DOST-ITDI

ANNUAL REPORT 2019

DOST-ITDI

About **ITDI**

The **Industrial Technology Development Institute (ITDI)** laid the groundwork for S&T in the country.

Today, it is one of the DOST's R&D agencies and undertakes multidisciplinary industrial R&D, technical services, and knowledge translation or technology transfer/ commercialization.

ITDI harnesses know-how in new technology and product innovation, and through the years, has emerged as a credible and reliable industry and government partner in accelerating growth and development in the country.

Our **Vision**
Leading industry partner for science, technology and innovation.

Our **Mission**
To contribute to making local industries globally competitive.

Mandate

- Conduct R&D to generate new knowledge and technologies
- Undertake knowledge translation or technology transfer/ commercialization
- Provide technical services, tests, and analyses
- Establish, develop, and maintain national units of measure to provide international traceability

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MESSAGE

DOST Secretary
FORTUNATO T. DE LA PEÑA

Every year, I enjoin the Science Department's line agencies to immerse themselves in something of profoundly deep and personal value to our fellow Filipinos so they can appreciate everyday science. How else may we know how we can attain the country's sustainable development goals if not for understanding how the so-called "live-work-play" paradigm works out in real communities?

However, the backbone of such mixed-use developments is a strong economy with abundant jobs. That is where ITDI with its solid partnerships with industry comes in.

I saw how ITDI worked tirelessly to open opportunities for businesses to grow and thrive. Out there in the open fields of the global market, competition among similar products and services is very stiff.

In 2019, ITDI looked out for our businesses on all fronts. Surely, building on previous efforts, it worked to establish not one or two facilities, but four.

Soon, our industry can avail themselves of services of a Simulation Packaging Testing Laboratory where stress conditions that affect products during transport are simulated. Similarly, we want to process and pack these products in a Green Packaging Laboratory.

At a future Advanced Manufacturing Center, businesses will have the option to do rapid prototyping, and direct digital and layered manufacturing. Companies will save time and money, as well as reduce design and prototyping errors. Currently, ITDI is also assisting the Philippine business to attain as the prime halal industry in the global market through its Halal Food Research and Development Facility and related projects.

In all of these, an old buzzword in business that persists is innovation. As expected, ITDI did not play it safe. It went beyond the innovation of product and service and tested its research mettle.

In partnership with the Department of Trade and Industry, it pilot-tested a technology check strategy to rank market readiness of 27 products and compiled results into a 226-page compendere.

ITDI re-engineered its peoples' skills and was cited as the 2019 Best Institute for Highest Number of Utility Model Registrations. Two staff members were recognized for their papers presented at the 7th International Conference on Nano and Materials Science in San Francisco, California and 2nd International Conference on Smart Materials Applications in Tokyo, Japan. Another two were listed in this year's 100 Outstanding Asian Scientists.

Lastly, the Asia Pacific Metrology Programme awarded the 2019 Developing Economies NMI (DEN) Award to the Philippines for the first time.

Congratulations to the ITDI on its accomplishments! As it takes a new and clearly defined strategic direction in 2020, I believe that it is creating lasting value for our country and the Filipino people.

FORTUNATO T. DE LA PEÑA
Secretary

MESSAGE

ITDI Director

ANNABELLE V. BRIONES, PhD

2019 was another auspicious year for ITDI. It is a year full of challenges for innovations and competitiveness. Amidst all these, the institute has managed to keep its gears on track as it hastens its development of new technologies and technological tools and come up with new and improved facilities to keep pace with the growing and changing needs of the industry and society.

It is with pride therefore, that I present to you, the ITDI's efforts and accomplishments for 2019.

In the first quarter of the year, the Institute has established its Simulation Packaging Testing Laboratory (SPTL), the HALAL Food Research and Development Facility, and is one of the major players in putting up DOST's Advanced Manufacturing Center (AMCen).

All these are state-of-the-art science and technology facilities.

