expanded the network within and outside Metro Manila, to eventually have adequate coverage of the whole country.

Meanwhile, Dr. Romel N. Grutas, Senior Science Research Specialist from DOST-PHIVOLCS, shared that the strong motion station in Tanay can record an earthquake up to 300 kilometers and can cover Greater Manila, Batangas, Central Luzon, and up to Bicol Region areas.



Filipino Coursera learners complete 130k+ courses in 8 months

By Dionard Mendova, DOST-Caraga

HIS IS beyond my imagination', told Engr. Noel Ajoc, Department of Science and Technology (DOST)-Coursera grant Administrator, last Thursday on the overwhelming performance of the 75,000 Coursera scholarship grantees in the country.

Since #DOSTCourseragrant started in April 2020, Filipino online learners pursued lessons and blew up the number of completed courses from 13,729 in September 2020 to 134,489 as of writing. During the Top-Performer Grantees Awarding Ceremony on 20 January 2021, Engr. Ajoc announced via Facebook Live that the enrolled courses passed 2 million with more than 1 million learning hours spent on the platform.

Grantees from Luzon, Visayas, and Mindanao were able to enjoy free online courses with certificates from different universities and organizations such as Yale University, Johns Hopkins University, Google, and IBM. More than half of the grantees are employees followed by students, unemployed learners, and part-time workers.

Who's the best performer?

Top-Performing DOST-Coursera grantees received recognition and certificate for completing 25 to more than 200 courses under the program. Greetings and congratulations flooded the live feed when names of awardees were flashed along with the number of courses completed.

James Colongan, Jr., an electrical engineering graduate, data scientist, and entrepreneur ranked first with 923 courses and 165 specializations completed under the program. He took courses and specializations in information technology, artificial intelligence, advanced machine learning, python data products, advanced data science, and more to help him develop his startup in General Santos City.

DOST-Caraga Regional Director Dominga Mallonga applauded the awardees on her message. "Although we face challenges with internet connectivity, you still manage to complete several courses in a short period of time," said RD Mallonga.

Grantees' online learning profile

In the first Coursera Online Orientation on May 2020, Engr. Ajoc encouraged the applicants to make quarantine more productive by upgrading skills through taking online courses. After eight months, as he cited insights into the scholars' interests, he found out that "Filipinos are passionate to learn if given a chance."

Almost half of the grantees completed business-related courses. Scholars were also keen on language learning, health, information technology, computer science, and data science. As of January 2021, 25,708 enrolled to improve their "Business Communication Skills" in several universities and companies around the world.

Given the industry benchmark, data shows a dramatic increase in learners' performance

DOST-Caraga Coursera Scholarship Awarding of Top-Performing Grantees

20 January 2021



DOST Assistant Secretary for Human Resources Management Dr. Diana L. Ignacio delivering a message.



Opening Message by DOST-Caraga Regional Director Dominga D. Mallonga.



DOST Undersecretary for Research and Development Dr. Rowena Cristina L. Guevarra delivering a message.



DOST-Caraga Technical Support Services Chief and Program Administrator Engr. Noel M. Ajoc presented the Scholarship background and updates.



Top performing learners are grantees that completed at least 25 certificates under the program. They will receive certificate of recognition.

from June 2020 to January 2021 based on test scores. From 60%, scholars hit an average score of 100% reaching the industry average based on Coursera's benchmark.

In fact, the Philippines ranked 5th in the Coursera's Index in Learner Growth with a 107% increase from September 2019 to September 2020 based on the Coursera Impact Report last year. Engr. Ajoc pointed out that online learning can be used to leapfrog our skills in the 4th Industrial revolution.

Inspire, upskill

Dr. Diana Ignacio, DOST Assistant Secretary for Human Resources Management, Management Services, and Special Concerns, reminded the scholars that the platform is not only for collecting certificates. "You savor the lessons and put it into practice," she said in her message during the awarding ceremony.

Along with the success of the learning program, Engr. Ajoc advised other agencies and institutions to venture into online learning platforms to train employees. "I think a legislation on using virtual learning platforms maybe passed to help us upskill more Filipinos," he added.

DOST-Caraga hopes to see more Filipinos inspired to learn new things online and offline in the future.



CREAM OF THE CROP. Grantees with over 200 certificates received from the DOST-Coursera Learning Program. [From left to right] Up - James Colongan, Jr., Ivy C. Leonardo, Mark Anthony S. Elcarte; Down - Alexandra Mari Leal, Klarenz Kristoffer M. Quiñones, Bernardo A. Rosario.



TOP 5 IN LEARNER GROWTH. Graph of Top 5 countries in terms of learner growth. Courtesy of Coursera Impact Report 2020



Top performing grantees sent their testimonials on how the program helped their learning growth.

Dir. Mallonga presented a plaque of commendation to Engr. Noel Ajoc. DOST Sec. Fortunato T. de La Peña congratulates the grantees and top performers in his message.



DOST-Caraga Assistant Regional Director for Technical Operations delivered the closing message.



Mr. James Colongan, Jr., an electrical engineering graduate, ranked first with 923 courses and 165 specializations completed under the program.

Lanao Norte schools receive digital S&T library

By Julie Anne H. Baculio, *DOST-X* **Photos from DOST-X**

FOUR SCHOOLS in Lanao del Norte received STARBOOKS units and pods on 21 January, 2021, from the Department of Science and Technology (DOST)-Lanao del Norte office.

Sultan Naga Dimaporo Memorial Integrated School-High School, Andres Bersales Sr. National High School, Sultan Naga Dimaporo Memorial Integrated School-Elementary School (SNDMIS-ES), and Miguela Pogoy Memorial Elementary School compose the four academic institutions that recently acquired the digitized library.

The Local Government Unit of Sultan Naga Dimaporo, under the leadership of Municipal Mayor Motalib M. Dimaporo, partnered with DOST-Lanao del Norte to realize the installation of STARBOOKS corners within each of the schools. STARBOOKS or the Science and Technology Academic Research-Based Openly Operated KioskS is the Philippines' first-ever digital science and technology library.

"STARBOOKS contains thousands of digitized science and technology resources in various formats (text and video/audio) placed in specially designed "pods" set in a userfriendly interface," cited by DOST-Science and Technology Information Institute.

Faculties from the schools expressed their gratitude as they received the STARBOOKS units. One, in particular, expressed her excitement as their students can now do research and more.

"Pwede na maka research ug makagamit puhon kung ma ok na ang tanan." (We can

finally start research soon once we complete all the software installations.), said Ms. Rona R. Nacua, SNDMIS-HS School Principal.

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DOST-X will conduct a virtual training on how to use STARBOOKS for each school's focal persons.

"STARBOOKS will be beneficial to the teachers as an aid in the development of their distance learning programs and to children who have limited access to computers and information. No one will be left behind, said DOST-Lanao del Norte OIC-Provincial Director Gerrylou Sweet M. Pia.

For more information on STARBOOKS, visit http://portal.starbooks.ph or contact starbooks@stii.dost.gov.ph.

DOST shores up water security, livelihood, nutrition, and environment protection in Concepcion, Romblon

Mae Angelica Fabito-Famini, *PSTC-Romblon* By Charlotte F. Pizarras, *DOST-MIMAROPA Regional Office* Photos from DOST-MIMAROPA

WITH THE newly installed solar-powered water pumping system with filtration and treatment facility, the Department of Science and Technology-MIMAROPA (DOST-MIMAROPA) intends to address water security and safety on the island of Concepcion in Romblon.

Concepcion, considered a Geographically Isolated and Disadvantaged Area (GIDA), is the farthest island municipality in the province with nine barangays that has been suffering from limited access to safe and adequate water. The residents only rely on rainwater collected using basins and pails and deep wells powered by an electric pump as their water source; however, the operation is limited due to high electricity cost.

