ISSN 0116-7766

VOL. XXXIV NO.4

S&T POST

OCT-DEC 2016

DOST = EXCELLENCE

www.dost.gov.ph

EDITORIAL

Excellence

Martin Luther King Jr. once mentioned, “If a man is called to be a street sweeper, he should sweep streets even as a Michaelangelo painted, or Beethoven composed music or Shakespeare wrote poetry. He should sweep streets so well that all the hosts of heaven and earth will pause to say, ‘Here lived a great street sweeper who did his job well.’”

Indeed, excellence is one quality that people admire. Could it be that it has become a lonely word and is hard to find? But for the Department of Science and Technology, excellence is a standard. This is, of course, inspired by its mandate of providing central direction, leadership, and coordination of scientific and technological efforts; and ensuring that the results are geared and used in areas of maximum socio-economic benefits for the people.

For this issue of the S&T Post, the editorial board has decided to showcase department wide programs, projects, and activities, including real people, deemed excellent in their respective rights. Highlighted here are great achievements in the areas of health, industry, enterprise, education, and what not. For instance, there are stories of the two technologies that landed in the world’s 2016 R&D finalists. There is also an account of how the department’s SETUP helped triple the annual production of a furniture shop.

In the area of education, the growing popularity and appreciated usefulness of the country’s first science digital library in a box is narrated as it reached its 1,000th site. Meanwhile, in the area of health, an inspiring story of how a sari-sari store owner got knee replacement through a DOST project is vividly shared. Alongside all these are more wonderful and compelling stories showing DOST’s excellent achievements.

As the department hurdled all challenges in 2016 and as it faces new ones in the year to come, it is but fitting to share how it handles all of these. With the leadership of Secretary Fortunato T. dela Peña, the vision “Service for Excellence and Equity through Science, Technology and Innovation (SEE through STI)” will surely be a guiding light for the DOST to excel in all of its undertakings. Complemented with the slogan “Science for the People”, the department’s thrust can be deemed laser focused thereby fulfilling what it has promised.

All these and those to come are results of painstaking hard work and unwavering dedication. And in the world of research and development, time is always the enemy. It may take years, not months, for a research result to be made public. But at the end of it all, the benefit is always for the public.

Therefore, Henry Ward Beecher, a social reformer, can be aptly quoted as he shared to the world his wisdom, “We should not judge people by their peak of excellence; but by the distance they have traveled from the point where they started.”

Aristotle P. Carandang, LPT, MPS, Ph.D

S&T POST
VOL. XXXIV No. 3

Science and Technology Information Institute (DOST)
Science and Technology Information Institute-DOST (Library)
DOST STARBOOKS

Like us on Facebook

The S&T Post is published quarterly by the Science and Technology Information Institute-Department of Science and Technology (STII-DOST)
with editorial office at DOST Complex, Gen. Santos Avenue, Bicutan, Taguig City.

Telefax: (02) 837-7520
Tel No.: (02) 837-2071 to 80 local 2148
Email: dost.digest@gmail.com;

Visit:
www.stii.dost.gov.ph

@ DOST, we offer solutions

science.ph

Science for every *juan*

Please visit

www.science.ph

Department of Science and Technology

weather • science • technology • innovation

DOSTv

The Filipino Weather Channel

www.dostv.gov.ph

Department of Science and Technology

S&T POST

ISSN 0116-7766

DEPARTMENT OF SCIENCE AND TECHNOLOGY
FOURTH QUARTER 2016

OCT-DEC 2016

OUR COVER

"The Infinity", carved by National Artist Abdulmari Asia Imao, is the symbol of excellence at the Department of Science and Technology. The sculpture symbolizes the Department's brand of distinction in research, development, innovation, human resource, and services.

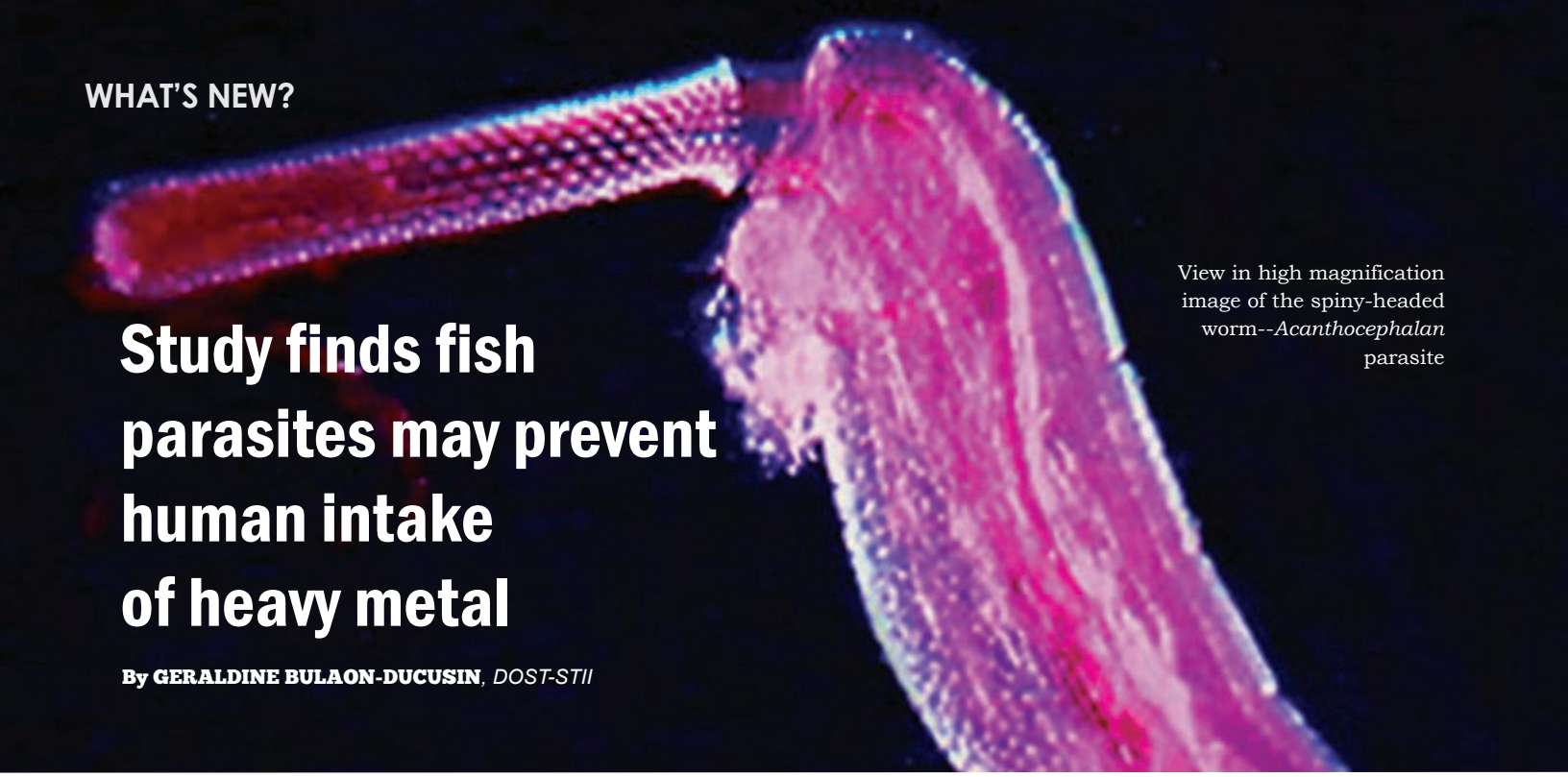
wht's new?

DOST news

main features

feature stories

science news



View in high magnification image of the spiny-headed worm--*Acanthocephalan* parasite

Study finds fish parasites may prevent human intake of heavy metal

By **GERALDINE BULAON-DUCUSIN**, *DOST-STII*

NOT ALL parasites are useless. Species of Acanthocephala (namely *Acanthogyrus sp*.), also known as the thorny-headed worm, can infect fish but they bring more help than harm.

This was found in a recent study by the Institute of Biological Sciences of the University of the Philippines Los Baños (UPLB) on Acanthocephala. Acanthocephalans are fish parasites that accumulate heavy metal concentration in their host's tissues (gills and intestine).

The study found that fishes infected with parasites (parasitized) have lower levels of heavy metals compared with fishes not infected by parasites (non-parasitized).

The difference in the tissues of the parasitized and non-parasitized fish is "remarkable", according to the study.

Acanthocephalan infection, according to the study, affects only the host's (fish) size or weight and length but has no significant effect on the immediate health of the fish.

Dr. Vachel Gay V. Paller, NRCP biologist/ researcher, says that as the number of parasites increases, the length of tilapia decreases.

"Smaller tilapia may not be so bad. Some may have parasites, but these parasites may just save the consumers from possible heavy metal intake. Besides, the parasites stay in those parts – gills and intestine – which the consumers most likely discard."

Conducted in the seven lakes of San Pablo, Laguna (Bunot, Calibato, Mohicap, Palakpakin, Pandin, Sampaloc and Yambo), the study aims to help farmers understand and control the acanthocephalan infection among fishes in the lakes.

Acanthogyrus sp. were found in the following four species of fishes: *O. niloticus* (Tilapia), *P. Managuensis, Vieja sp.,* and Red Nile Tilapia. The highest rate of Acanthocephalan infection and intensity was recorded in Palakpakin Lake.

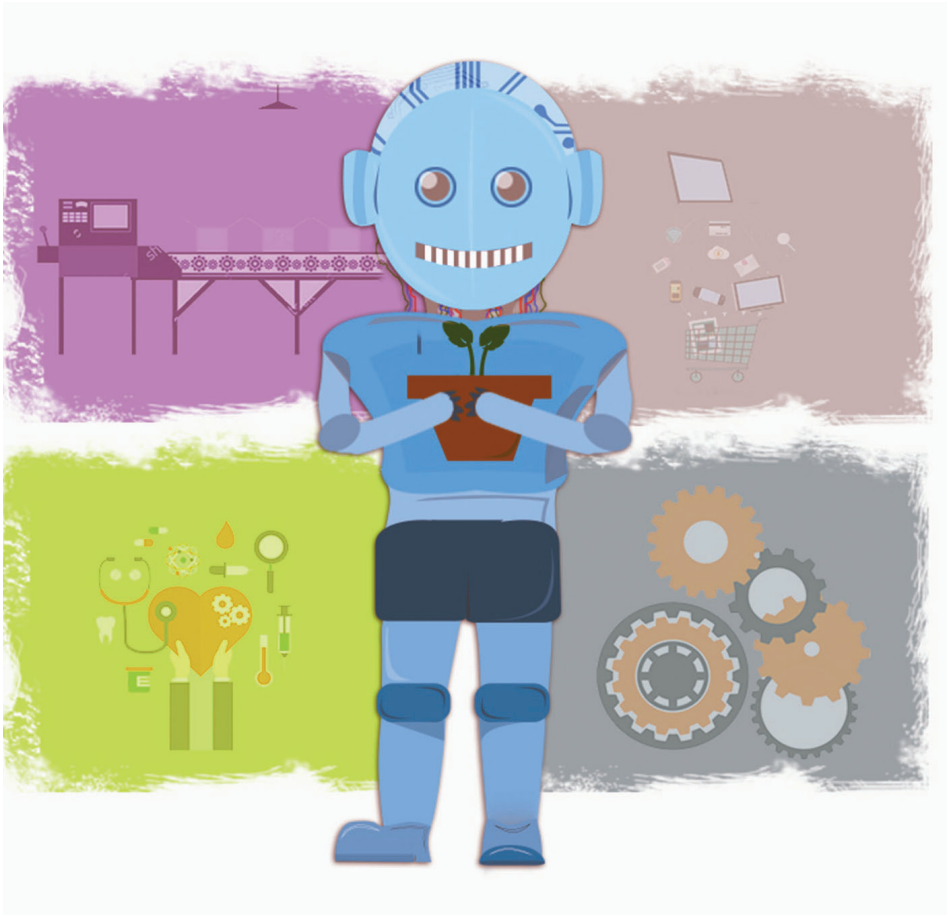
Among the heavy metal sources of pollutants in the Seven Lakes come from transportation vehicle (car exhaust, worn tires, engine parts, brake parts, rust or used antifreeze); and fish cages where the uneaten feeds that contain essential minerals for fish diet (copper, calcium, zinc, selenium, magnesium, potassium, phosphorous, manganese, iron and iodine)accumulate in the lake over the years. Other sources include untreated wastes from hospital, residential, commercial and industrial establishments; and pesticides from agricultural application in the nearby areas.

The study, funded by the National Research Council of the Philippines of the Department of Science and Technology (DOST-NRCP), is relevant at this time when the government is pushing for a cleaner environment, especially in the coastal areas where many people live and obtain their livelihood.

Tilapia *(Oreochromis niloticus)*

DOST eyes research on artificial intelligence

By JOY M. LAZCANO, *DOST-STII*



DEPARTMENT OF Science and Technology (DOST) Secretary Fortunato T. de la Peña said during the National Research and Development Conference that the science department plans to include artificial intelligence (AI) on its research and development agenda starting 2017-2022.

The National R&D Conference is a prologue to the crafting of a Harmonized National R&D Agenda (HNRDA) for science and technology, which intends to unify all R&D projects and initiatives in line with the Philippine Development Plan called "Ambisyon Natin 2040."

"Now we would like to pursue new areas, not necessarily new in the global sense but as far as local research and development is concerned and that is in the field of artificial intelligence and space technology," says de la Peña.

He added that in the 80s, he wrote a scientific article on the future of technology where AI had been prominently described as the next wave of technological development in the global technological space.

However, the former UP professor said that the government then had to focus more on other priority areas of development.

Moreover, the DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development Deputy Executive Director Raul C. Sabularse confirmed the planned initiatives on AI by DOST.

Engr. Sabularse shared that DOST is in talks with other R&D institutions to develop a program on AI consisting of various project components.

"We are in the process of consulting experts and stakeholders to form a development program on artificial intelligence. This is something not totally new but it is a promising field for our researchers with applications in the industry," explained Sabularse.

He added that Filipino tech giant Dado Banatao is also involved in the talks but told that details are underway and may be included in the national R&D agenda for 2017.

Artificial inteligence is intelligence exhibited by machines that have the capability to perceive their environment and take the necessary actions to a given situation and carrying out a positive outcome. It is simply understood as machines capable of mimicking human cognitive functions in doing simple to complex tasks. The AI technology has a wide range of use including medical diagnosis, stock trading, robot control, law, remote sensing, scientific discovery and toy making. Currently, some applications are no longer labeled as AI.

Sabularse said that DOST initially plans to use AI for the manufacturing industries to optimize mass production of goods in the country.

De la Peña added that the harmonized R&D agenda will pick research initiatives that are in line with the DOST's 11 research agenda namely R&D for pressing problems, productivity, tap and manage resource potentials, application of new technologies across sectors, climate change and disaster risk reduction, utilization of R&D through technology transfer and commercialization, assistance to production sector, upgrading and improvement of S&T services, human resource development for S&T, capability building and involvement of regional R&D institutions, and industry and academe collaborations.

The DOST, through Executive Order 128 of 1987, is the sole government office mandated to direct all scientific R&D activities with potential benefits to the socioeconomic development of its people.

It is also mandated through Sec. 19, article 9 of RA 10055 that "DOST shall call for regular national conference of Government Funding Agencies and Research and Development Institutes in order to: promote multi-disciplinary, joint, and cross collaboration in R&D; coordinate and rationalize the R&D agenda; and harmonize all R&D agenda and priorities. "

Secretary de la Peña encourages the Filipino Inventors Society to come up with more products that the consumers can use and invite more young inventors to join the group during the opening ceremonies of the National Inventors Week.

Dr. Benjamin Santos, inventor and president of Econolux Enterprises, gives his opening remarks during the opening ceremonies of the National Inventors Week held on November 14-18, 2016 at the DOST Complex, Bicutan, Taguig City.

DOST Secretary Fortunato T. de la Peña (3rd from right) leads the ribbon cutting during the opening ceremonies of the National Inventors Week at the DOST Executive Lounge with officers of the Filipino Inventors Society led by its national chairman Dr. Benjamin Santos (4th from right).

Local inventors showcase innovative products at DOST

By RODOLFO P. DE GUZMAN, *DOST-STII*

BICUTAN, TAGUIG – Local inventions that uplift the plight of many of our countrymen highlight the 73rd FIS Annual National Inventors Week November 14-18, 2016 in partnership with the Department of Science and Technology (DOST), DOST-Technology Application and Promotion Institute, Intellectual Property Office - Philippines and the Department of Trade and Industry at the DOST Compound, Bicutan, Taguig City.

With this year's theme, "Filipino Inventions & Innovations: Strengthen the Nation, Today", FIS is bullish in outdoing its achievements in the past years and its leadership promises more inventions in the coming years.

FIS was established in 1943 with this slogan on its crest "There is a better way, find it"-- very appropriate for an organization that creates new things that make life better.

During the opening ceremonies held at the DOST Executive Lounge, DOST Secretary Fortunato T. de la Peña urged the FIS to be more forward looking and proactive in their pursuit to produce new products and services.

"Inventions create new products and these help drive our economy with more choices for our consumers and more jobs created. So, I encourage the FIS to invite more to join as members especially young inventors and introduce young blood in the organization," de la Peña said.

He further stressed that the membership needs to strengthen the organization and camaraderie by lessening the member's disagreements to be able to invent more new things that will benefit more people.

De la Peña also shared his thoughts on the great potentials of the FIS should member keep abreast with world standards for their inventions to compete successfully in the international market. These pronouncements by the Science Chief were welcomed by the membership present led by FIS president Dr. Benjamin S. Santos, Rodolfo B. Biescas Sr., VP for Luzon; and Arsenio Navarro, VP for Visayas; and Dante U. Ursua, among others.

Secretary de la Peña also led the FIS officers and members in opening the exhibits at the DOST Compound where home grown companies showcase their latest inventions like energy-saving devices, motor oil, car ionizer, brickscoal, water purifier, rolling dustpan, portable gas lamp, health care products, portable floor seat,and other one-of-a-kind products. Some of the exhibitors include Mapecon (pest control), Bensan Industries Inc., Econolux Enterprises, Amecos Innovation Inc., Kingflute Philippines, and others.

Super Turbo Atomizer with Anti-Pollution Device produced by Mellions Industries boosts power for better engine combustion and stops the creation of carbon monoxide from vehicle exhaust system.

Tubig power using chlorox as main additive to produce Chlorolight All Purpose Lamp.

Jesmi Herbal Products made from natural ingredients that are good for the skin.

Aerogas Catalytic Combustor for fuel efficiency and maximum engine performance produced by MCM Multi Energy Inc.

IronMate is an invention by Inventor Rodolfo Biescas that saves on electric consumption, and has a automatic shut-off and fire safety features.


Technology
TAUGHT US
2 things
EVERYTHING IS ONLINE.
EVERYONE IS ONLINE.
WE'RE GOING THERE TOO.
105
DATABASE OF FILIPINO EXPERTS
Searchable by field of expertise, institution and location.
Contact consultants from your location
or from other regions today!
ONE ON ONE CHAT
COMMUNITY CHAT
Chat with an expert or fellow S&T afficionado
or create your own community chat asking for advice or
insights on today's national challenges.
DOWNLOAD OUR APP!
You don't have to burden yourself sitting on a
computer or carrying that laptop of yours
all day long.
Free yourself from clutter.
Just have all the Filipino experts in your hand.
ARE YOU LOOKING FOR ADVICE ON YOUR LIVELIHOOD PROJECT OR BUSINESS?
Search our database of expert.
Mingle with chosen expert.
Avail of our Consultancy Programs.
ARE YOU SEARCHING FOR RESOURCE PERSONS FOR TRAININGS AND CONFERENCES?
Search our database of expert.
Mingle with chosen expert.
Request for a resource person for your activity.
ARE YOU SEARCHING FOR RESEARCHERS OR SCIENTISTS?
Search our database.
Mingle with chosen scientist or researcher.
Request and avail service.
SIGN UP NOW AT
oneexpert.gov.ph
Google play

DOST portal enables online contact with S&T experts

By GLORIA C. MORALIDAD, *DOST-VI*

NOW LINKING up with experts is easier through the Department of Science and Technology's portal called "One Expert", an online interactive site that allows people to have easier contact with DOST's pool of science and technology experts. Said experts who are accessible online are committed to providing technical advice and consultancy services to Filipinos anywhere in the Philippines.

One Expert is an interactive portal featuring a pool of consultants. Launched last July during the celebration of the 2016 National Science and Technology Week, the portal comprises the country's scientists, researchers, engineers, inventors and other technical people from both the public and private sectors. Said experts are DOST's partners in addressing problems of the country through S&T-based solutions.

Spearheaded by DOST Region VI, the portal helps meet the needs of today's clients, students, and individuals in looking for solution to challenges in business, the academe, and other sectors through expert assistance.

According to DOST VI Regional Director Rowen Gelonga, One Expert "provides access to experts and technologies particularly by people living outside of the urban centers."

"Being an online service, One Expert uses information and communications technology to enhance the delivery of government programs, projects, and services," he added.

You can now contact my DOST expert even throught your mobile phone via One Expert portal and mobile app. *(Photo by One Expert)*

One Expert is the latest innovation in DOST's consultancy program for livelihood projects. business enterprises, and other sectors. The Department's consultancy program intends to address many technological issues and enhance the competitiveness of firms for increased profitability and adherence to quality standards and government regulations.