The SPTL is the country's first packaging laboratory that can simulate stress conditions that affect products during transport. Through this cost-effective stress testing on the packaging, SMEs can improve on their packaging materials and processes preserving product quality during distribution to various locations.

On the other hand, AMCen or Advanced Manufacturing Center is a pioneering facility in the country that is envisioned to transition local traditional manufacturing to additive manufacturing or 3D printing. This technology has great potential in reducing raw materials and operations costs while allowing the use of local raw materials for 3D printing. ITDI handles the MATDEV (Development of Multiple Materials Platform for Additive Manufacturing) that undertakes research and development of materials from local resources to reduce the cost of filaments and other materials used for 3D printing; while DOST-MIRDC undertakes prototype development.

In October of the year, the institute inaugurated its HALAL Food Research and Development facility. With this facility in place, the institute hopes to develop new food products that are compliant to Halal standards. It also supports the DOST as it responds to RA 10817, or the Philippine Halal Export Development and Promotion Act, whereby ITDI takes an active role in the upgrading of facilities of research centers involved in Halal development. Alongside establishing these facilities, ITDI R&D continued to focus on helping local industries make their businesses more productive and efficient.

The I-salt technology provides local producers with the design and prototypes of a salt processing line of equipment (evaporating pan, furnace, washer, spin dryer, and iodizer) that can help address problems in salt production, and enable the processors to comply with the ASIN Law and produce salt that meets the Codex standards for iodized salt. Also developed are various gourmet salt products and micro-sized salt flavored with Caulerpa racemose "lato", shiitake mushroom and shrimp heads; and salts smoked with guava leaves and twigs, mango, and tamarind.

Towards the last quarter of the year, upgrading a community-based terra-cotta production facility was started in Antique with the help of DTI, LGU Antique, and the University of Antique. With this collaboration, a Common Service Facility (CSF) on brick making for the Manungkoron Cooperative in Antique was established. This would be instrumental in improving the livelihood and income-generating capability of the community.

In terms of food safety, a new chemical testing method that will determine the level of sulfite in dried mangoes is now offered at ITDI through its Standard and Testing Division and Metrology in Chemistry (MiC) project. STD validated the Optimized Monier-Williams method--a standard testing method for sulfite presence that is generally accepted worldwide; and developed a reference material for sulfite testing in dried mangoes.

Meanwhile, the technical expertise and assistance of its Chemicals and Energy Division were tapped to implement the PCIEERD-funded project titled, Capability Building on Energy Efficiency and Conservation (EE&C) for State Universities and Colleges (SUCs) in six (6) Regions as Demonstration Sites. Under the Energy Conservation Program of the government, the project will help reduce the energy consumption of government facilities.

Natural calamities and disasters successively hit the country every year without warning. During such times when food shortage is unavoidable, ITDI came up with interventions to help disaster-stricken communities cope with their situation and meet their needs especially food. Its "Pack of Hope" of Ready-to-Eat (RTE) Arroz Caldo, smoked fish rice meal, and cassava in light

syrup are often distributed to areas hit by calamities/disasters. In DOST Region 2, RTEs were given to survivors of the earthquake that hit Batanes on July 27, 2019.

The ITDI, through Task Force Bangon Marawi, has continued to provide interventions in support of the national call to help Marawi rise again after the war. Some units of the modular-type rainwater catchment system developed from local indigenous materials that can store up to 1 cubic meter of water for non-potable domestic use such as washing, flushing, and watering of lawns/gardens were installed in select barangays and households in Marawi. Livelihood trainings for the displaced communities were also conducted.

Another initiative for disaster preparedness is the Emergency Disinfection System (EDS) which is a mobile, cost-efficient, and ready-to-use treatment system for contaminated water from different water sources including flood water, and help provide safe and potable water. It has an integrated solar panel for reliable and uninterruptable power supply. This year, one unit was already deployed in Taguig City's Environment and Natural Resources Office (CENRO).