The solar energy system-powered water pump was provided to Brgy. Masadya, the poorest barangay in Concepcion, through the Community Empowerment through Science and Technology Program of DOST-MIMAROPA. Compared to other barangays, the residents in Masadya are only given two hours in the morning and another two in the afternoon to get the water their families' lives depend on. Baranggay officials were forced to limit the water collection hours to avoid incurring high electricity costs. Each family is required to pay PhP 50.00 per 10 cubic meters of water per month and an additional PhP 5.00 per extra 10 cubic meters for the use of the deep well to sustain its operations. On average, Brgy. Masadya is paying PhP 7,000 solely for electricity, which they admit can be utilized for rather more valuable expenses for the community.

The water quality that is sourced from the water pump is also salty and metallic in taste, which poses many health risks to the residents. When a household is not able to save enough water within the four-hours allotment, they have to endure traveling to the next *barangay* with a water supply— Brgy. Poblacion which is about 7 kilometers away. It is the barangay's dream to reduce this drudgery to improve the health of its residents and give more opportunity of spending more time on incomegenerating and other productive activities.

Now, with the installation of the solarpowered water system with filtration and treatment facility, continued access to clean and safe drinking water at any time of the day is guaranteed. A total of 74 households or about 400 residents not only from the community but even from the adjacent barangay can now benefit from the improved water source.

Moreover, the system's water filtration and treatment facility greatly improve the quality of water. With the technology, the water's metallic taste has been removed and its brininess has been reduced by 90%. Since it is solar-powered, it also helps the community manage their water needs in an environment-friendly way. The



Aerial and close shot of the Ground Water (deep well) Collection system powered by Solar Energy System in Brgy. Masadya, Concepcion, Romblon.



Map of the MIMAROPA Region showing the location of Concepcion Island in Romblon.

barangay local government unit (LGU) maintains the technology and ensures that families can collect as much water as they need that is also assured clean and safe.

"Malaki po tlga ang pagkaka iba ng lasa ng tubig namin. Hindi na sya maalat, kaya panatag na kami na hindi kami magkakasakit," said Erlindo Fanoga Jr., Brgy. Masadya's Brgy. Captain.

Other interventions to guarantee the sustainability and reliability of their water supply include training on the operation and maintenance of the solar-powered water system with filtration and treatment facility, and provision of ceramic water filters to 50 households from other *barangays*.

DOST-MIMAROPA recognizes the importance of water security to ensure sustainable rural development and resilience, especially in this time of battling against the COVID-19 pandemic where sanitation and hygiene serve as the primary defenses. Through the CEST Program, DOST-MIMAROPA harnesses technology as a springboard for further development in remote areas in the region.

CEST works to raise the living standards of disadvantaged and vulnerable communities by addressing pressing issues related but not limited to livelihood, health and nutrition, education, disaster risk reduction, and climate change adaptation, and environmental protection and conservation.



DOST-MIMAROPA through its Provincial S&T Center (PSTC) in Romblon showcased the CBF through a feeding program.



Aerial and close shot of the water treatment facility located 300m away from the SES- powered groundwater collection system facility.



DOST-MIMAROPA through its PSTC in Romblon shows members of the women's organization how to use the coconut dehydrator (left) and chocolate tempering machine (right) for "Chocobuco" making.

Improving Children's Health and Nutrition with Complementary Baby Food

In addition to the solar-powered water pumping system with filtration and treatment facility, Brgy. Masadya also received various interventions to improve their status of health and nutrition through the CEST program. Barangay health workers and barangay nutrition scholars were provided with various training such as basic nutrition and food safety. The agency also showcased DOST-FNRI's Complementary Baby Food (CBF) through the conduct of a 120-day feeding program to all malnourished children in the barangay aged 6-36 months. Results showed that the children have improved nutritional status. Two children were removed from its severely underweight status while the seven underweight children improved their weight and were classified as normal after the intervention.

"Chocobuco" Making

Economic opportunities in the area are limited, with only coconut trees as the most abundant resource and main source of raw materials. To open more livelihood opportunities, a group of women was trained on the chocolate molding. This inspired them to venture into the chocolate-making business as a source of additional income. In 2019, the women's organization sought assistance from the DOST-MIMAROPA and was provided with coconut processing equipment that can be used to make a special chocolate called "chocobuco," a chocolate treat infused with coconut filling.

Opportunities in Recycling

DOST-MIMAROPA also performed a waste analysis and characterization study and provided the island with a plastic pulverizer



and a junk compactor to improve its waste management and upgrade their materials recovery facility. The technology, which started out as an initiative for solid waste management, later turned out to be an income-generating opportunity for the community and the LGU. Plastic wastes generated by households are being sold to LGUs to be pulverized and become a bulk material for hollow block making. Pulverized plastics are mixed with cement and gravel and then molded into blocks. These hollow blocks are being used in the construction projects of the LGU. Other recyclable wastes on the other hand are being compacted using the junk compactor and are sold to the nearest waste processing facility in Pinamalayan, Mindoro.





Take a look but don't pick them

By David Matthew C. Gopilan, DOST-STII

Orchids of Mt. Busa Researchers from Sarangani push for protection of the province's highest mountain

IN THE southernmost part of the Philippines, there lies a mountain teeming with one of the country's most valuable natural resources: orchids. Their flowers in lushes of red, blue, and any other colors will definitely lure you and wish you could bring them home. They are surely a prized addition for the plantitas and plantitos who are caught up in the "plantdemic" craze.

But researchers cautioned the enthusiastic *plantitos* and *plantitas* to make sure that their plants are not from the wild.

"Orchids are one of the heavily poached flora in the world and in the Philippines, and many of them are endemic and threatened," said Kier Mitchel E. Pitogo from South Cotabato's Provincial Environment and Natural Resources Office in Koronadal City. "If this practice continues to be unabated and unregulated, there is the risk of depleting wild orchid populations," he added and projected that poaching plants from the wild "won't end anytime soon."

Pitogo and his colleague Aljohn Jay L. Saavedra of Philippine Taxonomic Initiative from El Nido Palawan are authors of a research paper documenting the unique, colorful orchids of Mt. Busa in Sarangani. They are all available in the paper from the Philippine Journal of Science, published by the Department of Science and Technology (DOST).

Aljohn Jay L. Saavedra recording a fern plant in Mt. Busa.



Kier Mitchel E. Pitogo documenting an orchid in Mt. Busa (Photo from Kier Pitogo).

They initially hesitated to publish their findings along with the photos of their orchids. But they find it more timely and relevant to publicize their findings given the current craze for collecting plants. "By letting the public know about these Philippine species that are protected under our wildlife law, we can indirectly help in ameliorating the rampant collection of plants from the wild," Pitogo said.

Based on the DOST publication, the 2,064-meter-high Mt. Busa has at least 108 orchids species. But the fieldwork covered only about 50% of the mountain so the researchers are sure that the number of species will surely go up.

"We have not maximized our sampling effort and coverage yet, so we are confident that future fieldwork in the area, and in the whole of the Busa Mountain Range (BMR), would uncover more orchid species more than twice our current record even!," Pitogo exclaimed.

One interesting finding is their discovery of *Oberonia serrulata* in Mt. Busa. This orchid species was thought to exist only in the highlands of New Guinea. Surely, Mt. Busa has surely so much to reveal, and the orchid diversity of the Philippines remains understudied.

Orchids play a lot of ecological roles. Did you know that they are bioindicators? Pitogo explained that orchids are site-specific and need certain environmental conditions to survive. "A change in the orchid flora overtime would mean that there is something wrong about their environment or that poaching is present in the area."

"We wanted to leverage this popularity of orchids among the public to bring attention to the underappreciated biodiversity of southern Mindanao, particularly of the Busa Mountain Range, which is needing protection and conservation," Pitogo remarked.

According to Pitogo, BMR is now identified as a Key Biodiversity Area, making it a high conservation priority site for the government. Its northern slope is within the Strict Protection Zone. Meanwhile, its southern slope is outside the National Integrated Protected Areas System or NIPAS. He explained that NIPAS may mean the highest level of protection.

Environmental advocates in Mindanao are pushing for designation of the southern slope of BMR as a protected area. It would mean a "stronger legal framework for conservation," Pitogo said. "Legislated protected areas in the country will have their resources, management plan, and governing body," he added.

The provincial government of Sarangani has declared Mt. Busa as a local conservation area.