Areas of expertise available through One Expert are on food safety, energy efficiency, cleaner production, product packaging, and

productivity improvement. Experts can be invited as resource persons for lectures, conferences, on-site and firm-level trainings, and other technical assistance.

As consultants, the experts can work directly with clients over an agreed period to further develop customer's skills, improve existing plant operations, and transfer knowledge tailored to the clients' goals. Clients availing themselves of the project are ensured of proven approaches in the experts' assistance using sound assessment to come up with comprehensive recommendations.

Through the One Expert portal, clients can search experts by typing the experts' field of expertise, institution, or location on the search bar. Experts usually hold one-on-one or community interaction of users through the MINGLE chat application available at One Expert and through the experts' profile wall post.

The portal also provides information on the various DOST consultancy programs, consultants, industry updates, and business trends. There are also feature articles on the site that give clients a chance to read about the experts and how they provide their services.

Moreover, One Expert also provides link to a searchable technology database through STARBOOKS or the Science and Technology Academic and Research-Based Openly Operated Kiosk, a one-stop shop of S&T information materials developed by DOST-Science and Technology Information Institute.

One Expert works with all kinds of clients such as those from micro, small and medium enterprises, cooperatives, local government units, non-government organizations, rural and urban communities, the academe, professional and scientific associations, and other interested parties.

To request for technical assistance, DOST invites interested individuals and organizations to visit One Expert at http://oneexpert.gov.ph/ or the Facebook page One Expert PH.

The One Expert mobile app is likewise available for download for androids at the Google Playstore.

Photo by One Expert

Through OneExpert, clients can search and invite experts to provide technical assistance in various fields.

Showbiz, Politics, and Science

Richard Gomez is S&T Ambassador

By ALEXANDRIA DENNISE S. SAN JUAN, DOST-STII

Photo by Gerardo G. Palad

ACTOR-POLITICIAN, NOW Mayor of Ormoc City, Richard Frank Icasiano Gomez, was named regional science and technology (S&T) ambassador for Eastern Visayas during the Department of Science and Technology-VIII Regional Technology Transfer Day held at Ormoc City Superdome in Leyte last September 14.

The 50-year-old icon of the Philippine cinema and television won the mayoralty in Ormoc City this recent 2016 election. To further promote science and technology (S&T) in the Visayas, the DOST-VIII Regional Office designated Gomez as S&T ambassador for Eastern Visayas.

Gomez's conferment was led by DOST-VIII Director Edgardo M. Esperancilla, DOST-XI Director Anthony C. Sales, Undersecretary Rowena L. Cristina Guevara, and DOST-Technology Application and Promotion Institute Director Edgar I. Garcia.

As the regional S&T ambassador, Gomez shall be actively committed and determined to promote and advocate for science, technology, and innovation for the inclusive growth and development in Region VIII.

Moreover, Gomez is also expected to act on his duties and responsibilities as

Photo taken from Gomez's FB page

S&T ambassador, including mobilizing and helping increase the interface and exchanges of scientific and technical information among government policy makers, media, and the S&T community using the latest communication technologies; promoting the culture of research and development (R&D) and encouraging the adoption of evidence-based decision and policy-making;

Assisting in information dissemination to the public about science, technology and innovation and R&D initiatives to make communication easily comprehensible and connected to people's daily life; advocating for the use of S&T as a tool for green productivity and industry competitiveness; and being available for DOST Region VIII at least twice a year to actively participate in major events such as Regional Celebration of the National Science and Technology Week, S&T fora, and other activities.

Moreover, Gomez's stint as ambassador for science and technology will have a duration of two years which is renewable and considered as an act of goodwill. Thus, he will neither be paid a salary nor an honorarium and other entitlements.

The announcement of S&T ambassador is part of the Technology Transfer Day headed by the DOST Region VIII through DOST-TAPI and Ormoc City Chamber of Commerce and Industry, Inc. that served as the opening event of the three-day Visayas Area Business Conference. The event aimed to promote DOST generated/assisted technologies to intended beneficiaries, stakeholders and the private sector for commercialization, especially among the participants of the business conference.

DOST launches radio drama series on science and technology

By LILIAN B. DELA CRUZ, *DOST-STII*

TO BRING science closer to the hearts of the Filipino people, the Department of Science and Technology – Science and Technology Information Institute (DOST-STII) rolled out on Oct. 23 a radio drama series entitled "Handog ng Agham para sa Bayan."

The series airs as a segment of the primetime radio program "Radyo Henyo" anchored by Angelo Palmones and Ruby Cristobal at DZRH 666 khz every Sunday at 4:00-5:00 pm.

The drama series features stories of success of individuals whose lives were made better through science and technology.

Produced by the DOST-STII, "Handog ng Agham para sa Bayan" will initially air for one season.

Inno, the "DOST man" character, is the storyteller of the drama series directed by radio drama royalty Salvador M. Royales.

"I am awed by the stories," Royales said. "The technologies and DOST projects featured in the stories are really relevant and eye-openers."

"I am happy that I am part of this series because I learned a lot," Royales added.

The first episode was the story of a bright boy from an urban poor family whose family sees a brighter future for him after qualifying for scholarship at the DOST-Philippine Science High School.

Popularly called Pisay, the school offers a specialized curriculum in advanced science and mathematics to prepare students for careers in science and technology. The episode is titled "Pagpupunyagi Laban sa Karukhaan"

The second episode, "Abutin ang Pangarap," presented the story of farmer whose produce increased drastically after using carrageenan plant food supplement, a DOST-developed technology.

"Matang Lumilipad" was the third episode highlighting the grit and genius of young Filipino engineers who developed Diwata-1, the first Filipino-made microsatellite.

A wine- and vinegar-producing Zamboanga tribe who adopted technology to improve production – and consequently the group's income-- was featured next in the "Bukas Palad" episode.

The fifth episode was the story of a high school dropout jeepney driver who invented an anti-car leak device. The story highlights how curiosity and concern to solve an emerging problem on road safety can lead to technological innovation, even minus a college degree

The rest of the stories are equally interesting and relevant especially for Filipinos who still prefer radio as their medium of information and entertainment

DZRH voice talent Bobby Cruz (leftmost voices Inno, the "DOST man" character and the storyteller of the drama series directed by veteran radio personality Salvador M. Royales *(Photo: Henry De Leon)*

Director Salvador M. Royales

Octogenarian Luz Fernandez, multi-awarded veteran radio, stage, TV and film performer, lends her voice to one of the characters in an episode. *(Photo: Henry De Leon)*

Seasoned talents essay in voice stories of individuals whose lives were made better through science and technology in the radio drama series "Handog ng Agham para sa Bayan" airing over at DZRH every Sunday at 4-5 pm. *(Photo: Framelia Anonas)*

Samples of tissue cultured lakatan banana seedlings are on display during the STAARRDEC Fiesta and RSRDEH 2016 event held in Bacoor, Cavite in cooperation with the Philippine Council for Agriculture Aquatic and Natural Resources Research and Development. The tissue cultured lakatan produces more yield and are more resistant to diseases.

Coffee, banana showcased in PCAARRD event

By RODOLFO P. DE GUZMAN, *DOST-STII*

BACOOR, CAVITE – CALABARZON products and innovations, particularly on coffee and banana, got the spotlight in the recent twin events organized by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (DOST) and the Southern Tagalog Agriculture, Aquatic and Resources Research, Development and Extension Consortium (STAARRDEC) at the Bacoor Government Center in Cavite.

Dubbed *STAARRDEC Fiesta & RSRDEH 2016: Showcasing the Region's Products and Innovations*, the five-day long celebration highlights two major events: pushing the farmer and industry encounter agenda through science and technology and strengthening of the regional symposium on research development and extension highlights (RSRDEH). The focus of different forums and the exhibits are two prime commodities of the CALABARZON and MIMAROPA regions which are coffee and banana.

This event is envisioned to promote more interaction among researchers both from the academe and government institutions like the DOST-PCAARRD, extension workers, local government units, and technology users like investors, farmers, fisherfolks, and entrepreneurs.

PCAARRD is an attached agency of the Department of Science and Technology (DOST) and is a member of the STAARRDEC, a group of organizations that promotes and advocates development initiatives in fields of agriculture, aquatic and natural resources.

The other activities include product and technology exhibits, presentation of research papers, business forum and franchising, cooking contest, coffee and banana quiz bee, and photo and poster making contests.

DOST-PCAARRD Deputy Executive Director Dr. Edwin C. Villar, representing both Executive Director Reynaldo V. Ebora and DOST Secretary Fortunato T. de la Peña, bannered the different research projects and practical technologies developed by the agency on somatic embryogenesis technology for coffee and banana tissue culture planting material and the lakatanbanana variety which is resistant to banana bunchy top virus.

"The government's thrust is to increase the number of researchers in agriculture and aquatic resources and attract more young people to take up courses in these areas," Dr. Villar said.

Dr. Villar revealed that the marching order for DOST-PCAARRD is to roll out more technologies up to 2022 with a target increase in the budget of P440 billion.

Other special guests during the opening ceremonies included Bacoor City Mayor Lani Mercado-Revilla; Vincent Bae representing Cavite Governor Jesus Crispin Remulla; Dr. Hernando D. Robles, president of Cavite State University; Dr. Milo O. Placino, president of Southern Luzon State University; and Dr. Herminigilda A. Gabertan, vice chairperson of STAARRDEC.

DOST-TAPI helps Filipino inventors gain financial literacy for a secured future

By RODOLFO P. DE GUZMAN, *DOST-STII*

INVENTORS CREATE new products for people to use and are held with high esteem because their work made many people's lives better.

Because of the value of their inventions, many inventors made more money than they could imagine. However, there are some inventors who were not lucky enough because of different reasons. One is how they manage their financial resources. Although they may be geniuses in their own field, some are "financial illiterates."

To help inventors manage their financial resources and preserve their wealth, the Technology Application and Promotion Institute (TAPI) of the Department of Science and Technology (DOST) recently sponsored a two-day forum cum workshop on Entrepreneurship and Financial Management for Inventors. This event is in collaboration with the Filipino Inventors Society, Inc., a long time partner of the DOST.

This forum coincides with the holding of the 73rd Annual National Inventors Week that kicked off on November 14 and ran until November 18, 2016 at the DOST Compound, Bicutan, Taguig City.

Edwin M. Suson, an associate professor at the College of Business Administration of the University of Santo Tomas and a financial advisor and trainor, gave valuable tips to the inventors present during the forum.

Among the nuggets of wisdom Suson shared with the participants were as follows: financial planning process, setting financial goals, budgeting and financial strategies, prudent resource utilization, investing in mutual funds and other high-yielding financial instruments, wealth creation through asset management, among others.

On the other hand, Generoso S. David, department manager of the Land Bank of the Philippines, shared his expertise in fund sourcing. During his talk David discussed the many loan facilities of Land Bank and how inventors can avail of its services to finance their inventions for commercialization.

MAKING MORE SENSE AND CENTS FOR INVENTORS. Edwin Suson, an Associate Professor of the College of Business Administration from the University of Santo Tomas, financial advisor and trainor, talks about financial planning and investing to Filipino inventors during the Financial Literacy Seminar sponsored by the Technology Application and Promotion Institute (TAPI) of the Department of Science and Technology (DOST). The financial literacy lecture was one of the activities offered by TAPI to provide local inventors knowledge on handling their money for financial security. The event was held on November 23, 2016 during the celebration of the National Inventors Week. *(Photo by Rodolfo P. de Guzman/ DOST-STII)*

Financing inventions. Generoso David, Department Manager of the Land Bank of the Philippines, shares his expertise in fund sourcing from banking institutions and discussed the many loan facilities of Land Bank. David also showed how inventors can avail of various bank services and facilities to finance their inventions for commercialization. *(Text by Rodolfo P. de Guzman/ Photo by Henry A. de Leon, DOST-STII)*

Pisay studes win in int'l inventors' tilt

By **FRAMELIA V. ANONAS**, *DOST-STII and*
MICHELLE DALAY-ON, *PSHS-CARC*

PSHS-CAR campus team nicknamed Lioydie Fanatics, composed of Korreine Buccat, John Lloyd Martos, and Pascal Marius Aurelio, receive their Best in Project Paper Writing award for the project "Rain-Catcher Ring."

Students of the Philippine Science High School – Cordillera Administrative Region Campus (PSHS-CARC) bagged top prizes in two categories of the Young Inventors Challenge (YIC) 2016 held in Selangor, Malaysia recently. This year, the challenge aims to address one of the global sustainability goals of Tackling Poverty.

Winning the top prize in the Project Paper Writing Competition for the project "Rain-Catcher Ring" were Korreine Buccat, John Lloyd Martos, and Pascal Marius Aurelio. Nicknamed "Lioydie Fanatics", the team received a cash award of 500 RM.

The project, according to the team presentation, is highly usable in areas which have continuous rain throughout the year and have power shortages. The rain catcher ring, which works along with the windmill, can also be an additional source of electricity.

The students also bagged the silver award in the main competition for their rain catcher ring project, along with another PSHS-CARC team composed of Chantal Margaret Liporada, Krystal Nicole Vicente, Daphne Rose Molina, and Joshua Escaño. The other team, nicknamed "Sparking Touch", got the silver award for the project titled "Thermoelectric Generator Powered Phone Charging System." Said two PSHS-CAR campus teams, along with three other teams, received 1000 RM as prize for the silver award in the main category.

Sponsored by the Malaysian Association of Science, Technology, and Innovation, the YIC 2016 had the theme "Inventions to Serve" and held its Grand Finale at Jeffrey Cheah Hall, Sunway University, Selangor, Malaysia. Out of the 70 participating teams that passed the initial proposal screening were nine teams from the Philippine

The teams Lioydie Fanatics and Sparking Touch with their Silver Awards.



The groups of Infiniteam (upper left), Sparking Touch (lower left) and Lioydie Fanatics (right) in their respective booths.

Science High School System, three of which were from the CAR Campus.

About 60 judges, chaired by Dr. Ewe Chun Te,assessed the projects and interviewed the participants based on design thinking, innovation, leadership, and entrepreneurial skills.

S&T scholarships for science careers

The science buffs, techies, and inventor wannabes among today's Filipino youths will be the country's scientists, engineers, and technopreneurs of the future. With science and technology (S&T) as major economic drivers, the youth are expected to carry the torch for the Philippines on its way up the ladder of economic progress.

Hence, opportunities for learning are offered to this segment of the youth population by the Department of Science and Technology's Science Education Institute (SEI) and Philippine Science High School System (PSHSS).

One of these opportunities is DOST's scholarship program for the high school, undergraduate, and graduate levels.

For college level, scholarships include the RA 7687 or the S&T Scholarship Act of 1994, Merit Scholarship Program, Project Grant for Educational Assistance on Technology and Science Teaching Courses in Mindanao, Junior Level Science Scholarship, which may be availed by undergraduates.

For Master's and Doctoral degrees, the following scholarships are available: Accelerated S&T Human Resource Development Program, Engineering Research and Development for Technology, and Capacity Building in Science Education.

For the high school level, the PSHS provides free tuition, monthly stipends, and book allowance among others, including various opportunities for local and international competitions.

Photo lifted from "Profitabilty of Raising Zampen native chicken" presentation of Dr. Teresita S. Narvaez, WESMAARDEC director, during FIESTA 2016 techno-business forum held in KCC Mall, Zamboanga City.

ZamPen native chicken gives lifeline to inmates

By LILIAN B. DELA CRUZ, *DOST-STII*

Zamboanga City – ZamPen native chicken is a lifeline not just to farmers and micro entrepreneurs of the Zamboanga Peninsula but also to San Ramon Penal colony inmates who anticipate productive reintegration after serving prison terms.

This is the promising future that this subsector of poultry and livestock industry is offering.

Raising ZamPen native chicken as a science-based countryside alternative livelihood resulted from the collaboration of the Western Mindanao Agriculture and Aquatic Resources Research and Development Consortium (WESMAARRDEC) and project

funding agency Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD).

In celebration of its 29th anniversary, WESMAARDEC held November 22-23 the ZamPen Native Chicken FIESTA 2016 themed "Manok ZamPen: Livelihood Option for every Juan in the Region."

Dr. Teresita Narvaez, WESMAARRDEC director, said the event aimed to showcase and promote ZamPen native chicken in Region IX (Western Mindanao) on the concept of Farms and Industry Encounters through Science and Technology Agenda (FIESTA).

Promoting ZamPen native chicken was a package of technology transfer initiatives from production (breeding, handling, care, and management techniques) to commercialization (financing, processing, and marketing).

Dr. Narvaez expressed optimism that the ZamPen native chicken will be profitable for farmers and entrepreneurs because of its gourmet qualities of unique taste and texture; plus, its health benefits will make it a fine choice for consumers, which leads to increase in market demand.

WESMAARRDEC's Native Chicken FIESTA featured a techno-business forum at the KCC Mall of Zamboanga.

Farmers, entrepreneurs, students and other interested individuals attended to learn the native chicken's breeding and management technologies from PCAARRD and WMSU scientists and researchers.

Mr. Julian H. Payne, president of the Canadian Chamber of Commerce of the Philippines, shared relevant entrepreneurial strategies in his presentation "Best Practices and Sharing of Plans on Native Chicken for Adoption and Commercialization."

A direct beneficiary of the ZamPen native chicken project is this City's San Ramon Prison and Penal Farm inmates.

In February this year, a Memorandum of Agreement was signed by Western Mindanao State University (WMSU) representing WESMAARRDEC, DOST-PCAARRD, and Bureau of Corrections (BUCOR) through the San Ramon penal farm for a research team to study the profitability and sustainability of the ZamPen native chicken as source of livelihood in rural communities.

An offshoot of the study was WMSU's training for San Ramon inmates on ZamPen native chicken technology and marketing options. The BUCOR reminded that inmates to the project are expected to develop a sustainable livelihood once they leave prison and re-integrate into the community.

The inmates started raising ZamPen chicken in the San Ramon farms with WMSU providing breeders and grower stocks, as well as inputs such as feeds, vaccines, and other medications.

They were also provided technical assistance and other support services in the operation of the project, and in the marketing of live, dressed, and other native chicken products. WMSU also conducts a monthly evaluation on the status of the project.

On Day 3 of WESMAARDEC FIESTA, media and other interested individuals and groups toured the ZamPen native chicken farm site in San Ramon, observed developments of the project, and interviewed inmate-farmers.

One inmate lined up for release soon said he will step out of prison with renewed hope since he already has something to start a new life with – potential income from ZamPen native chicken.

Editor's note: This article will have a documentary film version to be aired over DOSTv

Dr. Edwin C. Villar, PCAARRD Livestock Research Division director, speaks with San Ramon Prison and Penal Farm inmates who are beneficiaries of the DOST-PCAARRD, WESMAARRDEC.

ITDI among the world's 2016 R&D 100 Awards finalists

By **DR. VIOLETA B. CANOZA**, *DOST-ITDI*

The Department of Science and Technology – Industrial Technology Development Institute (DOST-ITDI) made it to the list of 2016 R&D 100 Awards, joining the ranks of 100 finalists from world-renowned R&D (research and development) agencies, companies, and universities from around the globe.

"By becoming an R&D 100 Award Finalist, your institution is now a member of a select R&D community recognized for their excellent contributions to advancing science and technology," said Bea Riemschneider, editorial director of the ABM Science Group of the R&D Magazine which, through the awards, honors the 100 most innovative technologies and services of the past year.

"You should be very proud, indeed, of your exemplary R&D achievements and the teams that are responsible for these new products."

DOST-ITDI's innovative products that bagged the awards under the Process/ Prototyping category are the Pack of Hope RTE Chicken ArrozCaldo as First Stage Disaster/Relief Food and the Philippine Mosquito Ovicidal-Larvicidal (OL) Trap System: DOST Anti-Dengue Device.

The ready to eat (RTE) chicken arroz caldo was developed to give immediate satisfaction to the hunger of every disaster's victim. It will also lessen their agony. (Photo by Ceajay Valerio, DOST-STII)

OLTrap

Developed by ITDI's Chemicals and Energy Division, the OL Trap is an anti-dengue device that helps control the population of the Aedes mosquitoes through its ovicidal and larvicidal effect that prevents the next generation of mosquitoes from developing to the adult stage.

It has been successfully commercialized and rolled out nationwide in households and public schools. In partnership with selected schools, DOST launched a dengue vector surveillance website (dengue.

The OL Trap is an anti-dengue device that helps control the population of the Aedes mosquitoes by killing mosquito eggs and larvae.

ph) to provide information on mosquito density in a certain area. Mousing over certain locations in the map will draw up balloons that contain specific warning alerts, health advisory, and actions to be done by households in the area and the local government concerned.

Pack of Hope

Meanwhile, ITDI's Packaging Technology Division developed the Pack of Hope Ready-to-Eat Chicken Arroz Caldo as a disaster mitigation/relief food that can be immediately available to hungry disaster/calamity survivors, responders, and emergency service providers (medical, military personnel, and volunteer groups) within the next 48 hours. Arroz caldo (rice porridge) is a complete meal in the Philippines and considered as "comfort food" especially to the sick and unwell.

Daisy Tañafrancia and Annabelle Briones at the R&D 100 Conference and Awards Presentation in Washington DC, USA

The Pack of Hope is categorized as a first-stage-disaster-food which means it is ready for consumption and can be eaten without preparation. Conveniently packed in an easy-open stand-up retort pouch, the product can be directly consumed from the package. The retort pouch and transport packaging is designed to withstand grueling distribution by land, sea surface, and aerial drop.