The institute continues to harness the potential of locally available materials for industrial use. Now geared for transport applications is its abaca fiber-reinforced composites. This was developed using vacuum-assisted resin transfer molding (VARTM) or resin infusion process which is an innovative technique in fabricating abaca fiber-reinforced composites in more complex structures for different transport modes such as tricycle roof, fuselage for drones and boat body. This technology uses abaca fibers which are abundant and environment-friendly. Abaca fiber-reinforced boats are now in the final phases of testing to establish its usability or applicability.

Truly, the institute, through our R&D and technical services, has been trying its best to significantly contribute to uplifting the socio-economic posture of the country. And while the world economies are moving in a faster phase, we, still have a lot of catching up. I remain optimistic and steadfast in my faith that together, as one ITDI family, we can rise above our limitations and still achieve our goals as best as we can, and remain relevant as one of the prime movers for national development through science, technology, and innovation.

Annabelle V. Briones, PhD
Director

Highlights of ITDI Accomplishments

1.
ESTABLISHMENT OF STATE-OF-THE-ART S&T FACILITIES

2.
SUPPORT TO LOCAL INDUSTRIES

3.
INTERVENTIONS FOR DISASTER-STRICKEN COMMUNITIES

Ground breaking ceremony for SPTL
March 5, 2019

2.

Simulation Packaging Testing Laboratory (SPTL)

SPTL will be the first in the Philippines that can simulate actual environmental hazards that the packaged products e.g. fresh and semi-processed agricultural products, furniture, personal care, and dangerous goods will undergo during distribution in the supply chain. The laboratory will comply with the testing protocols of International Safe Transit Association (ISTA) Global for transport packaging. While serving as a prime laboratory for the Packaging Technology Division (PTD), the SPTL shall also serve as venue for collaboration in conducting training, R&D and testing for researchers and students in the Philippines and ASEAN member countries.

SPTL is expected to be operational in October 2020.

AMCen is a technological hub for additive manufacturing, offering services on Materials Development and Rapid Prototyping. It facilitates product innovation and development where various 3D printing technologies are made available to greatly contribute in the country's goal of becoming globally competitive.

The groundbreaking ceremony for AMCen was held last 15 March 2019. This 3D printing technology center is a joint project with the DOST-MIRDC. ITDI will handle developing multiple 3D printing materials while MIRDC, the prototype development.

Various benchmarking activities in the United States are currently being undertaken to build the capability of the country in additive manufacturing. Two DOST-ITDI staff had already completed their training and three more are currently undertaking theirs.

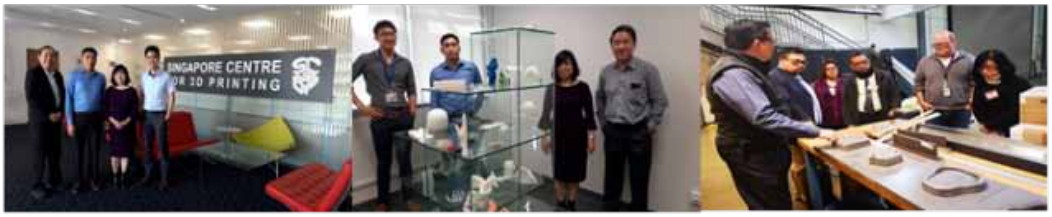
Advanced Manufacturing Center (AMCen)

On September 24-25, 2019, the first Philippine Additive Manufacturing Day was held where around 300 participants from the industry, academe, government, and other stakeholders gathered.

During this event, the AMCen PartnerShape, an agreement with five partner-companies was signed that hopes to advance additive manufacturing technology in the country. These are Puzzlebox 3D, Norde International, Omnifab Inc., Atarashii Technologies International, and MSC Software.