Orchids and the "Plantdemic"

One emerging trend in the urban Manila is what is called "plantdemic." People have converted themselves *plantitos* and *plantitas* and used this to stave off lockdown anxieties. While this has resulted to economic gains to horticulturists, it also heightened poachers to sell orchids and other plants that are illegally taken from the wild.

"If there is an increase in the demand for wild plants then we would expect that the intensity and incidence of wildlife poaching also increases. And we should care because our complacency may lead to local extinctions since it indirectly contributes to indiscriminate collections of wild plants," Pitogo explained.

When asked about how the public could help, Pitogo said: "I think the best way to go about it is to make sure that what we are buying is not from the wild so that the demand for wild-sourced plants will decrease. We can also inform the sellers and our peers about the laws that we violate if we collect plants from the wild, such as RA 9147 (Philippine Wildlife Act)."

Pitogo then encouraged the public to "know your plants well." He added that the buyers must know which plants are non-native (plants not originally from the country) and those that are native and endemic. "If it is the latter (referring to endemic), then be cautious about buying it."



Orchids are one of the most charismatic and recognizable plants groups. Photos from Kier Mitchel E. Pitogo and Aljohn Jay L. Saavedra, published in DOST's Philippine Journal of Science.



Orchids represent the rich plant diversity of the country. Photos from Kier Mitchel E. Pitogo and Aljohn Jay L. Saavedra, published in DOST's Philippine Journal of Science.



Many orchids are described as epiphytes or "air plants." They grow on trunks or branches of trees, and have no attachment to the ground. Photos from Kier Mitchel E. Pitogo and Aljohn Jay L. Saavedra, published in DOST's Philippine Journal of Science.



The discovery of the orchid *Oberonia serrulata* is only known to exist in New Guinea. But Kier Mitchel E. Pitogo and Aljohn Jay L. Saavedra has found the same species in Mt. Busa, Sarangani.

Lake Lanao, one of the world's 17 ancient lakes, remains pristine, study says

By Geraldine B. Ducusin, DOST-STIL

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UR LAKE Lanao from all sampling sites is still pristine; our water is still clean."

This was disclosed by Fema M. Abamo, Ph.D., a professor of Mindanao State University in Marawi City, during her webinar presentation for the regional basic research caravan for Bicol, as conducted by the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP).

The water quality of Lake Lanao in five sampling sites—namely Marawi City, Ramain, Balindong, Taraka, and Binidayan was monitored for two years by using the abundance of one-celled protozoan ciliates as bio-indicators of organic pollution. The highest ciliate abundance was observed in the littoral zone of Balindong at 0.0061 cells/mL during the dry season. The previous study of Beaver and Crisman (1989) categorized lakes as ultraoligotrophic when their ciliate abundance is equal to or lower than 2.4 cells/mL; Lake Lanao, therefore, is ultra-oligotrophic having ciliate abundance below the set range in all sampling sites. Such lake category has very low nutrients, scarce growth of plants and algae, and high dissolved oxygen indicative of a clean, healthy, good water quality and not organically polluted lake.

Organic pollution occurs when large quantities of organic compounds are released into aquatic ecosystems. Sources of pollution usually come from wastes generated by agricultural, residential, and industrial activities. High levels also of inorganic nutrients such as nitrogen and phosphorus in water can cause an overgrowth of plants and algae. As plants and algae die, they become organic materials in the water. Decomposition of these organic materials uses up high amounts of oxygen, thus depriving the fish population of needed oxygen that causes fish kills in the lake. These decaying organic compounds serve as substrates for the microorganisms, increasing the bacterial population, which in turn supports the abundant growth of ciliates.

Ciliate abundance varied as the season changed, *i.e.*, lower in the non-mixing season and higher in the dry season indicative of nutrient and organic load fluctuations in the lake as the season changed. Water samples for this study were obtained from 50-100 meters away from the lakeshore in the shallower littoral zone and towards the deeper open water in the pelagic zone.

Their results were corroborated by the findings of another group in the same program conducting the physical and chemical characterization of the lake and found the same that the lake is not polluted but still healthy and has good water quality.

The study, which was funded by the DOST-NRCP, was conducted during a three-year period but was temporarily suspended and eventually allowed to resume after the Marawi siege.

"The lake was reportedly deteriorating due to increased human population and activities around the lake," Abamo said, explaining why there's a need to conserve the lake's good condition, especially now that the people have resettled back near the lake after the Marawi siege.

The researchers suggested to the local government to strengthen their policies to maintain the healthy condition of the lake.

"We have recommended to the local government to create and implement stricter policies and ordinances to conserve the lake, and regulate and check both the residential and business establishments around the lake," Abamo said.

Lake Lanao is estimated to be around 10 million years old (World Lake Database) and is listed as one of the 17 ancient lakes of the world with a tectonic-volcanic origin. It is the second largest lake in the Philippines and the largest one in Mindanao, home to 18 endemic cyprinids (freshwater fishes related to the carps and minnows) that are found nowhere else in the world.

For generations, Lanao Lake has been a potent natural resource that breathes life to the Maranaws as a source of their food and water, livelihood, religious practices, transportation, and sports. But more than anything, the lake has shaped the Maranaw culture and tradition to what it is now and it has become imperative for the Maranaws to preserve its pristine beauty for a better and sustainable future.

Abamo is a member of DOST-NRCP's 4,944 research pool involved in various scientific disciplines. For more webinars on basic research, interested parties can visit the DOST-NRCP's Research Pod, a Facebook Page of the council.



The research team during field work for the Lake Lanao project after the Marawi siege. Photo: lifted from the zoom presentation.

Iligan City improves waste management through S&T

By Richelle Gonida and Julie Anne Baculio, DOST-X



DOST-X, led by PSTC-Lanao del Norte Provincial Director Gerrylou Sweet M. Pia (leftmost), turn over the check to LGU-Iligan.

OVER THE past years, Iligan City has been facing issues regarding waste collection as its population continues to grow. Though the city promotes strict waste segregation throughout its 44 barangays, its Central Material Recovery Facility (CMRF) is still having difficulty in handling wastes coming from the different Barangay materials recovery facilities due to the increasing volume of garbage collected per day.

To address this pressing need, the Local Government Unit (LGU) of Iligan partnered with the Department of Science and Technology (DOST)-Lanao del Norte to acquire waste management equipment and enhance the city's waste management processes. DOST-X turned over a check amounting to PhP 501,600.00 to LGU-Iligan for the project titled "Technology Support through Provision of Waste Shredding Machines and Dual Drum Composters for Waste Management of Iligan City, Lone District" on 15 January 2021.

The DOST-Community Empowerment through Science and Technology funded project aims to provide two units of dual drum composter and two units of organic waste shredder to two barangays in the city: Barangay San Miguel and Barangay Tomas Cabili. It also aims to improve the city's waste recovery efforts through process improvement.

The dual drum composter is a smallscale motorized composter developed for managing 100 kg of biodegradable solid waste. It follows a standardized process with compost as the end product. DOST-Industrial Technology and Development Institute developed this equipment to enhance biodegradable waste management in the country.

Both the DOST-X and LGU-Iligan envisioned the project to minimize wastes by converting them to usable and value-added products, accelerate the decomposition of solid wastes, and intensify the city's implementation of solid waste management.

"We are hoping that this project will serve as a model on solid waste management for the other barangays in Iligan City to follow," said DOST-LDN OIC-Provincial Director Gerrylou Sweet M. Pia.



The images captured by the DIWATA-2 were used in monitoring the extent of the ash fall from the Taal Volcano explosion last January 2020 (Photo from stamina4space.upd. edu.ph).

PH-owned satellites provide major help in monitoring the Taal Volcano explosion and Manila Bay Rehab efforts

By: Allan Mauro V. Marfal, DOST-ST//

BEFORE THE recent launching of the Maya-2 CubeSat in space on 21 February 2021, the Philippines has already developed and launched three satellites initially. Aside from the pride and the opportunity to send our Filipino scholars abroad, various sectors and government agencies have benefited from these satellites. In the latest episode of the DOST Report, officials and experts from the science department shared that DIWATA-1, DIWATA-2, and Maya-1 were able to generate data and information, which became significant to the monitoring of Taal Volcano explosion and rehabilitation drive of the Manila Bay. According to Dr. Alvin E. Retamar, Officer-In-Charge of the DOST-Advanced Science and Technology Institute (ASTI), the images captured by DIWATA-1 were used to monitor the turbidity of Manila Bay. He said that in a color image captured by DIWATA-1 on 19 February 2018, was visible are turbid water against the dark sea from Bulacan and Metro Manila, showing large areas of high turbidity.