The product went through field testing and validation studies in collaboration with the Department of Social Welfare and Development and local government units, and had been successfully commercialized.

R&D 100 Awards

Now on its 54th year, the R&D 100 Awards, also often referred to as the "Oscars of Invention", honors the 100 most innovative technologies and services. These can be promising new products, processes, materials, or software developed throughout the world and introduced to the market the previous year. Awards are based on each project's technical significance, uniqueness, and usefulness compared to competing technologies or services, according to the R&D Magazine website.

This year's R&D 100 Award Winners were presented with honors at the annual black-tie awards dinner held on November 3, 2016 at the Gaylord National Resort & Convention Center in Oxon Hill, Maryland (Washington, D.C.).

The finalists were selected by an independent panel of more than 50 judges and represent many of industry's leading R&D companies and national laboratories, as well as many newcomers to the R&D 100 Awards.

Second Most Innovative Product for Vacuum Fryer:

Eastern Visayas-developed Crunchy Mayahini

By MARK REMBERT M. PATINDOL, LILANE CUTANDA, and RAMIL T. UY, *DOST VIII*

The Top Five Most Innovative Products using Vacuum Fryer: (from left) Crispy Sprouted Monggo by Region II; Crunchy Mayahini by Region VIII; Marang Cruchies by Region XII; Instant Isda All-Lam Pack Region XII; and Rice Toppings by Region XII.

Photos by **Mark Rembert M. Patindol**

Food processing is one of the primary sources of revenue in the Eastern Visayas. This sector, along with its allied industries, is a major component of the economy which composes 50 percent of the micro, small and medium enterprises (SMEs) all over the country. The National Economic Development Authority (NEDA) in its drafting of the Regional Development Plan in 2010 considered this sector to be one of the investment priorities in Region VIII.

Taking into consideration the significant revenue contribution of this sector in the coffer of the country, the Department of Science and Technology (DOST) established Food Innovation Centers (FIC) in few pilot regions, and one of these is Region VIII. The region's FIC is expected to support the food industry in the area by providing a wide range of expertise to address the industry's needs.

EVFIC is offering the following services:

- Product and Process Development (Solid and Liquid Foods)
- Research and Development
- Information Resource Center
- Technology Trainings/Lectures
- Food Testing and Nutritional Facts
- Shelf-life and Sensory Evaluation
- Consultancy
- Packaging and Labeling
- Short-Run Production
- Common Service or Incubation Facilities
- Broking/Networking

ITDI Director Maria Patricia V. Azanza, DOST Undersecretary for Research and Development Rowena Cristina L. Guevara, and PCIEERD Executive Director Carlos Primo C. David awarding the 2nd Most Innovative Product using Vacuum Fryer to EVSU instructor Dale Daniel G. Bodo (middle) and EVFIC Technical Services Supervisor Mark Rembert M. Patindol (rightmost).

The Eastern Visayas Food Innovation Center (EVFIC) was established in 2014 through the leadership of an innovator himself, former DOST Secretary Mario G. Montejo.

The EVFIC, in partnership with the Eastern Visayas State University (EVSU) and DOST's Industrial Technology Development Institute (ITDI), leads business start-ups and aims to increase the number of MSMEs engaged in food processing in the region. Through the FIC, MSMEs will learn to appreciate and adopt new technologies and learn market trends. The FIC likewise assists MSMEs in developing new products and methods in food processing that paves the way for local food products to go into the mainstream market. The FIC also will serve as instrument in advancing production of quality food in the region.

These are just some of the significant contributions of the center to the food processing sector.

To highlight the significant contributions of FICs all over the country, DOST-ITDI launched a competition for the Most Innovative Product produced by the FIC and titled it "Recognition of the Most Innovative Products." Food Innovators from the different regional FICs showcased prototype food products using the DOST-HITS equipment to vie for the award.

Preliminary screening was held last September 22-23, 2016 at the Food Processing Division training room while the final round was held last November 14, 2016 at the ADMATEL Conference Room ITDI-DOST, Bicutan, Taguig City.

This competition is part of the Grants-In-Aid project of the DOST- Philippine Council for Industry, Energy and Emerging Technology Research and Development titled "Development of Competence of the DOST Food Innovation Center and Recognition of Most Innovative Product" which aims to catalyze research and development and boost food product development in the local scene.

In the preliminary screening, participating regional FICs were allowed to submit a maximum of five prototypes per DOST-HITS equipment. However, only the top 20 products can proceed to the final round.

Out of the five finalists for the most innovative products, the EVFIC bagged the Second Most Innovative Product in the Vacuum Fryer Category for its banner product "Crunchy Mayahini". The product is made from locally harvested surf clams which are commonly known as "barinday" and "mayahini" in some parts of Leyte and Samar, respectively. Marketed as both a ready-to-eat beer match for local bars and restaurants and as a product which can be used for further processing in non-meat eating countries, this crunchy seafood product captured the panelists' interest with its unique taste and its wide gourmet application, as pitched by Dale Daniel G. Bod, instructor at the Eastern Visayas State University. Crunchy Mahayini can likewise substitute for meat in pasta dishes and be used as ingredient for savory ice cream and other products. The EVFIC team led by Dr. Hilaria L. Bustamante, EVFIC center director; Marilyn O. Radam, DOST VIII FIC focal person; and Gerry B. De Cadiz, EVFIC project coordinator received a check worth Php 25,000 for qualifying in the final round and Php 50,000 as second placer in the Most Innovative Product for Vacuum Fryer category. The award spurred the EVFIC to keep on developing innovative products that will improve the food preferences of the Waraynons. As of December 2016, there were already 79 EVFIC-developed prototypes. The Center is currently applying for a license to operate and complying with the requirements set by the Food and Drug Administration after the first assessment last August 2016.

Exciting new food products on the FIC menu

By **DR. VIOLETA B. CANOZA**, *DOST-ITDI*

With the result of the recent awards organized by DOST's Industrial Technology Development Institute (ITDI) with support of the Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD), the DOST's Food Innovation Centers (FICs) may be the newest places to hunt for newly-developed innovative and nutritious food products.

Recently, DOST's ITDI and PCIEERD recognized the Most Innovative Products developed from the Food Innovation Centers (FIC) technologies and came up with exciting new products developed using in-house equipment such as water retort, vacuum fryer, spray dryer, and freeze dryer.

The award is part of DOST's program in developing the competence of FIC managers and technical personnel, particularly in product development and innovation. The DOST aims to achieve this by providing more detailed training on important aspects of food processing such as product development, food safety and regulations, food packaging, nutrition labeling, product costing, and marketing strategies.

"We have done a project on building up the confidence of our personnel in the FICs. As such, we would like to culminate this project by looking at the competence of our personnel in terms of their development of prototypes which we would find most innovative," said Dr. Maria Patricia V. Azanza, DOST-ITDI director, after the initial screening which came up with five food products from each technology.

The finalists were further tested in terms of the innovativeness, market viability, consumer acceptability, and soundness of process. Judges came from the academe, public and private organizations and institutions.

The winners

For the Most Innovative Products for Water Retort Technology, Tea Tums, developed by students and professors of the University of the Philippines Diliman, got the title. These are healthy ready-to-drink juices made from lemongrass, calamansi blend infused with turmeric, and ginger. All ingredients are known to have potential health benefits. Cagayan State University-Carig Campus placed second in this category through Uved, a traditional

Most innovative food product for water retort technology: Tea Tums (left) got first place while Uved (right) placed second.

Most innovative food product for Freeze Drying Technology: Gracilaria (left) got first place while Arius (right) placed second

Most innovative food product for spray dried technology: Sea Grapes Powder or lato (left) got first place while Bukolyte (right) placed second.

Ivatan food made from banana roots. The product is attractive to health-conscious consumers and travelers. It is also developed with a longer shelf-life so tourists visiting Batanes can buy it as pasalubong.

Region II bagged awards under the freeze drying technology: Gracilaria won as the Most Innovative Product, while Arius got the second place. Gracilaria is a kind of seaweed mass produced in Buguey, Cagayan that can be used as flavoring or processed as seaweed chips. Arius, on the other hand, is a tree that can grow anywhere in the Philippines but can only bear fruit in Batanes due to climate conditions. Its fruit gives off natural food colorants that can substitute imported berries.

For spray-dried products, Sea Grapes Powder or lato of the Zamboanga State College of Marine Science and Technology in Region IX nabbed the Most Innovative Product. It claims to have natural salty, peppery taste which can be used as flavoring for chips, noodles, and baked products. Also, it can be mixed with beverages. Bukolyte, developed by the Philippine Women's College-Davao in Region XI, then got the second place in this category. Bukolyte is powdered form of the coconut water with no artificial flavor and preservatives added made from young coconuts.

Lastly, the Most Innovative Product for vacuum frying technology went to Crispy Sprouted Monggo of Region II which claims to contain more nutrients compared with ordinary monggo. It can provide energy and help strengthen the immune system of lactating or pregnant women. Fried Mayahini or barinday of Eastern Visayas State University in Region VIII was awarded as the second Most Innovative Product for this category. In the process of frying, Fried Mayahini retains its natural and nutritional qualities, thus it can be an alternative to unhealthy chips available in the market.

For the special awards, Region II received the "FIC with the Most Number of Qualifying Products" with their seven food product entries. Another special award, the "Industry Choice Award", is given to Regions II and IX for Crispy Sprouted Monggo and Sea Grapes Powder, respectively. This award recognizes product/s that scored high in the following criteria: novelty, consumer appeal, manufacturing feasibility, and can be priced competitively.

The challenge

Commercialization of these food products poses the biggest challenge after the awarding ceremonies. Dr. Rowena Cristina L. Guevara, DOST Undersecretary for Research and Development recognizes this challenge in her closing message. To the judges, she says that they can do much in helping promote these food products as they came from different sectors of the society.

"I believe that we have the products to make the Philippines food secure. Making these available, affordable, and accessible will only happen if we have the FICs," said Dr. Guevara.

What are FICs?

Food Innovation Centers were developed in 2015 housing five DOST-developed technologies, namely: vacuum packaging machine, water retort, vacuum fryer, spray dryer, and freeze dryer. The spray dryer transforms liquids into powder instantly, while the freeze dryer produces dried materials but prolongs shelf life and enables a more convenient way of transporting these materials. The water retort machine improves shelf-life of food products even in non-refrigerated conditions, and the vacuum fryer creates crunchy products that are low in fat and high in fiber with minimal changes in color and flavor.

As of 2016, DOST has established 10 FICs nationwide located at the NCR and in Regions 2, 4B, 6, 7, 8, 9, 10, 11 with the main FIC located at ITDI, DOST Compound. FICs are open to scientists, technologists, and academicians who are in need of the said technologies.

Most innovative food product for Vacuum Frying Technology: Crispy Sprouted Monggo (left) got first place while Vacuum Fried Barinday (right) placed second.

Dr. Mario V. Capanzana, director of the DOST-Food and Nutrition Research Institute, receives the Presidential Lingkod Bayad Award from Pres. Duterte during the awards rites of the 2016 Search for Outstanding Government Workers Dec. 29 in Malacañang. Dr. Capanszana was recognized "for being a key player in addressing malnutrition, resulting in the decrease of the child mortality rate in the country." (Photo by Rappler)

Pres. Duterte confers Lingkod Bayan Award to *Dr. Mario V. Capanzana*

By FRAMELIA V. ANONAS, *DOST-STII*

President Rodrigo Roa Duterte conferred the Dangal ng Bayan Award to Mario V. Capanzana, director of the DOST-Food and Nutrition Research Institute, for "being a key player in addressing malnutrition, resulting in the decrease of the child mortality rate in the country."

"When the good news reached me, I was in disbelief and asked, 'Is it really me?' recalled Dr. Capanzana, or simply "Doc Mar" to his constituents, who received the award on the 2016 Search for Outstanding Government Workers Dec. 29 in Malacañang.

"Although I am aware I was nominated, the feeling of knowing I am in the shortlist of national qualifiers is good enough. *Nakakataba ng puso.* I also felt proud that I have done something for the good of the Filipino people."

For Doc Mar, to be included as a semi-finalist to the Presidential Lingkod Bayad Award is already a privilege. "To have won it, along with other three individuals and two groups, is a great honor," he said.

He also is also proud of the fact that the award is not only a recognition of his achievements but that of the DOST-Food and Nutrition Research Institute. "I only provided the guidance and innovative ideas to make things happen inspite of the many challenges in achieving the goal on bringing science and technology closer to the people," he admitted humbly.

Other than the award itself, Doc Mar considers it an honor too to be chosen to lead the prayer before the start of the awarding ceremony in Malacanang, with the president of the Philippines in attendance.

"I needed to review and rehearse with feelings the prayers I read at the awarding rites," he recalled.

According to the Civil Service Commission which administers the Honor Awards that includes the Presidential Lingkod Bayan,

Dr. Capanzana was recognized for his efforts in pushing for the implementation of food fortification programs and nutrition intervention strategies in the country. The initiatives, which include the Malnutrition Reduction Program, address macronutrient deficiency among Filipino children and mothers.

He also led the development of a multi-nutrient growth mix to increase the nutrient intake of infants and young children, as part of the Philippines' commitment to the Millennium Development Goals.

"The award simply validates that S&T in Food and Nutrition work towards improving the quality of life. Program and projects should be scaled up to have greater impact to Juan and Juana," said Capanzana.

"This is for you"

Feeling both happy and fulfilled during the awarding, Dr. Capanzana shares one fond anecdote with President Duterte when the President was conferring the award to Dr. Capanzana onstage. He shared that as the President wore on him the medallion and handed him the Plaque, he felt a greater sense of responsibility as a government worker.

"The President immediately acknowledged my wife by asking me, 'Is she your wife?' My response was an immediate nod, so the President told my wife, 'So this is for you', referring to the check.

"The event indeed was a memorable one to government employees like me."

Lessons learned

"Hard work, persevering attitude and not settling for mediocrity are the top qualities every government worker should possess. In my 39 years of working under the FNRI-DOST, I have demonstrated that hard works pay off," he told.

Among the fruits of his hard work are qualifying for the Lingkod Bayan Award for being a key player in addressing malnutrition, bringing science and technology in food and nutrition closer to the people. He likewise pushed for the implementation of food fortification programs and nutrition intervention strategies.

DOST's Malnutrition Reduction Program was able to address the macronutrient deficiency in children and mothers. His ardent belief that "local technology works" also led to the development of multi-nutrient growth mix to increase the nutrient intake of infants and young children as part of the Philippines' commitment to the Millennium Development Goals.

This kind of dedication is shared by more than 200-strong FNRI workers.

"The Institute is continually raising the bar of its service and this has benefitted our more than 80 million people," he said.

Advice to food and nutrition researchers

To those working in the government, especially to food and nutrition researchers, he has these words to say: "The government cannot solve the malnutrition problem alone. There is a clear need for equally vigorous efforts from all of us who are here today whether you are in the government, private or industry. Thus, we must ensure that the people who are nutritionally vulnerable must partake fully in the gains that our country achieves. We must see to it that our initiatives are not just small and short-lived advances towards nutritional improvement, but these must respond to current challenges and enough to prepare for any forthcoming crises."

Other Lingkod ng Bayan awardees include Dr. Jose Bacusmo of the Visayas State University, Baybay, Leyte; Aida Maniego of the Malita South District, DepEd-Division, Davao del Sur; M/Sgt. Perfecto Perez of the 205th Tactical Helicopter Wing, PAF, Lapu-Lapu City, Cebu; The Verdant Movers of the Bala Elementary School, DepEd-Division, Davao Del Sur; and the Bayawan City Local Flood Early Warning and Rescue Team of the City Government of Bayawan, Negros Oriental.

Presidential Lingkod Bayan awardees receive P200,000, gold gilded medallion, presidential plaque citation, scholarship grant, and other incentives.

The CSC's Honor Awards include the Presidential Lingkod Bayan Award conferred to an individual or group, the Outstanding Public Officials and Employees (Dangal ng Bayan) Award, and the CSC Pagasa Award.

In his speech during the conferment, the President said it is a virtue to sacrifice extra time for the service of government employees' fellow men aside from their regular work hours. "This is the virtue that is not present in everybody's soul, spirit," he said.

OUTSTANDING PUBLIC SERVANTS. President Rodrigo Duterte confers the awards to the 2016 Presidential Lingkod Bayan awardees at Malacañang on December 19, 2016. Photo by the Philippine Information Agency

Two women scientists get plums for novel research on "pandan" and fungi

By JOY M. LAZCANO, *DOST-STII*

Two women scientists received awards from international science research communities for their novel research works which gave prominence to endemic plants.

In a recent press briefing, Dr. Maribel G. Nonato and Dr. Rizalina L. De Leon were presented by the Philippine Association for the Advancement of Science and Technology (PhilAAST), headed by current Department of Science and Technology (DOST) Secretary Fortunato T. de la Peña, as recipients of this year's Gregorio Y. Zara Awards for Basic and Applied Research.

PhilAAST aims to promote more science and technology developments in the country through scientific and technological researches that contribute to the knowledge stock and national development.

Dr. Nonato was conferred the Gregorio Y. Zara Award for Basic Research for her pioneering works on the Phytochemistry and biological activities of Philippine genus Pandanus (Family Pandanaceae) or better known as pandan plants.

On the other hand, Dr. De Leon was given the Gregorio Y. Zara Award for Applied Research for her bioethanol production using local varieties of fungi as alternative sources of ethanol additives replacing food-based crops such as corn.

Dr. Nonato who is currently the Vice Rector for Research and Innovation at the University of Santo Tomas has spent years in doing groundbreaking research on pandan.

Dr. Maribel G. Nonato's novel works earned her the nickname 'Pandan Queen' from her students. *(Photo by Henry De Leon, S&T Media Service, DOST-STII)*

"If you are starting on your research," says Dr. Nonato. "Look for subjects that have little information so you can contribute to the development of new knowledge."

- Dr. Maribel G. Nonato

Prior to her research, there was little known information about pandan. Locally, 20 out of the 450 species of this monocot plant grow abundantly in the country. Ordinarily, pandan leaves are used by locals in preparing sweet delicacies and beverages due to its sweet aromatic scent.

In most occasions, pandan leaf can be found inside steamed rice pots.

In contrast, the closest the pandan has been considered as a herbal medicine was when the plant was included in *pito-pito*, a popular traditional herbal medicine concoction of seven endemic plants in the country used to relieve common illnesses.

In 1991, Dr. Nonato started her research focusing on the plant. She said, she chose pandan because little is known about the plant.

"If you are starting on your research," says Dr. Nonato. "Look for subjects that have little information so you can contribute to the development of new knowledge."

She was fortunate to have initial talks with world-

"I hope we could give more awards to our local scientists to inspire them and give credit and prominence to their works and contributions to science and the society."

Dr. Rizalina L. De Leon

Dr. Rizalina L. De Leon's research has brought her to discover fungus and other waste products as feedstock for bioethanol. *(Photos by Henry De Leon, S&T Media Service, DOST-STII)*

renowned Pandanus botanist Dr. Benjamin Stone who was then working with the National Museum on a project focusing on the inventory of Philippine medicinal plants.

But a turn of event almost stalled her research as Dr. Stone's untimely demise and its limited resources slowed down what could have been a smooth start. However, Dr. Nonato was unhindered by her predicaments and continued her work.

Her research led to the discovery of new secondary metabolites with new biological activities, which is the basis for its medicinal attributes. With her breakthrough discovery, our neighboring countries such as Malaysia, Indonesia and Thailand undertook similar research on their respective Pandanus species.

Moreover, biological studies on pandan have found it as potential source of anti-microbials, anti-viral, diuretics, anti-tuberculars, antioxidants, and anti-inflammatory agents.

Consequently, Dr. Nonato's research on the new alkaloids earned her the 2006 National Research Council of the Philippines Achievement Award in Chemical Sciences. And for her students, her various works on pandan has earned her the monicker "Pandan Queen" as most research literatures are attributed to Dr. Nonato's works.

"You just have to work diligently and be the expert on that field," Dr. Nonato closes.

On the other hand, Dr. De Leon's research on bioethanol production gave her prominence.

Deviating from the usual bioethanol feedstock using corn and other similar food-based materials, Dr. De Leon focused on local fungal species that can degrade complex polymers called lignin to produce ethanol as fuel additives.

According to her, corn and other food-base raw materials should not be used in the production of alternative fuel as this threatens food security in the country.

Her team identified *Fusarium moniliforme*, one of the most prevalent fungi, as a promising source of ethanol through a consolidated bioprocessing approach that extracts the ethanol from its solid form.

The bioprocess provides the fermentation resulting in the production of a substance with higher ethanol concentration at a shorter processing time.

Other notable scientists conferred were Dr. Enrico C. Paringit, recipient of the David M. Consunji Award for Engineering; Dr. Antonio Dans, for Dr. Paulo C. Campos Award for Health Research; and Dr. Antonio Laureana as this year's Leads Agri awardee.

In his closing remarks, Secretary Fortunato T. de la Peña encouraged DOST to give more recognition to local scientists and researchers as this provides a channel for local talents to be recognized.

"I hope we could give more awards to our local scientists to inspire them and give credit and prominence to their works and contributions to science and the society."

PhilAAST confers the awards annually to men and women of science who have contributed new knowledge for the advancement of science and technology in the country. Awardees receives P50,000 cash and plaque of recognition.