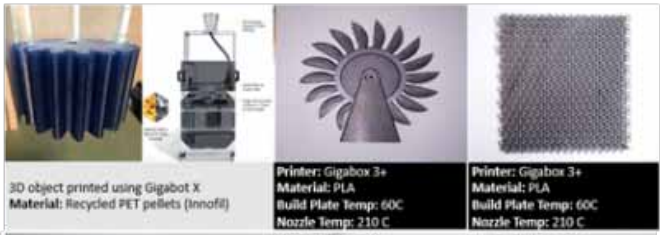
Advanced Manufacturing Center (AMCen)

BENCHMARKING



NTU, January 7, 2019 NUS, January 8, 2019 CWRU, Feb 16-24, 2019

3D PRINTED PRODUCTS



Filaments

AMCen
Advanced Manufacturing Center
Beyond the Conventional

ACTIVITIES

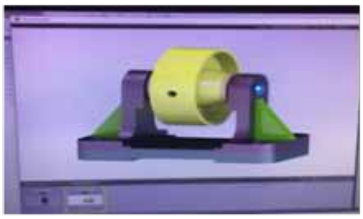
Planning Workshop, Jan. 10-11, 2019

AMCen Groundbreaking, March 15, 2019

TRAINING

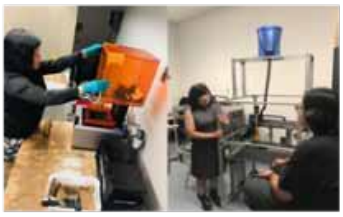
NTU, March 22-27, 2019

Echo Seminar, April 17
& May 2, 2019



Solidworks Training,
June 24-28, 2019

CWRU, Personnel Training



CWRU, Manager's Training

USER PROPOSAL FOR AMCEN

3D PRINTING WINNOVATION TECHFEST 2020

Stakeholder's Forum,
Jan. 14, 2019

AM Summit,
March 15, 2019

AMCen Booth,
Feb. 27 – Mar. 1, 2019

INCP AM Nanotechnology
May 28-29, 2019

Phil. AM Day
Sept. 24-25, 2019

HALAL Food Research and Development Facility

In October, the institute inaugurated its HALAL Food Research and Development facility. With this facility in place, the institute hopes to develop new food products that are compliant to Halal standards, and, as well, support DOST as it responds to RA 10817, or the Philippine Halal Export Development and Promotion Act. This Act provides for ITDI to take an active role in the upgrading of facilities of research centers involved in Halal development.

In relation to DOST's Halal S&T Program and to support the operation of the DOST-ITDI Halal Food R&D Facility, the first-ever Global Halal Awareness Program, Halal Lead Auditors Training and Certification Program was conducted last October 28, 2019 at the Heritage Hotel in Pasay City.

The training equipped the participants with knowledge in Halal food management system to support the increasing demand for Halal products in the local market. This comprehensive training program also ensured that all Halal industry players adhere to common standards and procedures to harmonize Halal compliance globally. A total of 23 DOST-ITDI staff were certified as Halal Lead Auditor after the said training.

I-SALT: Improving Productivity and Efficiency of Local Salt Producers Towards a Self-reliant Philippines in 2020

GDC salt farm in Dasol, Pangasinan

GDC salt processing facility

Project 1: Design and prototyping of salt processing equipment (evaporating pan, furnace, washer, spin dryer and iodizer)

This initiative aims to improve productivity and efficiency of local salt producers in the country through equipment fabrication, process standardization, and product development and enable them to comply with the ASIN Law and Codex Standards for Iodized Salt. It addressed problems on salt purity, consistency in iodine content level, particle size uniformity and final product's moisture content that is normally encountered by local salt producers. Salt processing equipment include dryer, iodizer, evaporating pan, furnace and concentrator (ion-exchange membrane).

Three salt processing equipment were deployed in the newly constructed salt processing plant of Gozon Development Corporation (GDC) in Dasol, Pangasinan last November 27, 2019.