Apart from that, the images of DIWATA-1 were also used for scientific purposes by determining cloud-type hype. Dr. Retamar explained if there is a faster growth rate of vertical cloud type hype, it means there is a possibility of a thunderstorm or rain.

Meanwhile, for DIWATA-2, it was able to cover almost 85% of our landmass and monitor the ash fall from the Taal Volcano explosion last year, especially its extent in different areas of Southern Luzon and Metro Manila.

Dr. Retamar added that images from DIWATA-2 were also relevant in incidents like during forest fire in Benguet, coral seagrasses for coastal applications, and urban planning.

DIWATA-2 can also be used as an emergency communication facility due to its amateur radio unit.

DIWATA-1 was launched in the space on 23 March 2016 while DIWATA-2 on 29 October 2018. Both of them weigh more than 50 kilograms and in cooperation with Hokkaido University and Tohoku University.

On the other hand, Maya-1 CubeSat, which weighs one kilogram, was launched in space on 29 June 2018. Dr. Retamar said that a nanosatellite such as Maya-1 has the same function and impact as DIWATA-1 and DIWATA-2 but its ability to become a platform for learning is the true essence of this project. He said that being part of the development of Maya-1, we were able to assess if nanosatellite is more cost-effective than microsatellites like DIWATA-1 and DIWATA-2.

DOST Secretary Fortunato T. de la Peña said that developing and launching our satellites would provide long-term benefits for the country even it is entailing a huge cost.

"It is a worthy investment. Those images captured by these satellites could be a strong basis for policy recommendations, project implementation, and decision-making to various sectors," said Sec. de la Peña.

Sec. de la Peña stressed that moving forward, these projects are seen to further intensify the efforts of the country to harness the power of satellite technology for other purposes like those for agriculture, forest cover and natural resources inventory, weather forecasting, and disaster damage assessment and monitoring, among others.

The images captured by DIWATA-1, DIWATA-2, and Maya-1 were sent to the ground receiving stations such as PEDRO (Philippine Earth Data Resource and Observation) Center in the DOST-ASTI office in Quezon City and Davao Ground Receiving Station in Davao City. The processed images from these satellites can be accessed via philmicrosat.upd.edu.ph/.

Maya-2 launched

The Maya-2 CubeSat was launched on 21 February 2021, 1:30 in the morning, through

the International Space Station along with Paraguay's GuaraniSat-1 CubeSat and Japan's Tsuru CubeSat for the BIRDS 4 Satellite Project - KyuTech aboard the Northrop Grumman CRS-15 mission.

The Maya-2 CubeSat team is composed of BIRDS-4 Project Manager Izrael Zenar C. Bautista who obtained his degree in MS Energy Engineering from the University of the Philippines (UP) Diliman; BIRDS-4 Project member Mark Angelo C. Purio, on the other hand, obtained his degree in MS Electronics Engineering from the De La Salle University and his MA in Education from Adamson University; and BIRDS-4 Project member Marloun Sejera who earned his degree in MS in Electronics and Communications Engineering from the Mapua Institute of Technology.

Meanwhile, Prof. Paul Jason Co, the project leader of Space Science Proliferation through University Partnerships or STeP-UP Program, said that eight DOST scholars have been working on the development of Maya-3 and Maya-4 under the Nanosatellite Engineering Program of Electrical and Electronics Engineering Institute of the UP Diliman. These scholars are Angela Clarisse Chua, Anna Ruth Alvarez, Khazmir Camille Valerie, Gio Asher T. Tagabi, Chandler Timm C. Doloriel, Genesis Remocaldo, Ronald P. Collamar, and Jonathan Joseph G. Co.



Faithfully serving the nation through science

By Allyster A. Endozo, DOST-STII

2020, THE year that was, has already come and gone. The terrifying specter that haunted it, however, lingers on to this day and—may fate forbid—could still wreak havoc in the coming years. The Coronavirus Disease 2019, otherwise referred to as COVID-19, has chillingly amassed over two million deaths out of nearly a hundred million cases worldwide since it first broke out in December 2019 as a local epidemic at Wuhan in mainland China.

Twelve months on, monumental challenges brought about by the pandemic have yet to be decisively addressed. Health workers in the frontlines keep on stemming the tsunami of newly infected patients. Policymakers keep on scrambling for solutions to keep the bureaucracy and the economy afloat. The working masses keep on toiling daily as they brave the "new normal" world despite the danger lurking beyond the walls of their homes.

Fortunately, the proverbial "light at the end of the tunnel" may just be around the corner as a number of promising vaccine candidates are set to be rolled out in select countries this year. An impending question, however, remains with regard to the cost of mass vaccination in developing nations: will there be sufficient personnel qualified enough to administer a costly and heat-sensitive vaccine to millions of people across the country?

Enter Dr. Nicanor Pier Giorgio R. Austriaco, Jr., O.P.—a professor of biology and theology at Providence Colleges in the United States who is working on genetically engineered yeast as a possible means to orally introduce the forthcoming COVID-19 vaccine among Filipinos. This low-cost technology may prove to be advantageous as it minimizes the need for cold storage, the availability of which would be problematic in remote areas.

Dr. Austriaco, O.P. is no stranger when it comes to COVID-19 research. He serves as the lead investigator for the University of Santo



Dr. Nicanor Austriaco, O.P. wearing a priest's black cassock underneath a scientist's white laboratory gown.

HEALTH & NUTRITION

Tomas (UST) CoVAX Vaccine Awareness team that is working to bringing awareness to the Filipino public regarding the new vaccines. He is also a consultant for the Catholic Bishops Conference of the Philippines on ethical matters relating to COVID-19 measures.

As a fellow of OCTA Research, Dr. Austriaco, O.P. works for the Office of the President and the Department of Health on data analysis, forecasts, and recommendations for pandemic management—the findings of which were published in the October 2020 issue of the Philippine Journal of Science. In this function, he co-advises mayors and public health authorities of Quezon City, Las Piñas, and other major cities around the country.

From 1989 to date, Dr. Austriaco, O.P. has assumed a myriad of academic functions—a professor, research fellow, instructor, scholar, editor, reviewer, director, board member, advisor, consultant, and chaplain. He garnered a total of 17 awards and honors, seven research grants, five genomic sequence publications, and three patents—which provided him the opportunity to travel to a dozen different countries in Europe and North America.

Moreover, Dr. Austriaco, O.P. was invited to speak at 106 events and present in 22 academic conferences. He authored 72 journal articles, 15 book reviews, six encyclopedia entries, and two full-length books. He also penned 15 popular essays and nine newspaper commentaries four of which appeared in Rappler and one in Manila Bulletin. He likewise appeared in an ABS-CBN news report covering his yeast research.

Having said aplenty that ought to be known about the career of Dr. Austriaco, O.P. as a "priest-scientist," many more remain untold about him as a humble, cape-less man—a man of words, thoughts, and actions; a servant of the faith, of science, and of the country.

ACTA (ACTIONS) The past, the present, and the future

• His family is a native of which part of the country?

I was born at the UST Hospital in Manila. My father is from Lal-lo, Cagayan, and my mother is from Naga City, Camarines Sur. We left the Philippines when I was four years old. I grew up in Bangkok, Thailand, and Penang, Malaysia. I went to the USA to attend the University of Pennsylvania and I have lived there since then. I am a dual citizen of the Philippines and the United States.

 How did his parents make a living? How many siblings does he have?
Both my parents earned their Ph.D.'s (doctorate degrees) in engineering. They Philippine Journal of Science



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were university professors like I am. I have a younger brother and a younger sister.

• How did his role models make an impact on his character?

My parents were always my first role models. They taught me to pray hard, to work hard, and to care about those around me and not just myself.