SEC. DE LA PEÑA'S VISION:
Science for the people

By HENRYLITO D. TACIO
Photos By HENRY DE LEON, *DOST-STII*

"I was surprised when I was told to go to Davao in the morning of May 31," recalled Prof. Fortunato T. de la Peña, DOST Secretary. The call was for him to take the leadership of the Department of Science and Technology.

He was not new to DOST as he had been with the Department for 14 years before his retirement. Little did he know that after just a couple of years, he would be pulled back to government service—this time as the Secretary.

As he assumed his work as Science Secretary, he reviewed all the on-going and proposed Research and Development (R&D) programs/projects. "This is to ensure that our R&D will be supportive of the president's priorities particularly in the area of agriculture and food, health, education, small enterprise development, and poverty alleviation."

Sec. de la Peña has also announced to the DOST family his aim of having an expanded program of services to the various regions in the country.

"I will see to it that capable state colleges and universities in the regions are given an opportunity to have their share of R&D work to address the concerns of their regions," he says. "I will work out a program to immerse our scholars in order to do work that will help communities in the regions. I will also work for a better utilization of our research outputs, our scientific and technological facilities and expertise."

Among the programs he is lining up are those pressing issues pertaining to legislation that will improve the delivery of scientific and technological services. "Bureaucratic procedures that slow

down R&D activities will also have to be addressed," he says.

Asked how his management will differ from previous science secretaries, he replies: "My style is participative management. I also value benefits derived from consultation. If other government agencies have a stake in the R&D work we are doing we have to collaborate closely."

Sec. de la Peña also wants to harness the services of its collegial bodies like the National Academy of Science and Technology and the National Research Council of the Philippines "for policy advice."

"I believe that we need a wise and rational system of resource allocation, in so-called 'value for money' undertakings, in hands-on monitoring and in motivating fellow workers in a variety of ways."

- Sec. Fortunato T. de la Peña

As Science Secretary, he wants to focus on how science and technology can be put to good use by government agencies, by the productive sectors and by ordinary citizens. "We will have focus areas, although not so many, where we will go all out to get the best results," he says.

His goal of bringing science to the grassroots spurred the Department's current mantra: "Science for the People." It embodies the Secretary's desire to bring the benefits and advantages of science and technology even to the farthest barangays in the country.

"I believe that we need a wise and rational system of resource allocation, in so-called 'value for money' undertakings, in hands-on monitoring and in motivating fellow workers in a variety of ways," he says about his strategy in bringing S&T to the grassroots.

In terms of science and technology, the Philippines is way behind among some members of the Association of Southeast Asian Nations (ASEAN). "In general, Singapore, Malaysia and Thailand are already ahead in science and technology. Our country, Indonesia and Vietnam are catching up. The others are still in the start-up or initial stages, so to speak," he says.

Sec. de la Peña dreams that under this administration, the Philippines will be in the league of Malaysia and Thailand. "We see that within six years," he says, adding that it could be accomplished by honing the country's assets in S&T: human resources, R&D institutions and universities. "The investors who want to operate in our country can also be considered assets."

His stint in DOST started when he became head of planning service division of the NSTA in the early 1980s. In 1989, he was appointed director of DOST's Technology Application and Promotion Institute where he stayed for three years. In 1993, he returned to UP Diliman as vice president for planning and development.

From 2001 to 2014, Prof. de la Peña served as Undersecretary for Science and Technology Services of DOST. During this time, he was the Chairman of the e-Government Committee under the

Information Technology and e-Commerce Council. His technical expertise was also solicited in designing the roadmap towards e-governance in the country in collaboration with the Department of Transportation and Communications.

Perhaps one his significant contributions in field of S&T is the PICWIN (PAGASA Philippine Interactive Climate Weather Information Network), an information system that provides direct public access to the frontline services, including weather forecasts and typhoon warnings, of the country's weather bureau. "PICWIN was not my idea," he admits. "I only coached the proponents on how to make the presentation to get funding."

Sec. de la Peña is also credited for the Tests, Analyses and Calibration Information System which establishes computer-based product and equipment testing, analysis, and calibration services.

Robotics is also one of his advocacies and research focus because he believes it is a platform the country can use. "Robotics," he points out, "attracts many young people to go to science and technology."

The Secretary was reportedly cited "for his key role in the formulation of the National Science and Technology Plan for 2002-2020, and in the conceptualization and institution of several e-Governance programs topped by the e-Library Project."

The NSTP 2002-2020 outlines the direction and policy framework for S&T efforts in the country. The e-Library is an inter-agency project that modernizes a network of major government libraries such as the National Library, and libraries of DOST, Department of Agriculture, and Commission on Higher Education, among others using information and communication technology tools.

The boy from Bulacan

The boy who grew up in Bulacan, Bulacan has gone a long, long way indeed. He is the youngest and the only boy among three siblings. His father, Emilio Banzon de la Peña, who hails from Bataan, was a postmaster, telegraph operator, and postal bank officer all rolled into one. He served the government from the early 30s to the late 60s.

His mother, Luz Fajardo Tanseco, was from Bulacan herself and was a full-time housewife taking care of the three children. Not too many know that his great grandmother was a cousin of General Gregorio del Pilar.

Sec. de la Peña admits that he misses the kind of life while growing up in his hometown. "Life was very simple (then) where we practically knew everyone," he recalls.

When he was still a little boy, he wanted to become a medical doctor. It was his two sisters, both graduates from the University of the Philippines (UP), who suggested that he should take up engineering. Perhaps, it was divine intervention for he did!

At the age of 19, he graduated from UP College of Engineering in 1969. "This was because I started elementary schooling early," he says. "I worked for an oil company which supported me in college after graduation but felt the urge to do something else.

"I was invited to teach at UP and loved it," he continues. "The liberal atmosphere, the very good students, and the excellent professors in UP were impressive. I decided to teach there because I was quite sure that my life will be of good use teaching there."

The loving father

He was already an assistant professor at the UP College of Engineering when he got married at the age of 29. "My wife, Mariquit Banzon, a nurse, is the daughter of our town doctor. We were school bus mates as we commuted to and from school in Malolos. Her simplicity and beauty attracted me."

The couple is blessed with five children. The eldest, Margarita, is a medical doctor while next to her, Emil, is a veterinary doctor. The third, Fortunato, Jr. is an assistant professor of industrial design in UP Diliman while another son, Miguel, is an artist/entrepreneur. The youngest, Federico, is an engineering geologist.

"My wife is a full-time housewife and mother," the Secretary says. "She worked for some years at the UP Infirmary during the early years of our marriage. She is very supportive of me and all our children."

Aside from his bachelor's degree in Chemical Engineering, de la Peña had masters in Industrial Engineering and special training certificates in business administration, also both from UP in Diliman.

He pursued graduate studies in Operations Research in Polytechnic Institute of New York and obtained a diploma in Industrial Quality Control from Bouwcentrum International Education in Rotterdam, The Netherlands.

As the new Science Secretary who went back to service after retirement, Prof. de la Peña believes that "Any citizen called to serve should serve with dedication, sincerity and to the best of ability," he points. "I believe in participatory management. I believe that good example is the best way to lead. I believe in building up the ones who will succeed us."

Danum is Life

By **ARISTOTLE P. CARANDANG, PhD**, *DOST-STII*

It was a chilly early December day and the morning sun was kissing the misty treetops. Fog clung like a carpet spread over the forest. And while shadow still gripped the mountain, the seemingly eternal silence was suddenly broken by the unexpected barks of stray dogs hiding in the unlit part of the streets. Intermittent chirps of birds and morning calls of roosters decorated the air. Everything was in synch as if 'Apo" was holding the baton creating a melodious harmony of sounds; conducting the beat of orchestral music, deeply touching the human soul.

In this picturesque, idyllic setup, a team from the city arrived in Barangay Tagudtud, a village about one–and-a-half-hour drive from San Fernando, La Union. The pure air was very cold and reminiscent of the daily weather in the City of Pines. Everyone immediately fell in love with this hard-up village bordering the province of Benguet. This community in northern Luzon with a population of 1,019 according to the 2015 National Census is part of the Municipality of Bagulin – one of the poorest local government units in the country that has nothing to boast of but the desire of its people to rise from their daily challenges.

The people, mostly of Kankanaey descent, draw their daily subsistence from the most basic agricultural produce – rice. But, unfortunately, it is planted only once a year because there is no irrigation. Farming is basically rain-fed in this part of the world.

Another major source of livelihood, which is not really as much, is their famous broom made of tiger grass or broom grass (*Thysanolaena maxima* of the family *Poceae*); which unfortunately, has been made into a popular brand by another LGU.

Water, called *danum* in this part of the country, truly dictates the fate of these people. It may give life and yet may also take it away – the push and pull of human existence.

And so they spoke.

Marilou A. Alagad, 38, is self employed and gets daily earnings for her family by selling a variety of foods that can be readily served near the municipal hall, about 30 to 40 minutes from the village by motorcycle or jeepney. She shared how difficult it was for them to get potable water in the past. What makes it more difficult is that she is engaged in food business where water is central.

True enough, their water sources remain to be the spring or *ubbog*. She recalled that sometime in the past, a score of children and a number of adults got sick because of water-borne causes.

Speaking in Iloko, Marilou said that they thought their drinking water was safe until the Department of Science and Technology (DOST) informed them of harmful microbiological organisms such as coliform and *E-coli* that were present in water, among others.

Later, Marilou became a recipient of the ceramic water filter that was distributed by the DOST to help arrest water-related problems.

Marilou C. Alagad, a karenderia operator, explains how the ceramic water filter helps her ensure that the water she uses to prepare food is safe. *(Photo by Aristotle P. Carandang)*

Barangay Health Worker Dolores A. Kadingpal, 65, of Brgy. Tagudtud, Bagulin, La Union thanks the DOST for helping address longstanding problem on their drinking water and intimated that the majority of the households now have the ceramic water filter. *(Photo by John Rodriguez)*

Marilou C. Alagad, 38, shows the way to their spring or *ubbog* where they get water to be filtered using the DOST developed ceramic water filter to make sure that their drinking water is safe. *(Photo by John Rodriguez)*

Developed by DOST's Industrial Technology Development Institute or ITDI, the ceramic water filter was formulated with locally sourced red clay, sawdust, and sand and coated with nano antimicrobial agent to eliminate water borne microorganisms. The ceramic filter is mounted inside a bucket receptacle with a pitcher-type receiver that purifies tap and deepwell water into potable water that conforms to the microbiological criteria set by the Philippine National Standards.

Majority of the households in the area now have the ceramic water filter, said Dolores A. Kadingpal, 65, a housewife who also dabbles as a barangay health worker. She is thankful that DOST was able to reach their area to help address their long standing water problem.

"Ang tubig namin dito ay sobrang napakahirap," Aling Dolores related. Noong wala pa ang ceramic water filter dito, marami ang nagtatae na mga bata at pati rin kami na adult ay marami rin ang nagtatae dahil hindi masyado malinis. Marami ang sumasakit ang tiyan.

But she is grateful now with ITDI's assistance. "Nagpapasalamat din kami sa ibinigay ng DOST. Ito ang nagbigay-solusyon lalo na sa buwan ng kuwaresma kaya dito kami kumukuha ng tubig namin dahil

Wearing a *Kankanaey* traditional outfit, Venus Llaneras shows how they boil water from the spring prior to receiving the ceramic water filter from the DOST through the project called Community Empowerment through Science and Technology or CEST. *(Photo by John Rodriguez)*

malayo kung saan kami talaga kumukuha ng tubig dito sa Brgy. Tagudtod, Bagulin, La Union. Ang gamit namin sa tubig – ginagamit namin sa pagluluto, ginagamit namin na panligo, ginagamit namin na inumin. Marami itong gamit."

She stressed, "Hindi kami mabubuhay kapag walang tubig."

DOST Region 1 Director Dr. Armando Q. Ganal said that through the DOST program billed as "Community Empowerment through Science and Technology" or CEST, the poorest barangays in the country are now being served by the DOST. CEST directly touches the lives of those in the periphery of development, which keeps it in synch with the thrust of the Department as can be gleaned in its slogan 'Science for the People' where research outputs are translated to actual benefits that can be enjoyed by the Filipinos.

Ganal shared that in the region he oversees, the Municipality of Bagulin where Barangay Tagudtod is located, is the poorest LGU in the province of La Union and the 6th poorest in the entire country.

But now, the Ceramic Water Filter, distributed to folks in Barangay Tagudtod under the CEST program , has made life easier and better for the locals by providing them with potable water.

Indeed, the locals are happy that the government reached a far-flung village in the mountains of northern Luzon to provide them with safe, clean water – a necessity for daily living and, in their case, plays a central role in their livelihood and therefore, their future.

Water, called danum in this part of the country, truly dictates the fate of these people. It may give life and yet may also take it away – the push and pull of human existence.

Various types of Ceramic Water Filter formulated with locally sourced red clay, sawdust, and sand and coated with nano antimicrobial agent to eliminate water-borne microorganisms. The ceramic filter, developed by DOST's Industrial Technology Development Institute, is mounted inside a top bucket receptacle with a receiver that purifies tap and deep well water into potable water that conforms to the microbiological criteria set by the Philippine National Standards.

Editor's note: This article will have a documentary film version to be aired over DOSTv

By **ARISTOTLE P. CARANDANG, PhD**, *DOST-STII*

Tawi-Tawi: A gift from the sea

Misconceptions about Tawi-Tawi abound, unfairly painting an unwelcoming image.

In more ways than one, however, this mystical province of the Sulu archipelago keeps in utter silence its hidden wealth from the transcendent sea, not to mention the warmth of its people that goes beyond hospitality. True, Tawi-Tawi lives because of the vibrant waters of the Sulu and Celebes Seas but its eternal liaison with Gaia is not only symbiotic but a real, unconditional bond.

Tawi-Tawi, comprising 11 municipalities, is the country's southernmost province with Bongao as its capital. Part of the Autonomous Region of Muslim Mindanao or ARMM, it lies at the southwestern tip of the country and situated between Sulu Sea in the north and Celebes Sea in the south. Strategically, the

Researchers from DOST-PCAARRD Coral Reef S&T program show how corals can be restored and propagated. *(Photo by Emir Khan Bautista)*

province shares sea borders with the Malaysian state of Sabah and the Indonesian North Kalimantan province. The critically fragile Turtle Islands, famous among conservationists, is just 20 kilometers away from Sabah, Malaysia.

With its dry and wet seasons, the province seems to enjoy eternally blissful summer. Its wettest months are from August to November while the rest of the year is generally dry with occasional showers.

Unknown to many, beneath the pristine waters and blue skies, Tawi-Tawi has experienced slow and painful destruction that is anthropogenic in nature – which means that humans remain the main culprit for its eventual ruin. Delicate coral reefs have been damaged and innumerable marine species are on the brink of total annihilation because of indiscriminate fishing practices that also include the notoriously popular dynamite fishing.

Then came the intervention

The Department of Science and Technology (DOST) through the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development or PCAARRD has silently ventured into an ambitious rehabilitation program of coral reefs that has helped improve the conditions of corals covering Tawi-Tawi, Palawan, Zamboanga, Pangasinan, Bohol, and many other sites all over the country.

DOSTv segment host and Indie actor/singer Sandino Martin (left) talks to Tawi-Tawi Provincial Tourism Officer Mobin Gampal (right) about the assistance provided by the DOST to rehabilitate the coral reefs that significantly contributes to the livelihood of the people of Tawi-Tawi. *(Photo by Aristotle P. Carandang)*

Rani Timpah, a Tausug fisherman, shares his relationship with the sea. He said that he used to be engaged in dynamite fishing but has now been transformed being part of the ongoing rehabilitation of the coral reefs – courageously protecting the corals from those with ill intent. *(Photo by Aristotle P. Carandang)*

In Tawi-Tawi, the project is in partnership with Mindanao State University – Tawi-Tawi College of Technology and Oceanography.

And they see hope.

Mr. Mobin N. Gampal, Provincial Tourism Officer of Tawi-Tawi emotionally shared that there were rampant dynamite fishing and use of cyanide in the past that contributed to the destruction of the coral reefs. Fortunately, he said that the DOST came into the picture and brought in the coral rehabilitation project.

He said, "In relation to tourism – sa restoration ng corals, isa po itong higanteng project mula sa DOST na kung saan hindi lamang nito binubuhay ang corals, binubuhay din niya ang buong Tawi-Tawi. (This is a huge project of DOST. The project does not only restore the corals but also revives the whole of Tawi-Tawi)."

He further explained that the province has been heavily dependent on the bounties of the sea where corals play the most critical role. The province is known for fishing and agar-agar (seaweeds) farming, two of the leading livelihood sources of the people of Tawi-Tawi aside from agriculture.

Being both Tausug and Badjao (Sama Dilaut), Mobin Gamal has the indigenous lineage and cultural responsibility to be passionately involved in the development of his home province, especially that the gargantuan task of providing tourism development roadmap has been placed on his shoulders upon his appointment recently.

He directly sees the strong connection and interdependence between local development and rehabilitation of the coral reefs. He said that tourists visit Tawi-Tawi because of its waters and everything under the surface especially the corals, and the assistance provided by the DOST to rehabilitate the coral reefs has significantly contributed to the livelihood of the people of Tawi-Tawi.

Meanwhile, Rani Timpah who spoke in his native Tausug shared his colorful experiences, both the highs and the lows of his lifelong relationship with the seas. Without a tinge of hesitation, he willingly told his story – a fisherman who has seen everything there was to see and done everything there was to do.

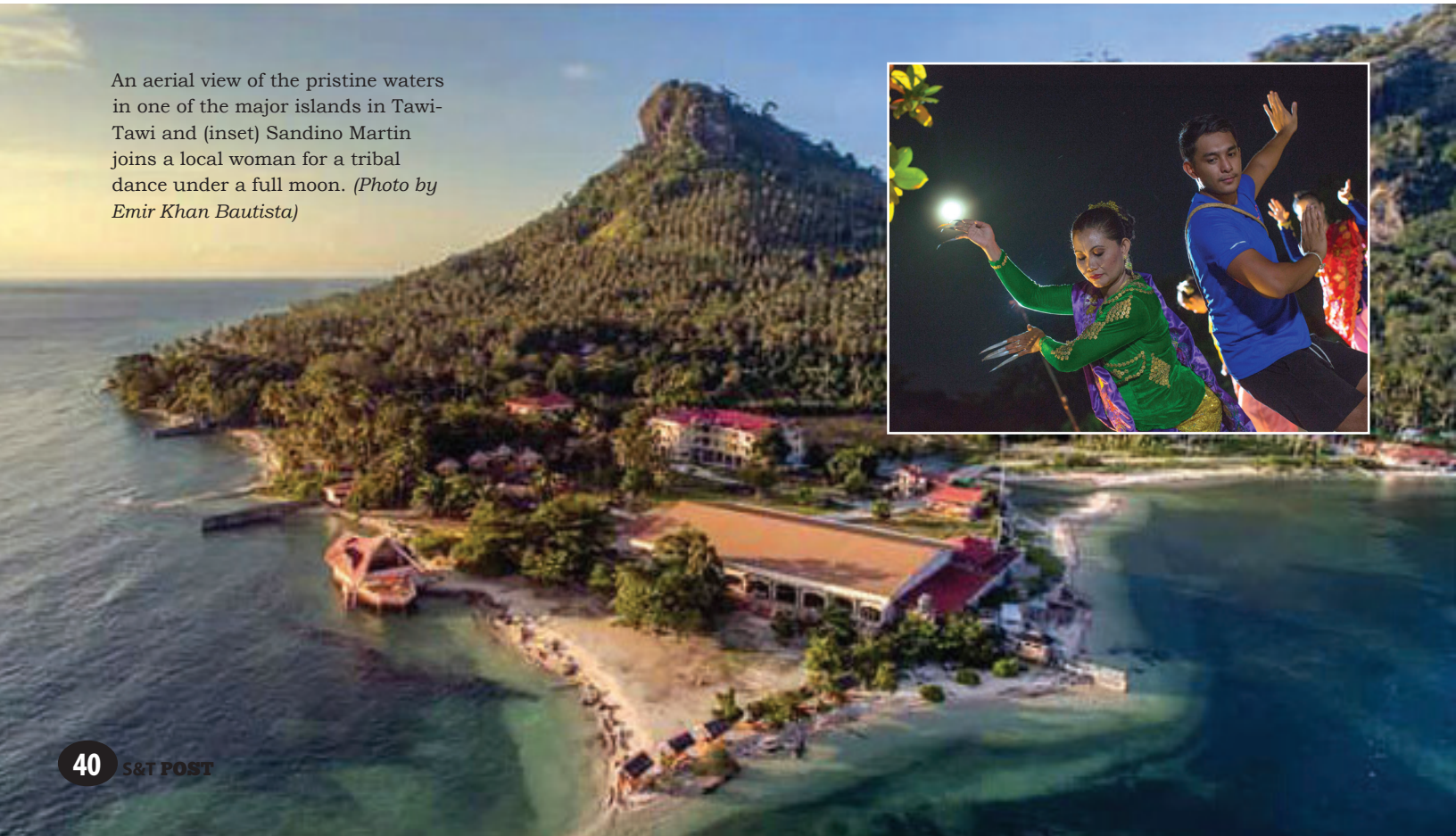
He used to be engaged in dynamite fishing. But after years of using destructive and unlawful means, he realized the dreadful results brought about by illegal fishing. He intimated that what used to be a bountiful catch eventually became unacceptably smaller. And as time passed by, he slowly and painfully learned the dangers posed by it not only to himself but to his family as well, and even to the community's source of livelihood.

Now, Rani Timpah is part of the ongoing rehabilitation of the coral reefs – courageously protecting the corals from those with ill intent.

Life changing is what everyone has been saying about the project. They said that various fish and other marine species start to thrive once again in the coral reefs.

As the coral reef rehabilitation progresses, more and more people become aware of its importance – its connection to their lives as a people who are directly dependent on the produce of the sea.

The area is part of the so called "Coral Triangle" composed of Malaysia, Indonesia, Papua New Guinea, Solomon Islands, Timor-Leste, and the Philippines. It is



An aerial view of the pristine waters in one of the major islands in Tawi-Tawi and (inset) Sandino Martin joins a local woman for a tribal dance under a full moon. *(Photo by Emir Khan Bautista)*

A local harvesting bounties from the Tawi-Tawi water during low tide. *(Photo by Emir Khan Bautista)*

recognized as the global center for marine biodiversity and a global priority for conservation.

On the side of DOST-PCAARRD, Virna G. Salac said that like any other DOST projects, sustainability is truly essential. She cited further the importance of coral reefs to the local government units in relation to source of livelihood and ecotourism, including their natural purpose of providing coastal protection during calamities.

She explained that there are two major reasons why corals are destroyed – natural and manmade. Natural destruction occurs when there are typhoons, tsunamis, or storm surges. Manmade or anthropogenic destruction happens due to dynamite fishing, and use of cyanide and destructive fishing gears that may uproot the corals. It also includes the "muro-ami" fishing technique that involves pounding on the coral reefs to drive fish to incoming nets.

Providing more technical and other project related information, Salac explained that the DOST-PCAARRD Coral Reef S&T program is composed of three components: Coral Restoration Using Asexual Reproduction, Coral Restoration Using Sexual Reproduction, and National Coral Mapping. The first two projects deal with rehabilitation and propagation of the coral reefs while the National Coral Mapping project is particularly important to know the location and status of the coral reefs in the country for proper management.

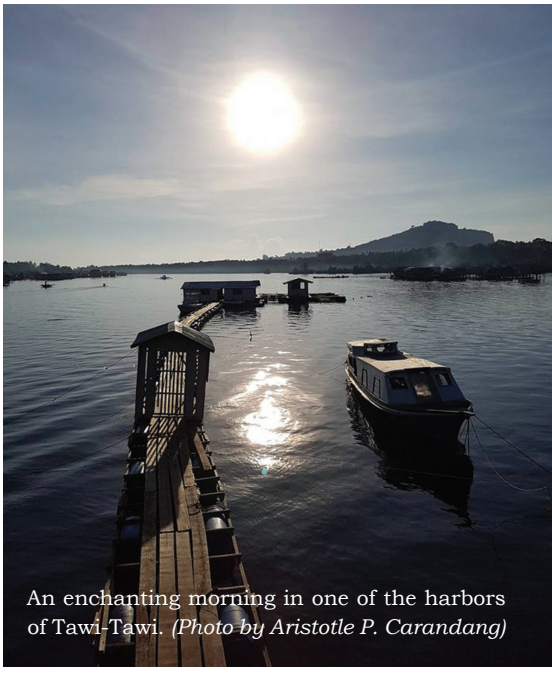
It was explained that the "Corals of Opportunities" or COPs, as the project staff call the corals, were delicately tied to coral nursery units and carefully reared for 6-10 months and later transplanted to restoration sites with barren or low coral cover. They were able to deliver 48 coral nursery units that were deployed in different areas such as Bongao, Panglima Sugala, Simunul, Sibutu and Sitangkai. Around 20,800 coral nubbins were transplanted to the restoration site covering an area of one hectare.

As they carefully measure growth of the transplanted corals, the project team observed that the branching corals species *Porites sp.* and *Acropora sp*. have higher survival and faster growth rate compared with the sub-massive species. Also, it was noticed that directly transplanted coral fragments had shown promising results. In fact, there were 2,118 fragments that were transplanted directly on dead coral boulders and have demonstrated high survival rate.

Project people see that rehabilitating the reefs of Tawi-Tawi through coral nurseries or direct transplantation proved promising and can serve as a benchmark for coral restoration in the Philippines.

With strong partnership from all sectors and the unwavering determination of every individual involved in the rehabilitation of the coral reefs, it is not impossible for Tawi-Tawi to be the place of destination of the future.

Editor's note: This article will have a documentary film version to be aired over DOSTv



An enchanting morning in one of the harbors of Tawi-Tawi. *(Photo by Aristotle P. Carandang)*

Dr. Rogel Mari D. Sese

PH can become hub of space tech in SEA, says astrophysicist

By ESPIE ANGELICA A. DE LEON, *DOST-STII*

THE PHILIPPINES has the capability to become the hub of space technology and space applications in Southeast Asia where engineers, scientists, and industry stakeholders around the region can converge, instead of the country sending its professionals abroad to learn and be trained.

This was stated by astrophysicist Dr. Rogel Mari D. Sese in an interview with the media after a press conference for the 23rd Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-23) held at the Sofitel Philippines Plaza Manila November 15-18, 2016.

Sese is the focal person for the Philippine Space Science Education Program of the Department of Science and Technology-Science Education Institute (DOST-SEI).

"These are the areas where we would like to have an impact thru space technologies: national security and development, hazard management and climate studies, space industry and capacity building, and education," DOST Secretary Fortunato T. de la Peña revealed at the press conference.

He added that government has earmarked P1B for space technology from 2017-2018, after which the yearly allocation would be around P2 billion.

Meanwhile, government invested around P840M prior to the launching of Diwata 1 – the first microsatellite designed and built by Filipinos, and deployed into orbit from the International Space Station in April 27, 2016.

"The initial strategy is to send our scholars abroad," de la Peña added. "The best strategy is to institute some academic programs here in the Philippines and that might involve the invitation of some foreign experts to help us initialize some of these programs. But eventually, we hope that we will be able to train our own."

"We're looking toward building our own space industry," shared Sese. We are a little bit behind. But if we do things right, we can take the lead in the Southeast Asian region."

Sese, a member of the APRSAF Space Environment Utilization Working Group, claimed that having a space industry in the Philippines will translate to jobs not only for astrophysicists, engineers, and others directly involved with the space industry, but also for support personnel.

"It had been stated that we need around 800 aerospace engineers and scientists in the next 10 years. Studies have shown that for every one person that is directly involved in the space field, there are four other people who serve as support personnel," Sese explained.

With a local space industry generating many jobs, the brain drain that currently characterizes local manpower will hopefully be put to a halt.

"The Philippines is pursuing this space technology development because we are also asking our lawmakers to have a bill approved for the creation of a Philippine space agency and a national space development program for the next ten years," said APRSAF Co-chair and DOST Usec. Rowena Cristina L. Guevara. "I assure you space technology is very useful for this country."

Said bills are House Bill 3637 and Senate Bill 1211 which both aim to legislate a Philippine Space Development and Utilization Policy and create a Philippine Space Agency.

Aside from the Philippine Science Education Program, SEI is also in constant collaboration with the Japan Aerospace Exploration Agency for several space awareness programs for local schools, and is currently working toward including space education in the K-12 curriculum for both elementary and high school levels, among others.

The APRSAF, which the country is co-hosting with Japan for the first time, is the largest space-related conference in Asia-Pacific attended by space agencies, government bodies, international organizations, companies, and research institutes in the region.

Image lifted from [illegible] DOST Region 12

Gov't services that can help in your food business

By GERALDINE BULAON-DUCUSIN, *DOST-STII*

DO YOU know that there are a number of government programs and services which can help you either start your own food business or help your existing food business grow?

If you're still undecided as to what food business you'd like to get into, the food technologies of the Department of Science and Technology's Food and Nutrition Research Institute (DOST-FNRI) can help you come up with healthy food products, such as vegetable noodles, crunchy healthy snacks, high fiber fruit juices, fortified food, healthy street food (squash fish balls and squash maja), ethnic food like instant *pinakbet* or *laing*, and many other possible food products.

For a list of food technologies, you may visit their website and the list of food technologies: http://www.fnri.dost.gov.ph/images/sources/List_FT.pdf

Now, if you already have a business, but want to improve yourfood packaging or the shelf life of your product, or you'd want to have food analysis, you may go to DOST's Industrial Technology Development Institute (ITDI) (URL: http://www.itdi.dost.gov.ph/) to help you with thermal processing studies, such as heat penetration test on canned and bottled products, heat distribution tests for retorts and corrective action and sterility tests. They also do physico-chemical and microbiological analysis, as well as pilot plant setup and shelf life testing.

DOST-ITDI also has Technology Business Incubators that are available for short term lease for start-up entrepreneurs to help them get familiarized with the technologies involved, enable them to produce product samples for market testing, help them get more established before venturing on their own and set up their own production facility.

The good news is that most of these services are available in the provinces because DOST has regional offices that help in the technology needs of the entrepreneurs in the regions. Every regional office has Regional Standards and Testing Laboratory that provides technical support to food manufacturing, trading and production sectors through the physico-chemical and microbiological tests it offers.

The RSTL adopts and implements several quality assurance programs and quality control activities. Its equipment are calibrated and maintained; it also undergoes regular proficiency testing, continuous improvement of its facility, personnel training program, andother relevant standards.

The regions also conduct seminar and training, some of which are technology seminars on the following: packaging and labelling training, Good Manufacturing Practices Awareness Seminar, Food Safety Orientation Seminar, and Charcoal Briquetting Technology, among others.

For more information on technologies and services you may visit http://www.dost.gov.ph/ and find the agencies and regional offices that can possibly help you give your entrepreneurial ventures a push.

Technology helped banana chips get that perfect crunch

By RITCHIE MAE L. GUNO, *DOST -X*

Banana Chips finely cut with DOST's intervention through the provision of equipment

HEALTHY, CRISPY and crunchy-- these kinds of snacks are what most health conscious people prefer. But when it was still starting, Malitbog Banana Chips was not delightfully crunchy. In fact, customers and other stakeholders said that the product needed to improve its quality, labeling, and packaging.

The story of Malitbog Banana Chips in Malitbog, Bukidnon started in 2011 with funding sourced from the Mindanao North Coast Integrated Development Project of the Department of Agriculture (DA) and the municipal government of Malitbog. The local government unit (LGU) funded the construction of the building while DA funded the purchase of equipment. The LGU started its operation through the effort of a local finance committee.

Operations got underway and the banana chip products became available in the market. However, it did not get a very good feedback.

Fortuitously, the Department of Science and Technology's Community Empowerment through Science and Technology (CEST) program was launched in Malitbog, Bukidnon as pilot site. CEST aims to empower poor and depressed communities through science and technology (S&T) interventions in health and nutrition, water and sanitation, disaster risk reduction, climate change adaptation, basic education, and livelihood development.

Sample taste tests were conducted during the consultation and presentation of CEST program with local officials and department heads by the DOST Regional Office and Provincial Science and Technology Center (PSTC) in Bukidnon. The tests yielded the same information: The banana chips had a rancid taste and needed packaging and labeling improvement.

The product of LGU Malitbog, Bukidnon on display during the 2015 National Science and Technology Week celebration at SMX, MOA, Pasay City.

Packaging the banana chips

Also, after the first site assessment of PSTC Bukidnon, it was found that the processing area, equipment, and process flow also had to be improved - an implication that the whole process should actually be enhanced.

Thus, in 2013, the LGU of Malitbog sought the assistance of DOST through CEST for the upgrading of the common service facility for banana chips processing. The processing facility was upgraded through the acquisition of equipment such as spiral mixer, vacuum packaging machine, deep fryers, digital weighing scale, refractometer, and industrial thermometer. Other interventions included enhancement training of the banana chips processing including compliance to Good Manufacturing Processes for food safety standards.

At present, Malitbog Banana Chips as a brand is now making a name in the market through pasalubong centers in Bukidnon and Cagayan de Oro City. Most importantly, the economic activity in the municipality is moving, employing women from the indigenous Higaonon tribe, and providing livelihood for Cardava Banana farmers.

Cardava banana as the raw material of Malitbog Banana Chips

Trips to Divi nurtured entrep spirit of PH pioneer in healthy sugar

By GERALDINE BULAON-DUCUSIN, *DOST-STII*

MAURA DE Leon was in grade six when she would tag along with her aunt to Divisoria for the latter's banana business.

"Maaga pa lang sumasama na ko sa tiyahin ko sa Divisoria. Dun sya bumibili ng mga saging. Tapos sa ibabaw na ako ng mga saging natutulog. Sa sampung tumpok, sabihin nya 'Ibenta mo walo, iyo na yung dalawa.' Kaya siguro ako nahilig sa negosyo, kasi bata pa ko, namulat na ko sa negosyo."

(Very early in the morning I would go along with my aunt to Divisoria. My aunt would buy bananas there. Then I would be sleeping on top of the bananas. For ten piles of bananas she would ask me to sell eight and I get the two piles. Perhaps that's why I was drawn to business because I was exposed to it at a young age).

This little girl would later find herself in various businesses - garments, chemicals, and her latest venture, as the country's pioneer in healthy sugar --- stevia. She is now president of the Glorious Industrial and Development Corp. (GIDP), maker of Stevia sold in leading supermarkets and drugstores.

Of ventures and losses

De Leon's first venture started when she was 25. She got into the embroidery business and stayed there for 17 years, after which the industry went for a downturn due to influx of garments from China. She incurred debts and her business eventually folded up.

The turn of events did not deter her though.

"Para akong magkakasakit pag hindi ako nag negosyo (I felt as if I'd get sick if I will not get into business)," she said.

She asked her friends what possible business she could get into. One of them suggested chemicals. And so into chemicals she ventured.

She studied how chemical products are done. A leading grocery store gave them the

opportunity to become the supplier of their house brand, so her foray into chemicals began with her production of soap, powder detergent, toilet bowl cleaner, fabric softener, liquid dishwashing and more. However, that venture came into a halt when her chemical warehouse was destroyed by fire.

Despite yet another loss, she ploughed on, this time venturing into unchartered territory: Stevia.

One of de Leon's children was taking up Medicine at the time, when she stumbled upon her child's book. Thereupon, she read about diabetes and learned that incidence of diabetes was steadily rising.

Coincidentally, de Leon's sister suffered a stroke around that time, as a complication of her diabetes. Little did she know that these minor events will lead her to another enterprise.

Still recovering from another loss, she solicited suggestions from friends and family on possible business ideas. A friend came home from Malaysia and pitched a healthy coffee product. De Leon's team embarked on product formulation.

"Kung magko-coffee tayo, tapos wala din naman syang magiging pagkakaiba sa malalaking players sa market, baka hindi rin tayo maging successful (If we get into coffee and it will not have any difference from the ones produced by the big time market players, we might not succeed)," she addressed her team for product development.

Then a doctor told her about a plant that serves as sugar substitute – stevia. But it grows in Paraguay.

She became hopeful when she heard the word "plant." She was reminded of the time when her family was into farming. Thus, she hired an agriculturist to look for the plant stevia in Baguio, La Union and Tagaytay. After a couple of months however, the agriculturist returned empty handed.

Not all is lost, though. She had a child in Europe who was able to send her the seeds of the plant which will be the core of her business. They struggled for three years to make stevia adaptable to Philippine soil.

But the next challenge was what to do about it.

Of pains, triumphs and government help

In the early stages while they were developing possible commercial products, they tried to make use of stevia as feeds to chickens and hogs.

Maura de Leon, president of Glorious Industrial and Development Corporation tells how her love for business fueled her drive to keep on going despite several business setbacks.

They noticed that chickens which normally laid 12 eggs, were producing 24 eggs upon feeding on stevia. And the pigs who fed on stevia were more meaty and not smelly even without a bath for 10 months 10 months.

When a family member suggested approaching the Department of Science and Technology (DOST) for assistance, it was then that they discovered the many services a government office can offer.

She would have preferred that small businesses in the barangay or municipalities know about the services of DOST right away.

"Nang mag start kaming mag-inquire sa DOST, nabuhayan kami ng loob (When we began inquiring from DOST, our hopes were rekindled)," she shared.

"Sabi ko nga at that time, kung ang mga nagnenegosyo nga sana alam na may assistance ang DOST, mas madali (I thought at that time, if businessmen knew about DOST's assistance, it would be easier)," she added, as she recounted the various ways they tried to make Stevia useful.

According to her, they first approached DOST-National Capital Region (NCR) in 2009 and obtained assistance a year later. She found DOST-NCR to be very accommodating. Aside from assisting them on drying, they were also referred to another agency for product shelf-life.

With the assistance, they obtained the following: cabinet type dryer, form fill & seal machine, calamansi juice extractor, shrink tunnel, bench top pH meter, refractometer, and digital incubator.

They also availed of other DOST services, such as Technology Needs Assessment, Technical Assistance on Food Safety Seminar on Good Agricultural Practices (GAP), and Consultancy for Agricultural and Manufacturing Productivity Improvement.

The interventions led to increased gross sales by 40 percent improved product quality and safety, improved packaging, and elimination of outsourcing of packaging.

Their brand, the Sweet and Fit Stevia is the first organically grown in the country. Meanwhile, GIDC has been in the business of food and non-food products for six years now.

Before DOST's intervention, they used to have over 30 employees. Today, their employees number to over a hundred, including stevia growers.

"Very proud kami na assisted kami ng DOST. Noon, nung walang nag-a-assist, medyo hesitant ka pa, kasi [yung] stevia hindi sya masyadong kilala. Pag tinanong kung ano ang stevia, kung safe ba yan? Pag sinabi naming assisted po kami ng DOST, parang ang laking tulong nya na ang tao nagtitiwala doon sa safety ng product (We're very proud that we're DOST-assisted. Before, when there was nobody assisting us, we were hesitant because stevia was not yet known. Whenever we're asked what is stevia, is it safe? When we say we're DOST-assisted, it helped us a lot in boosting public's trust on product's safety)," de Leon revealed.

Aside from manufacturing food and non-food products, GIDC is advocating Filipinos' return to farming. They want young children to see and enjoy a nearby farm, that is why aside from offering healthy farm products, they're also expanding to include a farm eco-tour.

De Leon's life goal is to contribute to other people's well-being. She came from a poor family and she wants to help others improve their lives.

She also seldom lets go of people. Most of those who had been with her in her embroidery business days are still under her employ now.

"Naniniwala kasi ako na lahat may potensyal (I believe that everybody has potential)," she said.

"Kailangan mo lang silang gabayan sa pag-nenegosyo. May parte na ispirituwal. Gusto ko yung pagwo-work nila sa akin, may na-contribute ako sa buhay nila (You only need to guide them in business, also in the spiritual aspect. I like it that they work for me, I get to contribute in their lives of people who worked with me)."

How SETUP more than tripled a furniture shop's annual production

By ESPIE ANGELICA A. DE LEON, *DOST-STII*

YEARS AGO, the Trader's Design Furniture Shop was merely producing 8,550 pieces of chairs annually. Now, they're making 31,776 chairs a year – an impressive increase of 271%.

What's the secret? The answer is SETUP.

SETUP, or Small Enterprise Technology Upgrading Program, is a major program of the Department of Science and Technology (DOST). It assists micro, small, and medium enterprises around the Philippines to improve their production and product quality, increase the skills of their employees and workers, and make their products more competitive in the market, not just locally but also internationally.

Aside from chairs, The Trader's Design Furniture Shop in Cauayan City, Isabela also makes school desks, cabinets, shelves, doors, and other furniture.

However, problems in manpower and production rendered the shop unable to come up with high quality products. First of all, they only had 20 workers. These workers did manual processing and used inappropriate equipment. Thus, production was slow and output was therefore limited. What's more, the furniture came out with low quality.

To solve these problems, owner Nestor B. Viloria sought assistance from SETUP.

Under the program, the shop availed the following equipment: assembly finger press, hydraulic and air operated pressure motor, finger jointer shaper, hydraulic operated motor, and a 3-in-1 wood working machine.

In addition, they were also provided with a lumber kiln dryer, consultancy service concerning wood seasoning and drying from DOST's Forest Products Research and Development Institute, an operations training on lumber drying, and technology training on wood bending and finishing.

When they got the kiln dryer, word spread about the new equipment in the shop. Natural drying of lumber is a long process. An alternative to this is kiln drying. This method

hastens the drying process. Here, both temperature and humidity are controlled to eliminate the moisture from lumber.

Kiln drying offers many benefits, among them (1) the wood may be cut precisely and machined more efficiently (2) warping, splitting, and other negative effects of uncontrolled drying will be significantly avoided (3) paint and varnish, and other finishes shall be better applied on wood.

Hence, when word got out that the shop had a new kiln dryer, the number of customers increased, some of whom are also from Isabela who purchased condominium units in Manila. The furniture they order from the shop are for their condo units.

Aside from this, production is now faster, output is higher, and furniture quality has improved. Plus, their workers now total to 60.

Hence, the secret isn't just SETUP per se. It's actually science and technology neatly packaged in DOST's assistance program for MSMEs.

Photos by Henry A. de Leon, DOST-STII

Unique tricycle wows 'em with the help of SETUP

By ESPIE ANGELICA A. DE LEON, *DOST-STII*

Photos by Henry A. de Leon, *DOST-STII*

Mattalog Welding Shop's unique tricycle

MATTALOG WELDING Shop's product amazes anyone who sets foot inside the production area, located in Cauayan City in Isabela: a unique, modern, and classy three-seater tricycle with a door to protect its passengers from the elements. When one climbs inside and closes the door, it makes a sound similar to that of a car's door.