 How did his passion for science progress over time? How about his faith?
I wanted to become a cancer biologist when I was 10 years old. I did not know how anyone became a cancer biologist so I majored in bioengineering at the University of Pennsylvania. I met my first cancer biologist there and he convinced me to do my Ph.D. in biology, which I earned at MIT (Massachusetts Institute of Technology). I have very much enjoyed doing science. I get to solve puzzles all the days of my life.

I have been a Catholic Christian from the beginning, but everything changed when I met the Lord Jesus on May 7, 1996, at 5:30 pm at M.I.T. The encounter with Christ, risen from the dead, changed everything. I realized for the first time that He is alive and that He loves me more than I can love myself! It was the most important discovery of my life. Before then, science was my god. After then, the Savior of the world, He is God.

Within two years, I had decided to resign my position as a fellow in cancer biology at

the Ludwig Institute for Cancer Research at the University College London to enter the seminary with the Order of Preachers (O.P.), known also as the Dominican Order.

- How did he surpass his most daunting challenges?
 Hard work and a lot more praver.
- What were his most proud achievements recently and much earlier? Professionally, I am most grateful to God for three achievements. First, I am grateful for being a member of the team of MIT scientists who first described aging genes in yeast. This laid the foundation for the seminal discovery that the sirtuins linked metabolism and gene expression. Second, I am grateful for the opportunity to undertake pandemic management for COVID-19 for the Philippines, the land of my birth, and to work to develop a yeast-based COVID-19 vaccine platform for developing and resourcepoor countries. Finally, I am grateful for the opportunity to have trained so many talented undergraduates who have gone on to pursue scientific careers of their own.
- What are his most immediate undertakings in the coming years?

I am a professor of biology and theology at Providence College, and I will continue to serve in this capacity. I hope to form a long-term relationship with [UST] that would allow me to train Filipino scientists in cellular and molecular biology.

• What is his life-long mission and for the sake of which?

Before I am a scientist, I am a priest. My lifelong mission is to preach the love and mercy of God that I discovered at MIT. I do science because that is what God has asked me to do. And, also, because it is so much fun!

COGITATA (THOUGHTS) Faith and science against the pandemic

 How has he viewed his experiences and those of his family, colleagues, and compatriots in the Philippines amid the COVID-19 pandemic?

I have spent most of the pandemic here in the Philippines. For many of those months, I have served as a fellow of OCTA Research, which is using data analytics to serve the common good during this pandemic. Once again, I have discovered that Filipinos are an incredibly resilient people and that our faith and our families provide us with a secure foundation in times of difficulty. I have also been troubled by the extreme poverty that I have seen here that has been exacerbated by COVID-19. We have to do more to help our fellow Filipinos who have barely enough to eat.

 In what ways are these experiences similar and different to those during his time in the United States?

The United States is a rich country that is experiencing profound cultural and social conflict because of fundamental disagreements over the nature of community, freedom, and the human person. The COVID-19 pandemic exposed the social rot that has led to a widespread disregard for the common good.

In contrast, the Philippines is a poor country that is still one nation. The COVID-19 pandemic has exposed the gross inequities that are prevalent in Filipino society but it has also shown me the resilience of the Filipino soul.

- What is his take on the dynamics between his faith and his scientific profession? In what ways are they in harmony, if not in conflict?
 I am a priest-scientist. My life has been characterized by the search for truth, whether it be religious truth or scientific truth. Since both faith and science are gifts from the one God, in principle, there can be no conflict or contradiction between them. Any apparent conflict is an invitation to more profoundly investigate both sides of the question to find the truth that resolves the tension.
- From his point of view, in what ways can faith and science improve the situation for the people as they collectively deal with the pandemic?

Both science and faith are necessary to respond to the challenge of the pandemic. Science is needed to better understand the nature of viral infection and to find solutions to the pandemic. Faith is needed to better understand the existential impact and meaning of this historic global pandemic on the lives of individual people who are suffering and who are dying.

DICTA (WORDS) His message, realization, and advice

• What inspirational message can he share with the people who are struggling with the pandemic?

To those who are struggling, suffering, and dying because of the pandemic, I say this: like every plague that has been recorded in history, the COVID-19 pandemic too will pass. As a Christian and a priest, I do



not understand why divine providence has ordained this pandemic at this time in history. However, I do know that there is a God who has loved us unto death. This God who has been revealed in Jesus Christ continues to call each of us to enter into an intimate friendship with Himself. I know that for me, it is this friendship with the Savior of the world that has allowed me to weather the many burdens of the pandemic.

 What personal realization can he share on the exercise of virtues or some other set of values to overcome such challenges?
Of all the virtues, I will single out the virtue of faith because it is faith that allows me to see beyond the tragedies and worries of COVID-19. It is faith, my Christian faith, that allows me to cling to Christ to overcome every challenge and every burden, whether it be related to the pandemic or not. All the other virtues are transformed when they are grounded in the Christian faith because it is the Christian faith that allows us to see that we are still loved in spite of all the suffering that surrounds us. And in the end, it is only love that allows us to move on when we simply want to give up.

 What motivational advice can he share with the young churchpersons and scientists who feel determined to perform their duties in the name of their faith, profession, and country? The Philippines needs more scientists. We need scientists to provide solutions and to develop technologies to help our nation to develop and to flourish. This is especially important because there are many among us who are suffering from abject poverty. I am a scientist because God called me to do science for the benefit of others. He continues to call many others in the Philippines to the same vocation.

Treat pandemic as disaster that needs preparedness, scientist says

By Geraldine B. Ducusin, DOST-STII

"LET'S THINK of pandemics and even localized epidemics as disasters for which we need preparedness and mitigation strategies."

Michael Tan, Professor at the University of the Philippines, said, during his presentation on "COVID-19, Circularity and Better Normal: Recovery and Rebuilding" at the Annual Scientific Conference and 88th General Membership Assembly of the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP).

Further, Tan mentioned that the country's unpreparedness with COVID-19 does not augur well for future public health emergencies as well as other natural disasters. What if, he supposed, the "Big One" turns out not to be an earthquake but a pandemic more serious than COVID-19?

Tan pointed out, "We just might outlive COVID-19, but COVID-19 is not going to be the last pandemic so it is not enough to speak of resilience, which often becomes as excuse for inaction, or for halfway measures."

What the country needs is to aim for a better normal, which includes avoiding mistakes of the past and addressing the "comorbidities" medical or social that made COVID-19 so destructive.

The four social concerns—the neglect of housing, transport, education, and social safety nets—are often referred to simply as "poverty," which somehow obscured important skewed social relations and economic inequities.

On the concept of "circularity," Tan explained that circularity relates closely to sustainability, which has been neglected especially in terms of S&T development for healthcare.

Poverty, he elucidated is not just low income; rather, this includes living in congested slums, shopping in congested groceries and malls, it's taking congested public transport, it's being more vulnerable to extortion from law "enforcers," it's paying more, in relation to income, when someone gets sick or dies.

Food and nutrition are parts of science and technology (S&T) and it is here where circularity is all the more important as the country faces serious problems on food security which will worsen during disasters.

While acknowledging government's efforts in S&T, such as the *abaca* face masks, testing kits, and medicines, Tan observed

that the Philippines has swallowed the "too small a country" argument hook, line, and sinker. And here he cited the tiny *Republica Cubana, que hermosa y forte eres!*, which has an 11 million population—even smaller than Metro Manila, yet they are developing four COVID-19 vaccines, of which the main one is called *Soberana*, for sovereignty.

"In contrast, we do not even produce our own syringes for the vaccines," Tan mentioned.

A lot still need to be done and foremost is explaining efficacy. Even a high 93% efficacy rate will mean 70,000 people out of 1 million vaccinated people getting infected albeit mostly mildly. This is not being talked about enough but, like family planning in the past, each failure, each negative experience (think vasectomy pregnancies!) sets back public health campaign, according to Tan.