This unique tricycle plies the streets of Cauayan City and that of other provinces as well.

However, in 2012, owner Adriano M. Mattalog was not satisfied with the quality of his products and that of the shop's production equipment and process. To start with, his workers lacked technical skills in metals

fabrication. Plus, production was slow and they were not applying the 5S organizational method which allows workers to clean and organize their work stations in a way that will make them more efficient and productive.

Thus, Mattalog applied for the Department of Science and Technology's (DOST) SETUP intervention.

Adriano M. Mattalog

SETUP, or Small Enterprises Technology Upgrading Program, is a DOST program which provides assistance to micro, small, and medium enterprises (MSMEs) via funding, training, and technology upgrade.

Under the SETUP intervention, the welding shop was provided with equipment through Innovation System Support – a major technology transfer and commercialization program of SETUP. The equipment provided were: one TIG welding machine, one cutting saw, two bar cutters, four electric hand grinders, four electric arc welding, one pipe bender, two press drills, and two air compressors.

Additionally, DOST's Metals Industry Research and Development Center provided the workers with training on Basic Shop Maintenance and Operation, and Metal Identification and Finishing. MPEX Consultancy and Energy Audit were also undertaken.

After the introduction of these SETUP interventions into Mattalog Welding Shop, the workers now practice 5S, thus improving their working environment. Their production equipment is also better. Such improvements have brought a windfall of benefits to the shop: If they used to produce five units per month, now they churn 20-25 units a month. Product quality is now higher, increasing sales by P3,715,770.00 per month. The shop was likewise able to hire more workers.

No wonder then these elegant looking tricycles never fail to amaze and wow anyone who sees it. A whole package of science and technology interventions were infused into the making of these products. And DOST's SETUP had a hand in this.

DOST programs help entreps yield more innovative products and services

By ALLAN MAURO V. MARFAL, *DOST-STII*

(Left) Secretary Fortunato T. de la Peña of Department of Science and Technology (DOST) gives his message during the launching of Benito Catalino Yap Foundation (BCYF) Innovation Awards last October 17, 2016 at Manila Polo Club in Makati City. He said that in recent years, DOST has been at the forefront of pushing innovation for inclusive growth, particularly to the small and medium enterprises in the countryside. The BCYF Innovation Awards will be co-organized by DOST, BCYF, University of Asia and Pacific and TEVSAPHIL. Also in the photo were: (middle) UA&P President Dr. Winston Conrad B. Padojinog and (right) TEVSAPHIL Chairman Brig.General Alex T. Escaño. *(Text by Allan Mauro V. Marfal and photo by Gerardo Palad, S &T Media Service)*

SECRETARY FORTUNATO T. de la Peña of Department of Science and Technology (DOST) said that innovation for inclusive growth has been the central idea of different programs of Department of Science and Technology (DOST) in recent years, particularly in supporting small and medium enterprises (SMEs) in the provinces.

"We have many local products and services, which are world-class, and DOST is recognizing this. That is why we are sharing all the resources and knowledge that we have to empower them to be innovative in improving and marketing their respective products," said Secretary de la Peña during the launching of Benito and Catalino Yap Foundation (BCYF) Innovation Awards held last October 17 at Manila Polo Club in Makati City.

Sec. de la Peña shared that DOST, through its Small Enterprise Technology Upgrading Program (SETUP), had helped many SMEs in the countryside to improve the quality of their production and services, particularly in the areas of technology upgrading, packaging assistance, market research, and technology transfer. He said that through this support, DOST was able to create ideal environment for our SMEs to develop and introduce more innovative products and services.

"Innovation has provided numerous impacts to our country, particularly on the SMEs side. It could stabilize businesses, it could generate income and revenue, and most importantly, it could generate employment opportunities for people in the countryside," Secretary de la Peña said.

Sec. de la Peña believes that the launching of BCYF Innovation Awards will help more in encouraging and motivating people to really contribute towards innovation.

On other hand, UA&P President Dr. Winston Conrad B. Padojinog also emphasized that innovation is one of the most important facets of development. According to him, as the object of development is always on the people and the society which they belong, it is very important that development must always be oriented towards the promotion of human dignity.

"Innovation gives us the opportunity to become better individual. For example, mobile phone is an innovation in social communication so we can experience faster and more efficient way of interaction with each other. Innovation has also revolutionized the field of education, particularly in remote areas. We could have seen how innovation has helped us harness more efficient use of our resources and we could have seen how energy prices fallen," said Dr. Padojinog.

"Coopetition" will keep entrepreneurs relevant - Sec. Fortunato de la Peña

BY JOY M. LAZCANO, *DOST-STII*

"COOPETITION", NOT COMPETITION, will keep entrepreneurs afloat in the imminent ASEAN economic integration. Such is the advice of Science Secretary Fortunato T. de la Peña to the country's local micro, small, and medium enterprises (MSMEs) to stay relevant in the industry.

"Coopetition", or the concept of cooperation between competing business, is a strategy of competing companies in creating new value-adding products and services at the fastest and economical way possible.

According to de la Peña, the ASEAN integration will definitely affect local enterprises as products and services become liberally available across all ASEAN markets, thus causing stronger competition.

Speaking at the recently held "Regional Workshop on Enhancing Innovation and Competitiveness of MSMEs" at the Diamond Hotel in Manila, the science chief observed that most local MSMEs do not have the capability to conduct research and development (R&D) activities to introduce more innovations.

The workshop, organized by DOST's Technology Application and Promotion Institute (TAPI) in cooperation with the UN Economic and Social Commission for Asia and the Pacific-Asia and Pacific Centre for Technology Transfer (APCTT), aims to foster cooperation among technology experts in the Asia-Pacific region in diffusing relevant knowledge and capabilities through technology transfer activities to spur further development. This year, the regional workshop focused on innovation and competitiveness in the agro-enterprise sector.

De la Peña encouraged the government to form farmers' organizations to enable the sharing of knowledge and expertise to help develop other small-scale farmers at the shortest time possible.

Reports say that in 2011, the Philippines had more than 11 million small farmers capable of producing small-scale production on a small piece of farmland.

Secretary Fortunato T. de la Pena shares some of the DOST programs that enhance the quality of the products of farmers and MSMEs in the agriculture sector. Sec. de la Peña was the keynote speaker during the opening day of the recent "Regional Workshop on Enhancing Innovation and Competitiveness of MSMEs in Response to the ASEAN Integration for Agro-enterprise" held at Diamond Hotel in Manila. The said workshop aims to help government and its partner institutions gather information and practical knowledge; and come up with policy recommendations that would enable our smallholder farmers and MSMEs to have easier access to various innovative agriculture technologies.*(Text by: Allan Mauro V. Marfal and photo by Henry De Leon, S &T Media Service)*

"You see, as time passes by without us being productive, the country gets left behind," said de la Peña.

De la Peña also shared the need for local farmers to gain other relevant skillsets to move their agricultural productions up to higher-value yields. In particular, he said they need to have entrepreneurial skills to complement their knowledge on farming.

"Our farmers are doing a very good job in the farm," he said, "but we also need to capacitate them in doing the business aspect of farming."

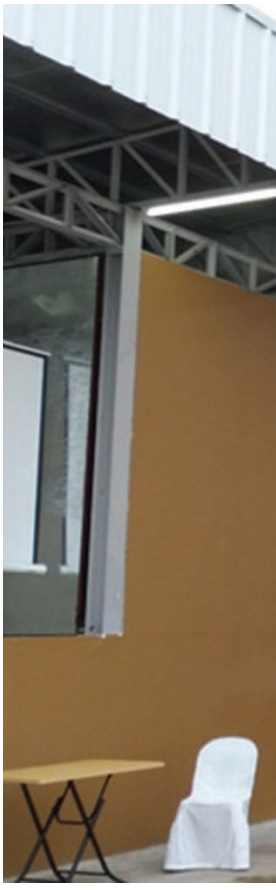
According to TAPI Director Edgar I. Garcia, the country's service industry has moved up by 8.4 percent while local manufacturing gained 6.9 percent in the past few years. However, the agricultural sector is on a decline of 2.9 percent which is attributed to the adverse effects of climate change in the Philippines.

In 2016, the Department of Agriculture estimates P7.013 billion worth of damage in the agricultural sector for the months of January to May. Most of the commodities affected were rice, corn, coffee, cacao, rubber, banana, and onion.

The fluidized bed gasifier up close. (Photo by RBSMCI1)

Sugar company gets DOST support for renewable energy facility

By DOST- NEGROS ORIENTAL



CEREMONIAL RIBBON CUTTING | DOST VII RD Edilberto L. Paradela (center) assisted by RBSMCI President Atty. Alejandro Florian O. Alcantara (extreme right) and Mr. Edward Lee (business associate). Behind Atty. Alcantara is Engr. Apollo Bawagan, Energy Section Head of the ITDI Chemicals and Energy Division. (Photo by RBSMCI1)

RAW BROWN Sugar Milling Company from Negros Oriental, through a P990,000 equipment grant from DOST, now has renewable energy facility—the first in the country-- to enhance its muscovado production.

A sugar company finally built a facility that converts wastes to new source of renewable energy, the first of its kind in the country. Called Fluidized Bed Gasification (FBG) System, the facility was recently unveiled by the Raw Brown Sugar Milling Company, Inc. in Pamplona, Negros Oriental.

The FBG System, introduced by the Department of Science and Technology-Industrial Technology Development Institute (DOST-ITDI), is used by manufacturing plants to convert biomass into new source of renewable energy.

Agri wastes are "burned" when a limited amount of oxygen or air is introduced into the FBG System to produce carbon dioxide and energy. This drives a second reaction that further converts waste material to hydrogen and additional carbon dioxide-- this is the gasification stage.

As such, the system helps supply the electric power requirement and bring down electricity costs of the company, according to Atty. Alejandro Florian O. Alcantara, president and CEO of the company.

"I see several advantages to powering our turbines with synthetic gas produced by ITDI's FBG System. These are 100 percent reduction of our agricultural wastes, production of our monthly electricity requirement at no cost, and significant reduction of gaseous pollutants due to the near-zero combustion process of the FBG System," Atty. Alcantara said.

The system is expected to provide around 40 percent of the company's total electricity requirement. The plant produces nearly 1,100 tons of pure, whole and unrefined muscovado annually. Muscovado is produced from fresh sugarcane juice without using bleaching agents.

DOST-ITDI's Engr. Apollo Victor Bawagan said that the gasification of biomass, such as sugarcane bagasse and sugarcane trash, is "most interesting" because the produced synthetic gas has a near-zero combustion. Bawagan led the DOST-ITDI team that modified the biomass carbonizer technology for sugarcan bagasse to support the setting up of the a co-generation facility at the plant.

The DOST Region VII through the Negros Oriental Provincial Science and Technology Center provided P990,000 for this Grants-In-Aids project. Components include among others the design, fabrication and installation, testing and debugging of the 50kg/hr batch-type biomass carbonizer.

The launching ceremony was attended by DOST VII Regional Director Edilberto L. Paradela, Bawagan, and the company's business associate, Edward Lee. Various government agencies, private sectors and local businessmen also witnessed the event.

Prototype carbonizer (painted red) is shown in foreground. Behind it is the gasification component (fluidized bed gasifier). *(Photo by RBSMCI1)*

After 32 years, sari-sari store owner gets knee replacement

By ESPIE ANGELICA A. DE LEON, *DOST-STII*

It was nothing short of a miracle.

For 32 years, Ronald L. Padrinas of Escalante City in Negros, struggled with hurting and swelling knees which greatly hampered his movement – a real battle for somebody like Padrinas who loved playing basketball in his teens.

That's when it all started – in his teens, when he played the sport a lot. In 1983 at age 15, his knees started to hurt. Then they started to grow bigger and bigger, until he found it hard to walk. Whenever he had to walk or climb the stairs at home or in school or anywhere, he had to do it slowly.

He had developed rheumatoid arthritis and life was never normal again. The doctor prescribed pain relievers which did take effect swiftly: the pain would subside and after about three minutes, Ronald can walk again. But his joy and relief were temporary. After five hours, the pain would come back.

For years, his situation did not improve.

Wife Belen was full of pity for her husband of eight years. "It was so hard for him. He was having a hard time moving around, sleeping, doing household chores," she related in Ilongo.

Ronald L. Padrinas shares his story to ST Post *(Photos by Espie Angelica A. de Leon, DOST-STII)*

The knee implants of the Axis Knee Replacement System *(Photo by Henry A. de Leon, DOST-STII)*

The couple owned a small store and since Ronald's movement was limited, it was Belen who tended to the store. According to her, they had accepted their situation and were no longer expecting him to be healed permanently.

Life will never go back to normal, or so they thought.

Hope for healing

And then they heard of Axis Knee Replacement System developed by Dr. Ramon B. Gustilo of Gustilo Clinic and Ambulatory Center in Manapla, Negros and his team of Filipino doctors and engineers with consultants from US, China, and Japan.

Dr. Gustilo himself was born and raised in Negros before he left for the United States where he developed the Genesis I and Genesis II knee systems for Smith and Nephew, one of the biggest orthopedic companies in the world.

Funded by the Department of Science and Technology - Philippine Council for Health Research and Development, the Axis Knee Replacement System is

Dr. Ramon B. Gustilo explains the Axis Knee Replacement System and its benefits.

the only one of its kind in Southeast Asia and has been in the Philippine market since 2015.

It is a more cost-effective alternative to imported knee implants.

They are made of similar materials: the femoral (thigh) component made of a highly polished metal alloy, the tibial (shin) component made of polymer, and the patellar (knee cap) component, also made of polymer.

Yet, knee implants from the US and Europe cost between P100,000-P120,000, partly because of the high cost of hospitalization especially in the US. In contrast, the Axis Knee implants cost around P60,000 in government hospitals and P70,000 in private hospitals. The reason for this is that these are being manufactured right on Philippine soil, in Cabuyao-based and ISO 13485-certified Orthopaedic International, Inc. (OII) owned by Dr. Gustilo himself.

OII has been designing and manufacturing orthopedic products such as trauma, joint, and spine replacement systems, for the past 20 years. Its ISO 13485 certification means that OII fulfills the requirements for a comprehensive quality management system for the design and manufacture of medical devices.

Another factor that makes the Axis Knee System unique is its instrumentation, made up of a total of 50 instruments contained in three

"Dahil sa aking positibong karanasan sa Axis Knee, malugod ko po itong irerekomenda sa aking mga kamag-anak, mga kaibigan at mga kakilala"

trays. In contrast, imported knee systems have six to nine trays. Among these instruments are tools that look like a hammer, a pair of pliers, and a cutting block with slots where the surgeon inserts the saw blade used for cutting the bone. These instruments guide the surgeon in making the proper cuts in the bone so that the knee implant components would fit within the cut portions.

The Mechanical Axis Finder is also one of these instruments. It is a portable, cost-effective and reusable device for locating the mechanical axis. "The mechanical axis is the line from the center of the hip joint to the center of the knee to the center of the ankle," said Dr. Gustilo. "The system should achieve correct positioning of the implant components in relation to the mechanical axis."

In lieu of the Mechanical Axis Finder, many hospitals abroad make use of a computerized navigation technology to locate the axis. Only a few hospitals in the Philippines have this technology which costs more than P20M and adds at least P20,000 to the total cost of the surgical procedure.

Hope leads to the unexpected

Thus, in 2015, the now 47-year-old Ronald became Dr. Gustilo's charity patient; he was actually the very first Axis Knee Replacement System patient.

"He had not been walking too much," said Dr. Gustilo of his first patient. "He had knees that were very deformed. His knees were growing outward."

On April 11, 2015, Ronald's left knee was operated. Less than three months after – in July 3 – his right knee was likewise operated.

"Hindi ako natakot (I was not scared)," said Ronald, adding that he had full confidence in Dr. Gustilo.

During his three-day rehabilitation following the operation, he was already walking inside the hospital with the aid of a walker. Then after three more days, he finally went home. And when he did arrive home, his wife, their neighbors and everyone else was shocked, for what they saw was a new Ronald.

Now, the new Ronald can easily stand, easily walk, easily move around and go anywhere.

What Ronald and Belen did not believe would someday happen DID happen.

"Our happiness is overflowing, I cannot describe it," said Belen in Ilongo, teary-eyed, her voice breaking.

"Dahil sa aking positibong karanasan sa Axis Knee, malugod ko po itong irerekomenda sa aking mga mag-anak, mga kaibigan at mga kakilala (Because of my positive experience with Axis Knee, I wholeheartedly recommend it to my family, friends and acquaintances)," said Ronald.

"Dahil una sa lahat, ito po ay gawang Pilipino. Pangalawa, ito ay mabisa at de-kalidad. At higit sa lahat ito'y isang malaking tulong sa amig mga maysakit ng arthritis at abot kaya ito para sa lahat (First of all, this is Philippine made. Second, it is effective and high quality. And most of all, this is a big help to us who have arthritis and it is affordable)," he continued.

For 32 years – from 1983-2015 – Ronald lived his life differently from most people his age. Arthritis caught up with him early and his life changed drastically.

Still, there was hope. And Ronald and Belen found such hope in their hearts in their 40s – an age when they were no longer in the prime of youth but when time is young still. And their hope, and future, came via the Axis Knee Replacement System.

Study on microorganism eyed to boost PH anti-microbials development

By **GERALDINE BULAON-DUCUSIN**, *DOST-STII*

THE PHILIPPINES imports antibiotics in the same way it imports perfume and chocolates. But given the study on indigenous Actinomycetes by a team of researchers led by Irene Alcantara-Papa of the National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños, the country may eventually reduceimporting antibiotics.

Actinomycetes are microorganisms that are crucial in the production of metabolites, such as antibiotics, anti-tumor agents, immunosuppressive agents (or anti-rejection drugs often used by liver, kidney or heart transplant patients), and enzymes.

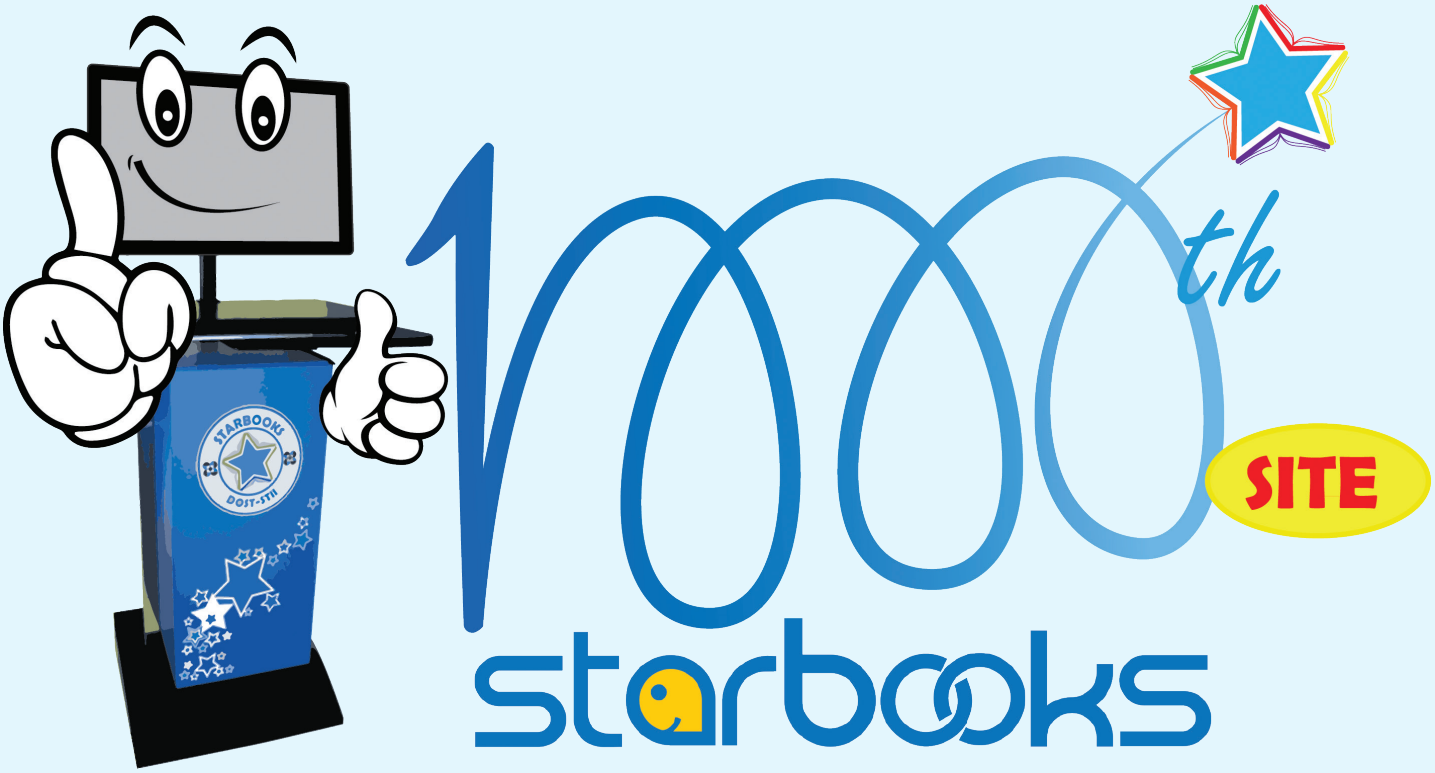
These metabolites can be anti-bacterial, anti-fungal, anti-cancer, anti-algal, anti-malarial, and with anti-inflammatory activities.

BIOTECH-UPLB has screened a total of 272 actinomycetes in its collection against some of the medically important organisms, one of which is the Methicilin Resistant Staphylococcus aureus (MRSA). MRSA isform of bacterial infection that is difficult to treat because it is resistant to some antibiotics, such as methicillin, amoxicillin, penicillin, and oxacillin.

Of the 272 studied, 19 actinomycetes inhibited five strains of MRSA while 14 showed activity against the others.

Papa said that this research is essential for the continued search for novel bioactive compounds that could be used as antimicrobials, thus eventually enhancing the Philippine's self- sufficiency and lessening importation of vital drugs.

The study is funded by the Department of Science and Technology-National Research Council of the Philippines (DOST-NRCP) which hosted the Science and Policy Forum for Sustainable Laguna Lake Management November 22 to 23, 2016 in Days Hotel, Tagaytay. The forum was a gathering of fishers, farmers, environmental experts in the academic, administrative and legislative sectors. To know more about the services of NRC, visit their website: http://www.nrcp.dost.gov.ph



DOST's "science library in a box" gets to its 1000th site

By JOY M. LAZCANO, *DOST-STII*

BRINGING THE mountain to Mohamad. This is exactly what the Department of Science and Technology's (DOST) has done in regard to bringing S&T information to the grassroots. Through the Science and Technology Academic Research-Based Openly Operated Kiosks or STARBOOKS, DOST reached places that had limited S&T information resources nor Internet connection.

STARBOOKS is the country's first digital library with hundreds of thousands of S&T information content. Developed by the DOST's Science and Technology Information Institute, STARBOOKS recently celebrated another milestone.

In a community in Laguna, STARBOOKS marked its 1000th site with the installation of four units at the Dayap National High School in Brgy. Dayap, Calauan, Laguna. Currently, STARBOOKS has deployed more than 1,123 units in several barangays and municipalities in the country.

Accessible on-site even without Internet connection, STARBOOKS provides students, researchers, and S&T aficionados with thousands of free S&T related materials in text, audio, and video formats.

Among these are K-12 interactive courseware on math and science developed by DOST's Science Education Institute, livelihood videos dubbed as "TamangDOSTkarte" which provides parents and entrepreneurial students a thing or two about various livelihood opportunities within their sphere of interest, and other videos.

Furthermore, unlike Internet searches, STARBOOKS assures the public that they are accessing credible sources of information.

Witnessing the milestone are DOST Secretary Fortunato T. de la Peña and Calauan Mayor BuenofridoBerris.

"We at DOST," said de la Peña, "are striving to cut boundaries so we can reach those who are in need of our services and assistance, alleviate poverty, and expand our local industries."

He added that STARBOOKS is proof of DOST's innovativeness and its commitment in providing significant technologies that answer to the needs of the public.

One of the prevailing problems in the country that affect development is the slow Internet connection, which curbs learning. This area of concern is now being addressed through STARBOOKS as it provides offline and royalty-free S&T resources.

Bridging knowledge gap in this Bulacan school

Bulacan- Seeing no regular school library around, a public servant went out of his way to give a small town school a science library-in-a-box to strengthen the science and math proficiency of its students.

Recently, Commission on Audit State Auditor Gerson Cepe visited Lambakin Elementary School in Barangay Lambakin, San Miguel, Bulacan to personally hand over a set of Science and Technology Academic Research-Based Openly Operated Kiosks or STARBOOKS to 400

DOST Sec. Fortunato T. de La Peña and Calauan Mayor Buenafrido Berris lead the unveiling of the STARBOOKS's 100th site marker at the Dayap National High School in said Laguna town. Others in photo are (from left) Provincial S&T Director Engr. Samuel L. Caperiña; , STII Director Richard P. Burgos, DOST-IVA Director Alexander R. Madrigal, DOST Asst. Sec. Urduja A. Tejada, and Dr. Joselyn S. Solano; OIC, Dayap National High School.

elementary students who unfortunately have never set foot in a library.

The school used to have five units of computers donated by the education department in 2014. Less than a year after, some looters allegedly broke in and took all the computers meant for students. As Grade 6 teacher Lorena Lapuz said, heartless elements selfishly "robbed them (students) of better education."

Developed by the Department of Science and Technology's Science and Technology Information Institute (DOST-STII), STARBOOKS is the country's first stand alone digital science and technology (S&T) library housing thousands of S&T reference materials in various formats. It contains a wide selection of reference materials including research papers, books, analytics, tutorial videos, investigative papers, and many more.

The digital library is an ideal research and learning tool for schools in rural areas where Internet connectivity is either weak or zero.

"With the current slow Internet connectivity especially in the remote areas, students hardly keep up with their research assignments as online research isn't always reliable," said Lloyd Frederick Mandapat, science research specialist from STII.

Further, to make STARBOOKS more user friendly, STII requires beneficiaries to use routers to enable network connectivity so researchers using tablets and smart phones can also access its contents.

It is also cheaper and more practical as it does not require dedicated rooms to store volumes of materials for students to read through, a problem in rural schools where textbooks and reference materials are scarce.

"What's good about STARBOOKS is that the schools do not have to procure general references on science and math topics," Mandapat added.

All information are stored in a single computer with an off-the-shelf high storage capacity. Its contents are also periodically upgraded by STII.

Cepe realized that bringing STARBOOKS to the community will boost students' proficiency especially in science and mathematics.

"In my years as a public servant, I find STARBOOKS a noble government project that helps our younger generation in gaining a wealth of knowledge in science," Cepe said during one of his interactions with local teachers. He explained that STARBOOKS is a nice gift to students and teachers of the school where his wife spent her earlier years.

"STARBOOKS also contains livelihood videos for parents who are entrepreneurial. It also has interactive K-12 materials so students can easily understand the lessons," he added.

Moreover, Lapuz averred that STARBOOKS makes teaching easier. "Instead of preparing for visual aids for the lessons, we will just search for a video topic on STARBOOKS and flash it on screen. Students prefer watching videos rather than us discussing the lessons."

Lapuz also added that with the implementation of K-12 program, most students do not have textbooks. "They do not have books because the K-12 program is a new curriculum while those in Grade 6 still use the old curriculum textbooks," she shared.

"With STARBOOKS, students can learn faster in a fun and easier way," she noted.

Profiling a river

By **FRAMELIA V. ANONAS**, *DOST-STII*

THE CARAGA State University (CSU) Phil LiDAR-1 research team, using various equipment, takes the profile of Cabadbaran River in Agusan del Norte. One equipment used here is the Acoustic Doppler Current Profiler, the gadget that looks like a small boat carried by a research team member (top photo), which measures how fast water is moving across an entire water column. Anchored to the seafloor, it can measure current speed not just at the bottom but also at equal intervals all the way up to the surface. The information gathered by this profiler are beamed by a bluetooth antenna to a laptop that records the data. According to Engr. Meriam M. Santillan, project leader based at the CSU, profiling a river enables the creation of 3D flood hazard maps that can help prepare communities during imminent weather disturbances that may trigger floods. CSU Phil LiDAR-1 of the Nationwide Phil LiDAR 1 Program is a component of the Department of Science and Technology's Project NOAH. The program involves partner universities tasked to conduct researches using LiDAR technology to come up with flood hazard maps in their assigned project areas. For Phil LiDAR-1, Engr. Santillan said that her team has developed flood models that are used to generate flood hazard maps of the river basins and watersheds of the Caraga Region. *(Photo and text by Framelia V. Anonas, DOST-STII)*

Real eco-tourism can benefit Laguna Lake, says expert

By **GERALDINE BULAON-DUCUSIN**, *DOST-STII*

rotary1110gse/files/wordpress/com.jpg

"REAL ECO-TOURISM, like the Bohol model in Loboc River, can actually be good for Laguna Lake," says Dr. Maria Victoria O. Espaldon, professor of the School of Environmental Science and Management and 2016 Outstanding Researcher of the University of the Philippines Los Baños.

She emphasized the "real" eco-tourism as one which preserves the naturalness of the landscape or the seascape. It is not about construction of dikes or buildings.

"The idea of developing Laguna Lake, with eco-tourism as a platform, could actually help bring in more jobs because old boats can be engaged in tours, people can produce food and handicrafts,"she says.

Currently, there are studies undertaken by the UPLB that shows that water quality in the lake, in terms of biological, physical and chemical parameters is bad. But Espaldon is hopeful that there are many ways to improve the water quality.

"All that's needed is a concerted action and strong leadership in terms of improving the water quality of the lake," she says.

There should be an integrated management of the Laguna de Bay, wherein all sectors should be engaged and responsible. Some studies that are already published show the presence of pollutants, such as pesticides residue in the tributaries of the lake and these can eventually find its way into the lake. Once the people become responsible and accountable, pollution can be reduced.

The good aspect of the lake, however, is the water quality. It is fresh water, so if it is of good quality it can really be a good source for the domestic and agricultural needs.

"Mas maganda nga gawin syang water supply. Kasi kung alam ng taong doon galing iinumin nila, hindi na sila tatae dun. Ang water supply talagang ipo-process bago ilabas. Pagginamit yang water supply, meron yang value formation na driven by economics, kasi alam mong may value ang tubig na 'yan, bakit mo pababayaan? (It is better to make it a source of water supply because if people know that it is the source water that they drink, they will not defacate in it. Water supply normally undergoes treatment process before it comes out. When the lake is used as water supply source, there will be a value formation that's economically driven. People know that it's valuable to them so why would they neglect it?)" Espaldon explains.

She suggests that the local governments should be more empowered in managing their rivers to help improve the water that goes to the lake.

Sustainable environment eyed to raise farmers' quality of life

By ALLAN MAURO V. MARFAL, *DOST-STII*

Department of Science and Technology (DOST) Secretary Fortunato T. Dela Pena shares some of the DOST programs that enhance the quality of the products of farmers and MSMEs in the agriculture sector. Sec. de la Peña was the keynote speaker during the opening day of the recent "Regional Workshop on Enhancing Innovation and Competitiveness of MSMEs in Response to the ASEAN Integration for Agro-enterprise" held at Diamond Hotel in Manila. The said workshop aims to help government and its partner institutions gather information and practical knowledge; and come up with policy recommendations that would enable our smallholder farmers and MSMEs to have easier access to various innovative agriculture technologies. *(Text by Allan Mauro V. Marfal and photo by Henry De Leon, DOST-STII)*

A SUSTAINABLE environment for smallholders in the countryside is a priority solution of the Department of Science and Technology (DOST) and Asia and Pacific Centre for Technology Transfer (APCTT) in order to help said farmers reap the fruits of their labor.

Such sustainable environment will address the current condition of farmers who usually own less than two hectares of land and live in poverty despite being responsible for producing food for the country. The farmers' low income is traced to limited access to innovative agricultural technologies and lack of knowledge on how to market their products.

The farmers' plight was one of the issues discussed in the "Regional Workshop on Enhancing Innovation and Competitiveness of MSMEs in Response to the ASEAN Integration

Engr. Edgar I. Garcia, director of Department of Science and Technology-Technology Application Promotion Institute (DOST-TAPI), says that DOST has been at the forefront of creating ideal environment for technology transfer through helping researchers to further improve their innovative products, commercialize, and file Intellectual Property (IP) protection. *(Text by Allan Mauro V. Marfal and photo by Henry De Leon, DOST-STII)*

for Agro-enterprise" held recently in Manila. It was organized by the DOST's Technology Application Promotion Institute (TAPI), Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD), and DOST-Region XI.

The workshop was organized to help the government and its partner institutions gather information and practical knowledge, and come up with policy recommendations that would enable smallholder farmers and MSMEs to have easier access to various innovative agriculture technologies.

The said workshop was also designed to enhance the productivity of micro, small and medium entrepreneurs (MSMEs) in agriculture sector, government officials, smallholder farmers' associations; MSMEs involved in agriculture and agro-food processing; technology business intermediaries; and the academe.

DOST Secretary Fortunato T. de la Peña admits that most of our farmers are not entrepreneurial. However, he stressed that DOST has put in place mechanisms to provide sustainable environment to farmers. One of these is arming farmers with knowledge and access to various innovative products and systems that will help them raise and market their agricultural crops effectively.

"DOST offers numerous programs and assistance that can bolster the productivity of famers and MSMEs in the agriculture sector. From funding researches, acquiring equipment, up to providing linkages that could enhance the quality of their crops and expand the reach of their market," said Secretary de la Peña.

"We don't want these new discoveries and knowledge to be stored only in the library; our farmers and MSMEs in agriculture should have access to this essential information."

Importance of agricultural innovation

According to Michiko Enomoto, head of APCTT, despite the economic growth in the Philippines, development gap within the economy still exists—particularly in rural areas and cities. She said that all these challenges could be resolved through creating and formulating policies that would promote innovation in the agriculture side.

"Agriculture innovation will be a driver for job creation, increased income, and reduction of poverty. It has the potential to increase the productivity and adaptability of the crops, help diversify the variety of agricultural crops, and enhance nutritious valuable food."

"They will help to feed more animal population and will provide fuel for growing range of industrial sectors without depleting available land, water and biodiversity resources," Enomoto said.

Meanwhile, Engineer Edgar I. Garcia, DOST-TAPI director, said that DOST has been in the forefront of creating enabling environment for technology transfer, and agriculture sector, definitely, will receive tons of benefits out of this.

"DOST, through TAPI, has been providing various assistance, such as helping researchers further improve their innovative products, commercialize them, and file IP (Intellectual Property) protection. We want to encourage and empower our naturally creative Filipinos to develop more products that can be helpful to their fellow hard working Filipinos, like our farmers," said Engr. Garcia.

Technology transfer is the handing over of technology from creators or inventors to its target users.

FIC Manager Ronnie Magsino, explains the purpose of the spray dryer technology and mentions possible product innovations.

DOST Secretary Fortunato T. de la Peña emphasizes the importance of getting the results of R&D to those who need it.

The ribbon-cutting ceremony signifies the official opening of the MIMAROPA Food Innovation Center. From left: Vicente G. Hernandez, MinSCAT vice president for administration and finance; Dr. Ma. Josefina P. Abilay, DOST-MIMAROPA regional director; Sec. Fortunato T. Dela Peña; Gov. Alfonso V. Umali Jr.; and Atty. Jojo Perez, board member, 1st District of Oriental Mindoro.

DOST-MIMAROPA launches its own Food Innovation Center

By PATRICIA O. CALORA, *DOST – MIMAROPA*

CALAPAN CITY, Oriental Mindoro – The Department of Science and Technology, in partnership with the Mindoro State College of Agriculture and Technology (MinSCAT), formally launched the MIMAROPA Food Innovation Center (FIC) through an inauguration ceremony held last October 14, 2016.

Located in the Calapan City campus of MinSCAT, the MIMAROPA FIC is a research and development (R&D) facility that can be used by experts in creating new and innovative products that can be competitive in the local and international markets. The FIC can add more value to the region's agricultural and marine products such as coconut, banana, cashew, palay, corn, calamansi, mango, and seaweeds.

According to DOST-MIMAROPA Regional Director Ma. Josefina P. Abilay, the main purpose of the FIC is to strengthen the competitiveness of micro, small, and medium enterprises (MSMEs) in the local food industry through the use of innovative technology.

"The establishment of the Food Innovation Center will accommodate actors in the region's food value chain – producers, processors, marketers, and entrepreneurs. It will provide them with access to DOST-developed technologies and enhance their capabilities in order to create innovative food products or processes which are locally and globally competitive," she said during the opening program.

The major equipment housed in the facility are the vacuum-fryer, spray-dryer, and

DOST – MIMAROPA Director Ma. Josefina P. Abilay delivers the opening remarks and introduces the keynote speaker.

water retort, with adjunct equipment like freezers, dryers, and packaging machines. These locally developed technologies will allow for the creation of products with better taste and texture, and that are shelf-stable even in non-refrigerated conditions. Those engaged in the local food industry can use these food technologies to add value to local commodities or crops abundant in the region.

In his keynote address, DOST Secretary Prof. Fortunato T. de la Peña emphasized the importance of R&D and delivering its results to help improve the lives of people in the communities. He cited the FIC as an example and suggested the possibility of MIMAROPA having an innovation facility specifically for healthcare products and bamboo furniture, which will help in enabling the indigenous people of the region.

Throughout the opening program, innovation as a means to help communities was a recurring theme. Gov. Alfonso V. Umali Jr. echoed these thoughts as he reiterated the value of science and technology in the everyday lives of people. He encouraged everyone to embrace innovation as a way to usher in development, especially in the MIMAROPA region. Atty. Jojo Perez, who represented Rep. Paulino Salvador Leachon of the 1st district of the province, delivered the message of continued support for DOST-MIMAROPA's S&T initiatives which notably benefit the people of MIMAROPA.

Moreover, Gov. Umali was named as one of DOST-MIMAROPA's Science and Technology Ambassadors, and given a plaque of recognition for his invaluable support to S&T-based programs and initiatives in his province. DOST also recognized Rep. Leachon's extra efforts in the furtherance of S&T undertakings and programs in the province.

The FIC was then formally launched with blessings from Rev. Fr. Simplicio A. Bonquin and ribbon-cutting by Secretary de la Peña and Gov. Umali. Those who attended the event were able to have hearty taste-tests of vacuum-fried and spray-dried products developed from the FIC. Product samples included vacuum fried banana, kalabasa (pumpkin), biya (goby fish), and trail mix (banana, sweet potato, purple yam, and jackfruit); and spray-dried baroy (clam) extract, guyabano leaf extract, and nipa sugar.

One of the technologies demonstrated in the launch was the vacuum-fryer – a food processing equipment that deep fries food in a closed system under reduced pressure, lowering the boiling point of the oil and water present in food. Root crops, marine products, and different vegetables and fruits can be processed using this technology. Compared with traditional deep frying, the vacuum-fryer produces food that are crunchier and have lower fat and moisture content. Aside from retaining the natural color and flavor of the food, it also reduces the oil absorbed by food and preserves more of its nutritional content.

On the other hand, the spray-dryer converts liquids into powder. The liquid is first turned into a spray of droplets, which comes into contact with hot air inside the drying chamber. The heat then evaporates the moisture from the droplets, and turns the food solution into powder. Milk powder, fruit/vegetable powder, assorted herbal powders, and spices are among the products which can be developed from this technology.

Lastly, the water retort is a pressure cooking vessel used to thermally process food that are packed in sealed containers such as tin cans, glass jars, and retort pouches. This eliminates the microorganisms in the food, prolonging its shelf life even in non-refrigerated conditions.

In addition to these three, the FIC also anticipates to have a freeze dryer and a vacuum packaging machine. The freeze dryer prolongs the shelf life of perishable goods for many years by removing water content, thereby inhibiting the growth of microorganisms. Freeze-dried products retain their taste, color, and nutritional value even without the use of additives. Likewise, the vacuum packaging machine also reduces microbial growth and extends the shelf life of food products by minimizing its contact with air. The vacuum packaging machine keeps food fresh, retains its flavor and reduces shrinkage by containing food moisture.

These technologies, developed by the DOST's Industrial Technology Development Institute (ITDI) and Metals Industry Research and Development Center (MIRDC) hope to replace imported equipment and improve the productivity of local MSMEs.

Around 60 stakeholders attended the FIC inauguration, including municipal agriculturists from the various local government units, representatives from state universities and colleges, MSMEs engaged in the local food industry, and the newly reorganized MIMAROPA Food Safety Team – all of whom are prospective clients of the MIMAROPA FIC.

In line with its food research and development services, the MIMAROPA FIC also offers technology trainings, consultancies, and short-run production services for its clients. Those who are interested in availing the services of FIC can send an email to minscatcalapancity@gmail.com or call (043) 286-2368.

Being a staunch supporter of S&T initiatives, DOST-MIMAROPA names Gov. Umali as one of its Science and Technology Ambassadors. Sec. de la Peña and Dir. Abilay awards to the governor with a plaque of recognition.

Atty. Jojo Perez accepts the plaque of recognition in behalf of Rep. Leachon.

Cryogenic storage offers hope for renewable energy

BY YASMIN ALI, *Science Reporter*
http://www.bbc.com/news/science-environment-37902773

THE WORLD'S largest cold energy storage plant is being commissioned at a site near Manchester. The cryogenic energy facility stores power from renewables or off-peak generation by chilling air into liquid form.

When the liquid air warms up it expands and can drive a turbine to make electricity.

The 5MW plant near Manchester can power up to 5,000 homes for around three hours.

The company behind the scheme, Highview Power Storage, believes that the technology has great potential to be scaled up for long-term use with green energy sources.

Peaks and troughs

Electricity demand varies, influenced by factors like time of day and season. The National Grid is prepared for surges in demand, with power stations on stand-by ready to crank up the power.

However, dealing with these peaks and troughs will become increasingly difficult as coal-fired power stations close down and more intermittent renewable energy like wind and solar comes online. In 2015 renewables provided almost a quarter of UK electricity.

The intermittent nature of green sources has seen researchers focus on trying to improve energy storage.

Pumped hydropower can provide large amounts of energy for long durations, and lithium-ion batteries can respond to demand in milliseconds making them ideal for portable electronic devices and electric vehicles.