There should be an information, education, and communication for vaccination: as vaccines come in, the country has to deal with widespread vaccine hesitancy, some related to growing denial of COVID-19 ("gawa gawa lang") plus mistrust because of previous vaccine scares and Dengvaxia. Pulse Asia survey in November 2020 found that only 32% of Filipinos were willing to be vaccinated, which is far too low for herd immunity. Tan acknowledged, however, that there are a lot of good things being done and he encouraged the documentation of these good practices among national and local governments, including kinder, more compassionate, and science-based approaches, some in sharp contrast to unscientific methods.

Since over 1,600 gathered virtually for the annual scientific conference, the social scientists were urged to remind the government that it needs their research, quantitative and qualitative, to inform public policy. From these researches, for instance, information on what the people are doing are known, whether these are good things, such as gardening, or risky, such as the taking of Lianhua, which is a Chinese remedy with ephedrine, or some other practices, like "suob/tuob," which people resort to that needs to be evaluated.

DOST-NRCP holds the biggest and largest database of science, including social science and humanities, experts in the country. For information and requirements on free membership for Filipino researchers and other free informative research-based webinars, please visit Research Pod page on Facebook, the DOST-NRCP's basic research promotion page.



Professor Michael Tan during his presentation on "COVID-19, Circularity and Better Normal: Recovery and Rebuilding," at the Annual Scientific Conference and 88th General Membership Assembly of the DOST-NRCP.

"No death penalty needed": TB and health injustice in Philippine prisons

By Allyster A. Endozo, DOST-ST// Photos and captions from ICRC Extreme jail congestion in the Philippines contributes to the spread of TB, which is transmitted by air through coughing, sneezing, and spitting by an infected person.

PRISON (/'PRIZ(Ə)N/): a word horrifying enough to send chills down one's spine upon its mere utterance. Known by its many names—lock-up, penitentiary, reformatory it is "an institution where people are kept as punishment for committing a crime," as defined by Macmillan Dictionary. In a cruel twist of irony, the very system designed to exact justice has kept regressing into an inhumane cesspool throughout decades of mismanagement.

The Asia-Pacific region hosts the largest prison population in the world with over four million incarcerated in 2019. Among all nations, the Philippines ranked first in congestion rate at 534% as of March 2020. A total of 134,549 inmates were kept in 467 jails as of September 2019, while 49,114 remained inside prisons as of January 2020. Manila City Jail, with its nearly 1,000-person capacity, currently houses more than 5,000 detainees.

On top of diabetes, hypertension, and mental illnesses, inmates are especially vulnerable to infectious diseases amid overcrowding such as TB (tuberculosis), HIV, and—more recently—COVID-19. Human Rights Watch called out the administration for numerous underreported prison deaths during the pandemic, while the Red Cross raised perennial lapses in inter-agency coordination, policy coherence, and facility and staff adequacy.

Food and sanitation stood out among other challenges outlined during the third Asian and Pacific Conference on Prison Health held November 2019 in Manila. A Far Eastern University study reported that government allotment for daily food supply amounts to less than USD 1 per prisoner. Moreover, the New Bilibid Prison (NBP) did not provide showers for its 26,877 convicts, who had to make do with communal drums for bathing and laundry.

All the aforesaid problems in living space, healthcare, nutrition, and sanitation add up into a recipe for one pestilent disaster in particular. In 2008, TB claimed around 1.3 million lives globally, 34% of which are in southeast Asia. It is estimated that 75 Filipinos on average die of TB every day; the equivalent figure could be unspeakably high in prisons, where TB's prevalence is reportedly ten times more than that in the general population.

In fact, during a senate hearing on 03 October 2019, the NBP Hospital Chief disclosed that about 20% or over 5,000 prisoners perish each year for its population of nearly 26,000 mostly due to TB, apart from stabbing incidents and old age. Having heard about this information, the Senate President was then quoted as derisively saying: "We don't need [the] death penalty anymore."

Despite their ostensible similarity, TB is far from being the mythical Grim Reaper who justly culls mortal souls regardless of their standing in society. In one highly publicized case in the late-2000s, two factory workers died from TB in detention for protesting the illegal termination of workers of Karnation Industries and Exports, Inc. and demanding payment of minimum wages and other lawful benefits from their employers.

Health presents a salient dimension to a list of disrepute the Philippine penal structure is long mired in: from its administrators and procedures to its infrastructure and resources. One can't help but think that the system suffers from a malady that can't seem to ever go away. The remedy, one can only hope, still awaits to be discovered through an unlikely recourse—via sound research grounded on indigenous science and technology.

TB or not TB?

In an effort to better understand and, hence, better manage the TB epidemic scourging our prison system, a group of medical researchers conducted a molecular analysis of the bacterium (*Mycobacterium tuberculosis*) collected from inmates with pulmonary TB in selected prisons in the country. The team was led by Dr. Jaime C. Montoya, the Executive Director of the Philippine Council for Health Research and Development.

Discharged mucus samples were taken with full consent from detainees housed in the NBP, Metro Manila District Jail, Manila City Jail, Antipolo City Jail, Cebu City Jail, Davao City Jail, and Correctional Institute for Women. Included in the study were participants experiencing a number of hallmark symptoms such as persistent or even bloody cough, sudden appetite or weight loss, back and chest pain, night sweats, and prolonged fever.

Most of the patients were male (84%) and aged 30–49 years old (68%), with over half (52%) having the TB bacteria present in the samples—a number of which (28%) is considered highly loaded. An overwhelming majority (72%) showed a severe pulmonary form of TB, whose infection can spread through the bloodstream and is typically characterized by lesions and even fluid within the cavity of one or both lungs.

On the fortunate side, 80% of the isolates across four different strains were containable by first-line antibiotics. A cause of concern, however, was the resistance of the remaining to streptomycin (12%) and multiple drugs (8%). Furthermore, 48% of the patients were infected by bacteria belonging to the unique "EAI2_Manila" cluster, which suggests that TB in the country goes way back by millennia along the evolutionary chain.

Curiously, no significant associations were found among patient demographic factors, disease severity, drug resistance, and bacterial strain. This might stem from the fact that the research team was only able to study 25 cultures out of the original 2,622 invitees—a challenge made much more complicated by issues on establishing informed consent, TB criteria, attested samples, and uncontaminated cultures in the prison setting.

The group of Dr. Montoya relented on the need for further studies that would utilize whole genome sequencing and other modern sensitive techniques so as to "better describe the dynamics of TB transmission in Philippine prisons." Until then, painstaking transformation needs to be urgently implemented by authorities for the sake of those enduring behind bars, the bare misery of whom remains elusive from the eyes of the free, average citizen.

Reproductive health education vital to preventing teenage pregnancy during the pandemic



By Geraldine B. Ducusin, DOST-STII

"TEENAGE PREGNANCY is unplanned, but not necessarily unwanted, and unplanned pregnancy means no regrets."

These are some of the findings presented by Dr. Gloria Luz M. Nelson, Professor of Sociology, University of the Philippines Los Baños, from the study of 18 teenagers from nine provinces in seven regions in the Philippines who are pregnant, mothers, or are both pregnant and are mothers at the same time during the COVID 19 pandemic crisis.

When asked how it is to be a mother, teens responded that being a mother means a source of joy, excitement, and inspiration. No one had attempted to abort or commit suicide.

Majority, except one, however, expressed regret over being pregnant, "Napakaboring, 'di ako makalabas, di ako makagala. Kain, tulog na lang ako...mag isip ng mga bagay na walang kwenta, makipagchismisan sa mga kasama ko sa bahay, mangarap ng napakalalim na imposibleng nangyari" (It is boring, I cannot leave the house to roam around. Eat, sleep only... vague thoughts, gossiping with my housemates, dream big but I know it is impossible for it to come true).

Further, these teens view pregnancy as a consequence of having a boyfriend and that sexual abstinence and use of contraceptives are not being practiced. Also, for those interviewed, being intimate is an expression of love and respect.

While the study cannot provide a general conclusion, given its small sample size and

the qualitative method employed in the study. It however, provided vivid descriptions and meanings of the experiences of the Filipino pregnant teens during the COVID-19 pandemic crisis.

The stories told by the teens show that family members, partners, husbands, relatives, and friends are the main source of financial and emotional support of the teenagers. Most of these teens are not currently enrolled but have plans to continue their studies since they are aware that education can help provide a better future for their children.