But hydropower depends on specific geographies as water has to be pumped uphill, and batteries currently cannot be scaled in a cost effective way to store energy for a town or city.

"Our technology is a bit like a locatable version of a pumped hydro system. Anywhere that needs large scale long-duration storage, that might be to help integrate an offshore wind farm, a system like ours can help achieve that," Gareth Brett from Highview Power explained, during a visit to the Manchester cryogenic site.

"5MW is a bit small for this technology; anything from 10MW and up is the sort of scale we're talking about.

"We've already designed a plant that can do 200MW /1200MWh, that's enough to keep a city going for 6 hours."

Cryogenic storage works by using renewable or off-peak electricity to cool air down to -190 degrees C, which turns it into a liquid.

It's then stored in an insulated tank, similar to a large thermos flask. To release the stored energy, the liquid air is exposed to ambient conditions causing it to expand back into a gas. The volume increase is huge, about 700 times, which is used to drive a turbine to generate electricity.

Highview Power's demonstrator plant is next to Pilsworth landfill gas generation site. The large insulated tanks sit across the road from a collection of gas engines. These engines burn methane gas produced from decomposing rubbish to generate electricity. The waste heat from this process is captured and used to increase the efficiency of the cryogenic process.

Dr Sheridan Few, Research Associate at the Grantham Institute, Imperial College London, described a phenomenon unique to this technology.

"There's the storage of the energy, and the generating of the energy. You can make use of waste cold and waste heat... because you're putting both electrical and thermal energy in, the amount of electrical energy you get out, can in some cases end up being more than the electrical energy you put in."

Alongside the provision of energy storage, this technology can tackle the issues of waste heat which is a by-product of many industrial process. Waste cold, as an example, can be found at liquefied natural gas (LNG) terminals.

Meeting demand

While cryogenic storage may be one of the solutions to help the future supply of electricity, there are also new approaches to controlling demand.

"One of the most current issues is understanding the demand side," Dr Jenifer Baxter, Head of Energy and Environment at the Institution of Mechanical Engineers, told the BBC.

"We tend to just produce electricity to meet the demand. Once we understand demand, we will have more confidence in deploying technologies."

Demand side response, the concept of adjusting usage in response to the available supply of electricity, could work easily alongside other innovations like cryogenic energy storage.

Methane surge needs 'urgent attention'

By JONATHAN AMOS, *BBC Science Correspondent, San Francisco*
http://www.bbc.com/news/science-environment-38285300 significant source of methane

SCIENTISTS SAY they are concerned at the rate at which methane in the atmosphere is now rising.

After a period of relative stagnation in the 2000s, the concentration of the gas has surged.

Methane (CH4) is a smaller component than carbon dioxide (CO2) but drives a more potent greenhouse effect.

Researchers warn that efforts to tackle climate change will be undermined unless CH4 is also brought under tighter control.

"CO2 is still the dominant target for mitigation, for good reason. But we run the risk if we lose sight of methane of offsetting the gains we might make in bringing down levels of carbon dioxide," said Robert Jackson from Stanford University, US.

Prof Jackson was speaking ahead of this week's American Geophysical Union (AGU) meeting in San Francisco where methane trends will be a major point of discussion.

With colleagues who are part of an initiative called the Global Carbon Project, he has also just authored an editorial in the journal Environmental Research Letters (ERL).

This paper makes a clarion call to the scientific community to address the knowledge deficit that surrounds CH4.

Quite why methane has suddenly spiked is not obvious. After barely moving between 2000 and 2006, the concentration in the atmosphere ticked upwards from 2007, and then jumped sharply in 2014 and 2015.

In those final two years, methane rose rapidly by 10 or more parts per billion (ppb) annually.

It is now just above 1,850ppb. By contrast, global CO2 emissions have flattened somewhat of late, giving hope that the rise in its atmospheric concentration (currently just above 400 parts per million) might also slow.

"Methane has many sources, but the culprit behind the steep rise is probably agriculture," Prof Jackson told BBC News.

"We do see some increased fossil fuel emissions over the last decade, but we think biological sources, and tropical sources, are the most likely."

Agricultural sources would include cattle and other ruminants, as well as rice paddies.

Emissions from wetlands are almost certainly a significant part of this story as well. But so too could be the role played by the chemical reactions that normally remove methane from the atmosphere.

One of the most important of these is the destruction process involving the so-called hydroxyl radical.

The concentration of this chemical species in the atmosphere might also be changing in some way.

According to the ERL editorial, there needs to be a particular push on understanding such methane "sinks".

CH4 is about 30 times better than CO2, over a century timescale, at trapping heat in the atmosphere.

Scientists use computer models to try to project how Earth will warm given a certain mix of gases, and right now methane's growth rate is close to a path that would take the world into a very challenging future.

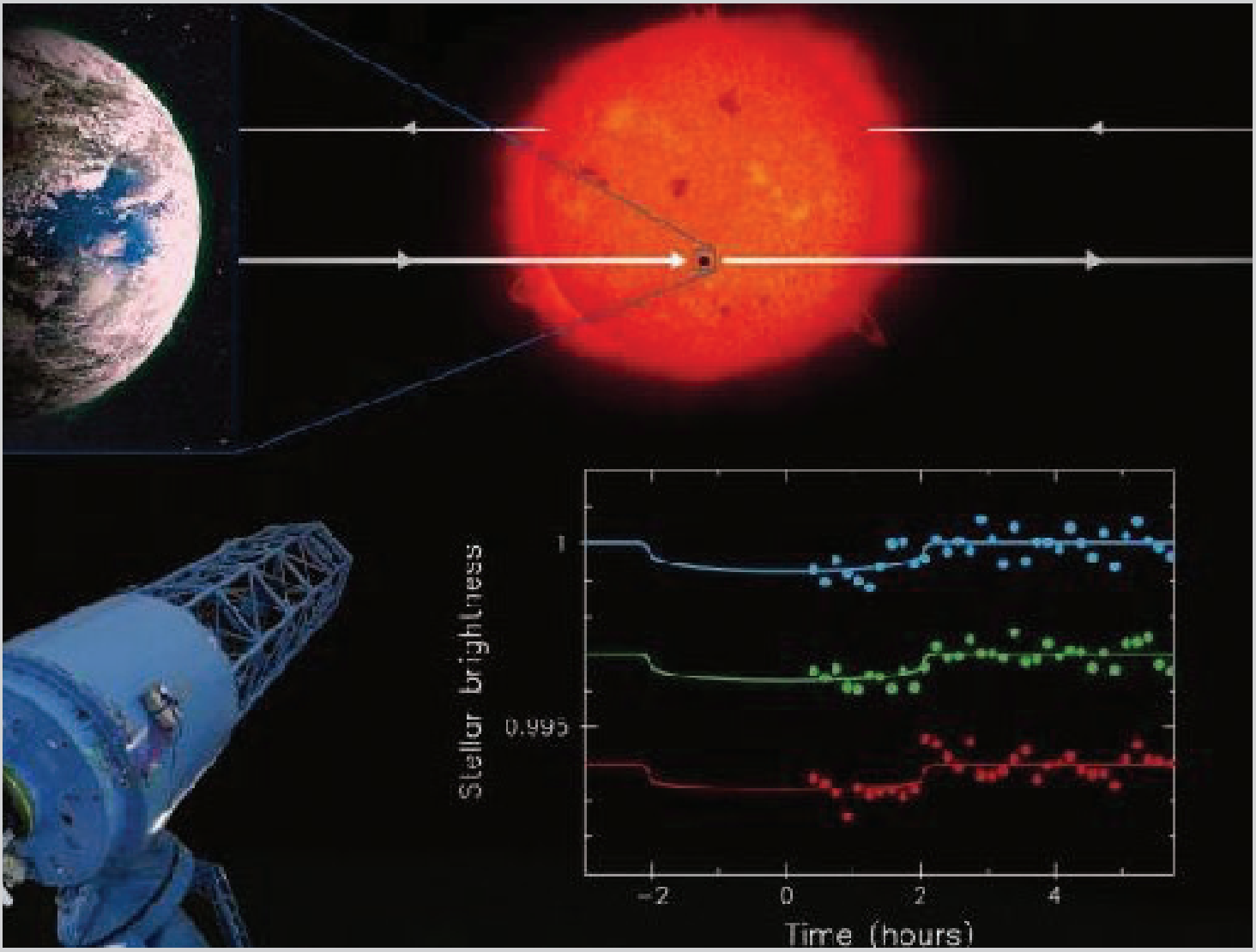
"If we want to stay below two degrees temperature increase, we should not follow this track and need to make a rapid turn-around," said Dr Marielle Saunois from the University of Versailles Saint Quentin, France. She is the lead author on the ERL paper.

One development that should help scientists as they grapple with the methane issue is the launch of new satellites.

A number sensors are planned that will specifically target carbon molecules.

"I'm optimistic that the scientific community and the policymakers will be able to have better information. I'm optimistic because there are new satellites coming along that will give us the power to see methane concentrations all over the world on a regular basis," explained Prof Jackson.

"Methane is more difficult to study than CO2 because it's more diffuse, but I think we're poised to make really good progress over the next few years."



Could Humans Live There? Check The Planet's Shadow

http://www.asianscientist.com/2016/12/in-the-lab/shadow-habitable-extrasolar-planet/

ASIAN SCIENTIST (Dec. 9, 2016) - Scientists in Japan have observed the transit of a potentially Earth-like extrasolar planet known as K2-3d. Details were published in The Astronomical Journal.

K2-3d is an extrasolar planet about 150 lightyears away, which is 1.5 times the size of the Earth. The planet orbits its host star, which is half the size of the Sun, with a period of about 45 days. Compared to the Earth, the planet orbits close to its host star, at about a fifth of the Earth-Sun distance; but because the temperature of the host star is lower than that of the Sun, calculations show that this is the right distance for the planet to have a relatively warm climate like the Earth's.

A transit is a phenomenon in which a planet passes in front of its parent star, blocking a small amount of light from the star, like a shadow of the planet. K2-3d's orbit is aligned so that as seen from Earth, it transits or passes in front of its host star. This causes short, periodic decreases in the star's brightness as the planet blocks some of the star's light. This alignment enables researchers to probe the atmospheric composition of these planets by precise measurement of the amount of blocked starlight at different wavelengths.

A group of researchers from the National Astronomical Observatory of Japan, the University of Tokyo, and the Astrobiology Center, among others, has succeeded in measuring the orbital period of the planet to within about 18 seconds. This improved accuracy ensures that when the next generation of large telescopes come online, they will know exactly when to watch for transits.

To characterize a 'Second Earth' using the next generation of large telescopes, it will be important to measure the ephemerides and characteristics of planets with additional transit observations.

Book Review

An Appetite for Wonder: The Making of a Scientist By Richard Dawkins

By ESPIE ANGELICA A. DE LEON, *DOST-STII*

ANYBODY WHO dreams of becoming a scientist or who is fascinated by the lives of the world's greatest scientists should read this book. It is a memoir of British biologist Richard Dawkins, voted in 2013 as the world's top thinker via a poll conducted by Prospect Magazine of 10,000 readers from more than 100 countries.

Dawkins' contributions to public understanding of evolutionary science have pushed scientists studying fish in Sri Lanka to create the genus name Dawkinsia in his honor. Dawkins is also an author, having penned the bestselling book "The Selfish Gene" as well as "The God Delusion."

His memoir, "An Appetite for Wonder" is truly a wonderful read –a reflection of what is inside the mind of the child who would become one of the world's greatest scientists as it puts the reader right smack in the middle of life in Africa and English boarding schools.

Richard the little boy had a huge sense of imagination.

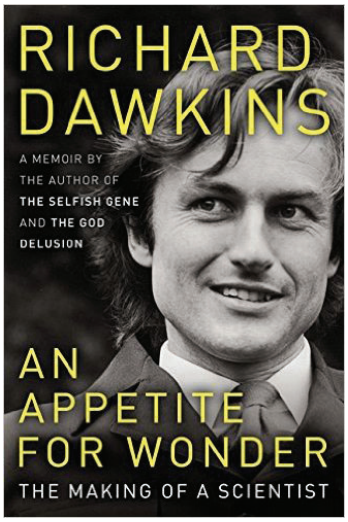
He narrated how, at St. Anne's, he was bullied by older girls and thus concocted in his mind his idea of a revenge: a purplish black cloud with a scowling face streaking across the sky to come and rescue him.

He also shared how he and his little sister played games in which their beds became their spaceships, how he fantasized about being cooked and eaten, and how he imagined his teacher Miss Copplestone as his own mother.

Not to mention the water wheel near their home in Africa when the author was a toddler. The water wheel fascinated him so much that, at the age of three, he uttered some instructions for making one. These instructions, recorded by his parents, are reproduced in the book.

Not surprisingly, Dawkins grew up in a family of scientists in England; his father was a botanist, while his mother "knew the name of every wildflower you could normally expect to see."Many among the rest of his relatives were involved in the sciences as well.

His parents' own inventiveness showed on special occasions, especially during birthdays and at Christmas time during the war years. His mother created a teddy bear as big as he was while his father made him a lorry, among various other contraptions. The elder Dawkins was actually very creative and productive – at one point, he made pendants for female relatives; at another, he was obsessing about building his own automated pasteurizer for the dairy, among others. It was this kind of family background that served as his springboard to an exceptional career in science.



Briefly, he spoke about his first sexual encounter; and profusely, he related stories about his various teachers and mentors and the kind of education and discipline he gained from the different academic institutions both in Africa and England where he studied, including Balliol College in Oxford, England.

However, highly intelligent that he was, Dawkins was no nerd. Like any other youngster in the 1950s, he was an Elvis Presley fan who snapped up his records the moment they were released in the market.

And like any other kid, he was gullible too – believing in the possibility of being invisible and in dogs having their own heaven up above. He also revealed that though he passed IQ tests with flying colors, he did not do as well in exams on spatial ability.

Aside from his family, childhood, and education, the book also delved into his professional life as scientist and professor/lecturer.

Dawkins' writing shows that the author is not just a scientist; he is also a man of letters. After all, he is a bestselling author. His style is descriptive, light, and breezy – enough for the ordinary reader with the un-scientific mind to actually enjoy the book – in most parts, at least (toward the end, the chapters begin to deal with his experiments and very scientific discussions of these).

Three things in particular help make "An Appetite for Wonder" a good read.

First, Dawkins peppers his memoir with passages lifted from his mother's diary – passages which put his imaginative young mind, sensibility, and sense of humor in full display for the reader to admire and be amused.

Second, the author also makes appropriate analogies to explain and simplify a particular point. For example, in discussing genes and mutation, he likens the body as a bedsheet held by thousands of strings attached to hooks in the ceiling. One string represents a gene and a gene mutation is represented by a change in the tension in one string's attachment to the hooks.

Third, his writings are also interspersed with his interesting insights, sometimes of matters which are of no importance to the ordinary thinker. In one instance, he mused about how incomprehensible words in a prayer he and his schoolmates used to recite, made them merely imitate the words' sound. From generation to generation of students, he said, this sort of imitation led to a very high "mutation rate." "I think it would be interesting to investigate this effect experimentally," Dawkins said in the book.

Then he mentioned comfort blankets. "I'm interested in the phenomenon of comfort blankets," he stated. "They seem to be held in a position to be smelled while thumb- or finger-sucking."

In another chapter, he spoke about the modern age and all its technological trappings – first discussing an old invention such as the typewriter, and then launching into his thoughts about computer word processors.

Overall, there are many things about the book which both hard core science aficionados and ordinary book lovers would enjoy. Not only does it provide insights into the mind of an individual destined to become one of the world's most profound thinkers; it also provides inspiration and encouragement to scientist wannabes, plus a good measure of humor for everyone.

S&T Post welcomes contributions for our Book Review section. Please email your contributions to eadeleon.dost@gmail.com. Reviews should tackle the movie's science and technology component, subject to the approval of the Executive Editor. For inquiries, call 837-2191 local 107 and look for Gigi de Leon.

1000th SITE

starbooks

Contributors

Patricia O. Calora
DOST-MIMAROPA

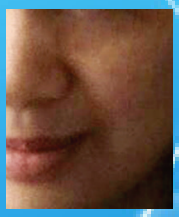
Violeta B. Canoza
DOST-TAPI

Michelle C. Dalay-on
PSHS-CARC

Lilane A. Cutanda
DOST-VIII

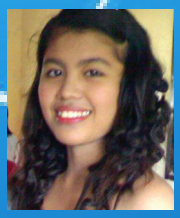
Lilian B. Dela Cruz
DOST-STII

Ritchie Mae L. Guno
DOST-X



Gloria C. Moralidad
DOST-VI

Mark Rembert M. Patindol
DOST-VIII



Alexandria Dennise S. San Juan
DOST-STII

Ramil T. Uy
DOST-VIII

Henrylito D. Tacio
Philippines Graphic

MAKING SCIENCE COMMUNICATION WORK |In another significant move to elevate S&T communication in the country, the Department of Science and Technology (DOST) and the University of the Philippines (UP) Los Baños ink partnership to launch the first off-campus scholarship in Master of Science in Development Communication for DOST's communication specialists recently at the PHIVOLCS Auditorium in Quezon City. The scholarship, funded under the DOST Human Resource Development Program, aims to "better communicate and popularize the results of efforts of DOST to improve the lives of Filipinos, address current problems, and promote the use of S&T in Filipinos' daily lives." Representing the institutional partnership are DOST Secretary Fortunato T. de La Peña (fourth from left) and partners (L-R) UP Los Baños Graduate School Dean Dr. Jose V. Camacho Jr., DOST Science Education Institute Director Dr. Josette T. Biyo, UP Los Baños Chancellor Fernando C. Sanchez Jr., DOST-Science and Technology Information Institute Director Richard P. Burgos, and UP Los Baños College of Development Communication Dean Dr. Ma. Theresa H. Velasco. Other officials in attendance are DOST Undersecretary for S&T Services Dr. Rowena Cristina L. Guevara, Undersecretary for Regional Operations Dr. Carol M. Yorobe, and administrators from UP Los Baños. **(George Robert E. Valencia III, DOST-NRCP)**

New scholars under DOST's first off-campus scholarship grant in Master of Science in Development Communication (MS DevCom) formally receive their admission notices during the ceremonial memo signing between DOST and UP Los Baños last October 8, 2016 at PHIVOLCS, Quezon City. The program was made possible through the collaboration of the Science and Technology Information Institute (DOST-STII), the Science Education Institute (DOST-SEI), the DOST Media Core, and the UP Los Baños College of Development Communication. In photo are seven of the 16 scholars (from left): Haziel May C. Natorilla (STII), Charmaine V. Villamil (PHIVOLCS), Melanie R. Aquino (PAGASA), Jude M. Jose (PAGASA), Lucille D. Sanico (PHIVOLCS), Ma. Grace B. Sasota (SEI), and Marren Joy J. Belgado (SEI). Aside from full coverage of tuition and matriculation fees, the MS DevCom scholars are entitled to monthly stipends, book allowance, and thesis assistance grants. **(George Robert E. Valencia III, DOST-NRCP)**

Partake in the making of the Philippines' scientific history.

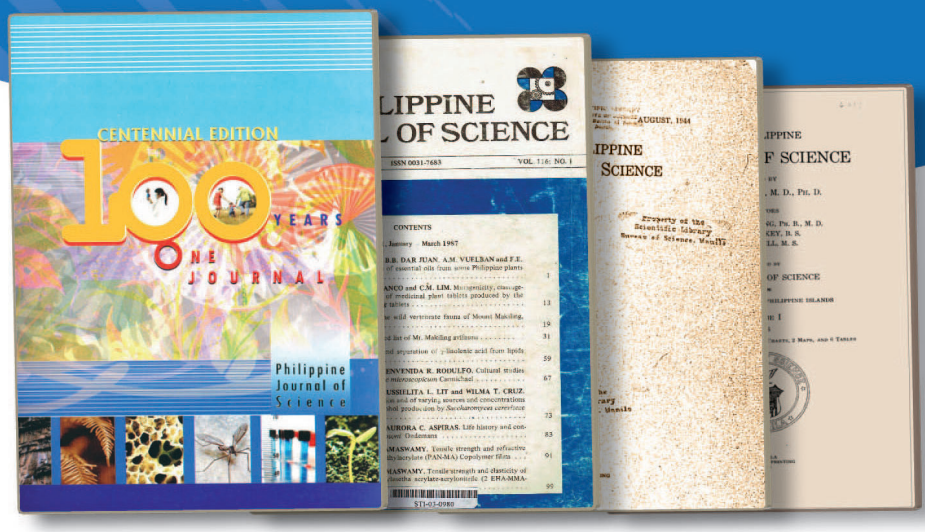
Contribute to the continuing improvement of the country's rich research culture.

PUBLISH your research in the Philippine Journal of Science (PJS), the country's oldest scientific journal since 1906.

PJS accepts scientific articles on a wide range of topics:

- Natural sciences
- Applied sciences
- Engineering
- Mathematics
- Computer Science
- Social sciences
- Review papers are also welcome

All paper submissions shall undergo **RIGOROUS PEER REVIEW**. Authors are given the opportunity to publish their work in a Thomson Reuters and Scopus-indexed journal **WITH NO PAGE CHARGES**.



NOW ON ITS 110th Year

You may submit your manuscript and other requirements to the PJS Editorial Office via philjournsci@gmail.com.
For further information on submission and subscription, visit the PJS website at http://philjournalsci.dost.gov.ph/