Nelson cautioned, though, that the study is bias towards teens with access to cellular phones. The in-depth interviews that lasted for over an hour were conducted via Facebook Chat or Messenger, and this leaves out those who did not have access to communication devices. Nelson further shared that most of the time, cellphones are not for the exclusive use by teens but for the use also of other members of the households.

From the researcher's perspective, the situation of teenage pregnancy and teenage mothers means facing multiple burdens that include the following: having a low to no income, lack of education, less employment opportunities, and health risks for both the mother and the unborn child.

In a related study in 2020, it was estimated that two million Filipino women, 15–49 years old, are expected to get pregnant

due to COVID-19 lockdowns, and 10 percent of these pregnancies will come from those below 20 years old.

Photo from www.philstar.com

One of the recommendations of Nelson and Gonzales is to urgently implement an age-appropriate comprehensive sex education, which according to them is not a privilege, but a right of the youth to know about reproductive health from the right sources. Nelson, added that sex education does not only mean teaching the youth on the proper use of contraceptives, but includes rational planning in terms of the following: when they want to have kids, how many they want, how many years of interval between children, and learning to say "No" over sexual advances.

For his part, Gregorio E.H. del Pilar, President of the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP), emphasized the importance of qualitative research, such as this, which gives people the knowledge on the range of varying experiences, instead of the trends commonly provided by quantitative studies.

The study, the 7th in the KTOP (Kapakanan ng Tao sa Oras ng Pandemya-COVID) webinar series, was viewed by over 300 participants, some of whom came from the House of Representatives, Commission on Youth, Department of Social Welfare and Development, National Security Council, and the Population Commission. KTOP is a basic research promotion initiative of the DOST-NRCP.

Study explains possible danger of low nitrite in skinless longganisa

By Geraldine B. Ducusin, DOST-STII

SAKTO LANG! No more, no less is the way to go in processing food and the exact recommended measurements of preservatives must be strictly followed to keep our food safe for consumption.

Studies have shown that nitrite plays a key role in the preservation of meat products such as *tocino* and *longganisa*. While the consumption of too much nitrite over long periods of time could have carcinogenic risks; its underapplication, on the other hand, may also pose another health risk as this could shorten the product's shelf life and compromise the integrity of the meat products.

Nitrite used in meat curing adds a distinct color and flavor and enhances the antioxidant activity of processed meat products. It helps prevent the product from turning rancid and it controls the growth of foodborne pathogens, such as *Clostridium botulinum*, the bacterium which causes botulism. Botulism is a rare and potentially fatal illness caused by the toxin produced by the bacterium *Clostridium botulinum*, which may result in weakness, blurred vision, fatigue, and difficulty in speaking and in breathing.

According to the World Health Organization, foodborne botulism, which is caused by the consumption of improperly processed food, is rare but can be potentially fatal if not diagnosed immediately and treated accordingly.

A team of researchers from the University of the Philippines Mindanao (UP Mindanao) conducted a study "Linking Sociodemographics of Meat Vendor-processors to Residual Nitrite in Skinless Native Sausage Sold in a Typical Public Market in the Philippines," which examined a total of 90 cured skinless *longganisa* packs weighing 120–320 grams per pack, collected from the vendor-processors at a typical public market in Davao City.

"The study results demonstrated that all skinless *longganisa* samples gathered had residual nitrite levels ranging from 0.005– 1.031 mg/kg, which is way below the minimum required amount of 50 mg/kg for the inhibition of *Clostridium botulinum*," says Dr. Virginia P. Obsioma, Professor at the Department of Food Science and Chemistry, College of Science and Mathematics, UP Mindanao.

In relevant and earlier studies, it was explained that the underapplication or lack of nitrite used may, on the one hand, compromise the microbiological safety of cured meat. It was also found previously that, traditionally, Filipino market vendors primarily used nitrite more for color, texture, and flavor functions, rather than as a preservative or antimicrobial agent.

The current study, however, finds that the extreme precaution of the vendor processors, which may have led to their underapplication of nitrite in skinless *longganisa*, may have been a result of their fear of the ill effects of overapplication of nitrite.

The study also revealed that those with higher educational attainment tend to apply less residual nitrite levels for food preservation, with the values falling way below the recommended limit. The skinless *longganisa* processed by the vendor-processors who reached high school was found to have lower residual nitrite compared to that processed by those who attained elementary education.

Furthermore, the study revealed that skinless *longganisa* vendor processors who are married tend to incorporate more nitrite into their products compared to their unmarried counterparts. The same result was observed among *longganisa* processors with children in the household, as they tend to increase the application of nitrite to make the color and flavor more pleasing to the consumers.

"There is a need to improve the food safety knowledge and practices of the skinless

longganisa vendor-processors, specifically in the application of appropriate nitrite levels to ensure the safety of the processed meat," Kriza Faye A. Calumba, also a member of the research team, said.

The team also recommends that food safety seminars must be regularly conducted to educate food processors and vendors on appropriate amounts of nitrite and emphasize the correct measurements to apply to avoid the bad effects of both overapplication and underapplication.

Likewise, the researchers suggested that the seminar can be conducted in the vernacular to ensure easy and correct understanding by all participants.

Realizing the practical value of the study, this can serve as a relevant information for local government units and government agencies mandated to oversee the safety of products sold commercially for the protection of the consuming public.

This study appeared in the Philippine Journal of Science (Vol. 149, No. 4, December 2020), the oldest science journal in the country, published by the Department of Science and Technology-Science and Technology Information Institute. For detailed information on the study, you may visit the link https:// philjournalsci.dost.gov.ph/



(Photo credit: UP-Mindanao researcher conducting a survey among *longganisa* vendor-processors in a typical public market in Davao City)



Tour Batanes with DOSTv!

By Karl Raven Ramon, *DOSTv* Photos by DOSTv

Gel Miranda, host of DOSTv, enjoys posing in the picturesque Valugan Boulder Beach. It is one of the wonders of Batanes. ound to Batanes but your flights get cancelled last year? The Pandemic surely is a downer to our travel goals. The place is idyllic and peacefully – pleasurably isolated and can be a respite from the maddening world. While Batanes is still not

accepting tourists, at least as of this writing, the DOSTv team had the lucky chance to relish taste its local

delights, get-in touch with its people, and explore its many delights before the pandemic.

DOSTv will share what they experienced in one of the most famous bucketlisted destinations in the Philippines – Batanes.



A Taste of Batanes

First time in Batanes? Make sure to drop-by at the top highly-searched, famous, or well-known honesty store and honesty coffee shops, where you can pick out and pay items such as local delicacies of cookies and pastries unwatched or out of trust.

Indulge in healthy-flavored cookies, a variety of flavors from turmeric to carrots, and coconuts all made from "AJ's Bread and Pastries."

Your throat must be probably dry now thinking of those cookies. Have a sip of Tawsen Agriventures' turmeric tea. Not just your ordinary turmeric tea. Their special concoction is composed of common ginger and yellow ginger.

Get your notes ready as we share the step-by-step process on how you can make your own turmeric tea powder. (scan QR code for the video).



Thirst for more sips? Don't forget the Arius wine made from the Arius Tree, a tree that mysteriously bears fruit only in Batanes.

Both AJ's Bread and Pastries and Tawsen Agriventures are recipients of the the Department of Science and Technology's (DOST) Small Enterprise Technology Upgrading Program (SETUP). It is a nationwide strategy to encourage and assist SMEs to adopt technological innovations



to improve their operations and thus boost their productivity and competitiveness. AJ's received PHP

250,000 worth of equipment that enabled them to meet the growing demand for their products while Tawsen on its second phase received PHP 2.3 million to augment their production as they ventured to create other delights for their product line.









Edson Rico, one of many high school graduates from Itbayat who leave their hometown to continue tertiary education.



The People of Itbayat, Batanes

Low crime rate, people hanging their electric bill payment outside, we all assume that life in Batanes is simple and in perfect seclusion. But to its secludedness seeming isolation, opportunities are scarce.

College education is a struggle especially in Itabayat, the biggest and one of the hardest to reach. In order to attend college, students should brave the motion sickness-triggering nauseainducing strong current. Even locals go seasick from the strong sway of vessels, let alone tourists who are not used to this.

One student from Itbayat had to leave his home and study in the mainland Basco since no tertiary school is available in the island. Edson Rico from Itbayat, a recipient of the scholarship program from DOST's Science Education Institute, is now an Information Technology graduate from Basco State College.

With his monthly stipend from the scholarship, he was able to finish his studies while helping his family to build their own house.

Even as a degree holder, he still wants to pursue his first dream of becoming a civil engineer, return to Itbayat, use his knowledge, and help his hometown.



Fish is Flying in Batanes

Not just simply because it is called flying fish, the fish in Batanes is actually flying. Right after being caught, fish is brought to the fish port, processing it fresh and clean – thus making this a value-added product and a must-have pasalubong.

Now known as *dibang* "or 'day-old," it gets popular among tourists because of its delectable taste. But due to airport protocols, many tourists would rather not buy *dibang* as this means extra expense for check-in baggage.

Dibang maker Teresy Idel models Batanes' best packed with the use of vacuum sealer. Their vacuum sealer is provided by DOST and it is the first of its kind in the province.

Only those of vacuum-sealed processed *dibang* may be allowed in hand-carried baggage. In response to this setback, the Provincial Science and Technology Center of DOST in Batanes provided the fishing port a variety of processing equipment.

Particularly, a vacuum-packing machine enabled the fishing port and the community to operate in full scale, as it does not only made *dibang* cleaner, the prolonged shelf life of up to 5-6 months makes the product more sellable.



Experience all in Batanes

You're probably wondering as to the best time to visit Batanes? But we do suggest to book your flights during their Batanes Day where you can participate in the celebration, try out their local products, meet the beautiful locals of Batanes, and experience its diverse culture all at the same time. During Batanes Day, people from different islands of Batanes gather to celebrate its founding anniversary.



Balayan's baked goodies producer is all set for their improved food safety system implementation

By John Maico M. Hernandez, *PSTC-Batangas* Photos from PSTC-Batangas



Sweetie Pies employees participate in the workshop facilitated by PSTC Batangas team.

SWEETIE PIES, baked goodies producer in Balayan, Batangas, has laid the grounds of their improved food safety system implementation after completing the two-day training on good manufacturing practices and documentation conducted by the Department of Science and Technology (DOST) CALABARZON Provincial Science and Technology Center (PSTC) Batangas, from 17–18 February 2021.

Sweetie Pies, which started as a Pasalubong Center, has been consistent with their goal of satisfying their customers' tastebuds through their baked products. According to its owner, Ms. Ivy Marquez, their business mantra is to let sweet tooth customers buy the experience more than just their products—a reason why product quality and safety are always top of mind. Although food safety practices are in place. Ms. Marguez still recognizes the need to strengthen its implementation to ensure that every product they produce conforms to food safety standards. She also shared their efforts in securing a License to Operate from the Food and Drugs Administration to certify their compliance to food safety.

As a move towards improving their food safety system, all their production

workers were capacitated on the food safety standards in different production processes and in the processing facility. Each of them was asked about their individual functions and the manufacturing practices they observe during production. The training covered topics on basic food hygiene, food hazards (i.e., biological, chemical, physical and allergens). cross-contamination, personnel hygiene, food contact surfaces, pest control, cleaning and sanitation, and documentation. The production workers were also grouped for simulation activities on hand washing, food hazards, and cross-contamination. A diagnostic examination was also given and all the trained production workers got passing grades.

Ms. Marquez acknowledged the benefit of the training conducted not only to the pursuit of making their production facility and processes compliant to food safety but also in upgrading the skills and knowledge of their production workers. To her, it was a big leap in their business as they also prepare to cater to new markets and wait for the approval of their DOST SETUP (Small Enterprise Technology Upgrading Program) project proposal to upgrade their production equipment. Sweetie Pies is located at 102 Palikpikan St., *Brgy.* 4, Balayan, Batangas. They continue to champion the hearts of the people through their oven-baked products such as five-layered chocolate dream cake, chocolate temptation cake, "kitkat" chocolate overload cake, mango bravo cake, banana bread, *yema* macaroons, caramel bars, chocolate brownies, and *brazo* cups. Their best-selling banana bread is a technology developed by the Institute of Food Science and Technology-University of the Philippines Los Baños and provided to them during the technology training conducted by PSTC Batangas in 2019.



Mr. Mhark Ellgine Libao, SRS II and Mr. John Maico Hernandez, SRS I, served as the training resource speakers on food safety.



Dr. Maribel Nonato

By Karl Raven Ramon, DOST-STII

All hail the queen, Dr. Maribel Nonato, at least of Pandan in the Philippines.

During the stricter quarantines when *plantitos* and *plantitas* were busy building their home gardens, many invested in vegetables, herbs, and other plants that can be used as culinary ingredients. One is *pandan mabango (Pandanus amaryllifolius* Roxb.).

Guess what? "Achievement unlocked" for your *plantitos* and *plantitas* goals during this pandemic. This specie of *pandan* was found to be effective in fighting repiratory related conditions. Not COVID-19 but for one of the world's most infectious disease—Tuberculosis.

Accidentally discovered by the team of Dr. Maribel Nonato, the *pandan mabango* "has a slight antitubercular, antimicrobial (for select microorganisms), and antioxidant properties".

With over 700+ existing species of *pandan*, Dr. Nonato and her team of researchers are focusing on further studying endemic species in the country to with regard to their medicinal properties. Pandan as documented in many areas: (1) acts as diuretic or "*pampa-ihi*"; (2) anti-inflammatory *o lunas sa pamamaga*; and (3) lowers blood sugar.

She also said that *pandan* is usually made into tea as a health drink. But she recommends, "while *pandan* is safe to drink and easy to prepare by simply brewing its leaves (*pagpapakulo*), only its diuretic properties can be extracted." But if pandan juice is to be taken as remedy for other ailments and medicinal purposes, Dr. Nonato clarifies that "*pandan* will have to undergo scientific process of extraction by using alcohol."

Dr. Nonato is an academician of National Academy of Science and Technology of the Department of Science and Technology. She is now leading her team in the University of Santo Tomas (UST), where she also graduated to focus on

the medicinal properties of locally available pandan species, especially those which are endemic in the Philippines.

Her dedication to study *pandan* in the country has led her to be named as the *Pandan* Queen of the Philippines. In fact, a newfound specie of *pandan* was named after her, Freycineta Nonatoi, discovered in Quezon province.

SCAN THIS QR CODE FOR DOSTv's interview with Pandan Queen. Photo by University of Sto. Tomas



DOST introduces ORAS PINAS as the new Filipino Time

By Jachin Jane O. Aberilla, DOST-ST//

TO SYNC all timepieces in the country's more than 7,100 islands, the Department of Science and Technology (DOST) unveiled ORAS PINAS or the new Philippine Standard Time (PST). Previously dubbed as "Juan Time", ORAS PINAS campaign aims to promote the nationwide use of the PST and sync timepieces with the PST.

Every year, the DOST also leads in the observance of National Time Consciousness Week (NTCW) following Republic Act No. 10535 or The Philippine Standard Time (PST) Act of 2013.

The NTCW is being observed in the first week of January to promote the value of time and the need to respect the time of others, so that the people may realize the imperative of synchronizing the official time.

With the theme "Synchronizing Filipino Time with ORAS PINAS", the NTCW 2021 aims to introduce ORAS PINAS as the new brand of the PST with the tagline, "One Nation, One Time:

Pilipinas ON TIME". Through the new brand, the campaign aims to institutionalize the new Filipino culture of being always on time and having only one time as a nation.

Established decades ago, the PST is set by DOST's Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the country's official timekeeper since 1978 as mandated by Section 6 of Batas Pambansa Blg. 8.

The PST is set via DOST-PAGASA's timing system that consists of a rubidium atomic clock, a Global Positioning System receiver, a time interval counter, a distribution amplifier, and a computer. The system automatically calculates its time difference with every satellite within its antenna's field of view. The PST is available online at the DOST-PAGASA website (http://bagong.pagasa.dost. gov.ph/).



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