Meanwhile, periodic monitoring activities are being done in JM Salt Manufacturer in Infanta, Pangasinan. With the DOST-ITDI-developed I-Salt technology, JM Salt Manufacturer increased their product output by 32% in a shorter production run of less than 12 hours compared to the traditional process. They are now producing salt with the correct level of iodine content, compliant with RA 8172 or Asin Law, and can check or validate their products' iodine level by using the WYD iodine checker.

Samples of gourmet salt

Project 2: Development of gourmet salt products and micro-sized salt

The project aimed to alter or redesign the size of salt to micro-size as to optimize its delivery to the taste buds and fully bring out its taste; while gourmet salts were produced by infusing the salt with aroma and taste from various local plants. Micro-sizing of solar and cooked salts was achieved using a nano-spray dryer.

Various gourmet salts flavored with *Caulerpa racemose "lato"*, shiitake mushroom and shrimp heads; and salts smoked with guava leaves and twigs, mango and tamarind were developed. These products were among those featured by ITDI in the IFEX 2019 and were again presented in the post-IFEX meeting with stakeholders who attended the exhibition.

Upgrading of Terra Cotta Production in Antique

This intervention intends to assist the province of Antique in upgrading their community-based terra cotta production, that can generate livelihood and help improve lives of communities especially the terra cotta producers. Initial site visit and consultative meeting at Tibiao and Sibalom was conducted by DOST-ITDI last August 2, 2019. This was then followed by a series of technical assistance focusing on enhancing brick/ pottery-making skills, introduction of new techniques, and upgrading/ establishment of production facilities last August 27-30, 2019.

DOST-ITDI along with DTI, LGU Antique, and University of Antique are currently collaborating for the establishment of a Common Service Facility (CSF) on brick making facility for the Manugkoron Cooperative.

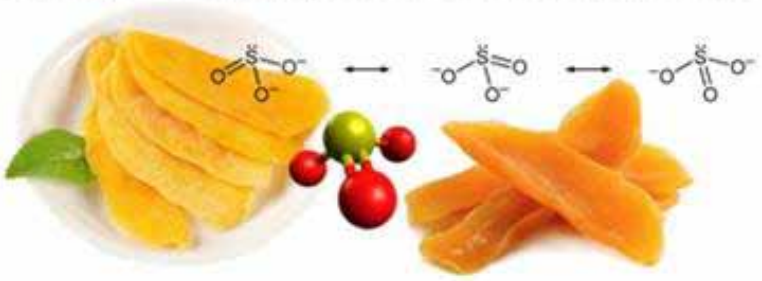
Manugkoron Cooperative Antique upgrading of terra cotta production

SULFITE IN DRIED MANGOES

Philippine National Standard for Dried Mango Products – Specification
(PNS/BFAD 15:2007)

Parameter	Maximum Allowable Level	STD Test Method	Detection Limit	Test Fee, PhP	Turn-around Time, Days/Weeks
Sulfite as SO_2, mg/kg	3,000	AOAC 990.28 Monier-Williams	3.00	2,200.00	3-4 weeks

Sample Requirement: At least 250 grams of sample or 6 packs of unopened package for market



Sulfite Testing for Philippine Dried Mangoes for Export

Sulfite is widely used as a food additive to prevent microbial spoilage and browning. However, excessive intake of this additive may cause adverse effects to human health including dermatitis, urticaria, hypotension, abdominal pain and asthmatic reaction.

The demand of local food companies for sulfite testing escalated as food recalls and detention were reported for Philippine export products across Asia, Europe and the United States for exceeding the regulatory limit for sulfite presence in food systems (e.g. US-FDA limit < 1000 mg/kg). This may translate to large losses considering that Philippine export of dried mangoes is estimated at 8.06 metric tons per year on average (Dept. of Agriculture-Philippine Mango Industry Roadmap, 2018).

DOST-ITDI, through its Standard and Testing Division and Metrology in Chemistry (MiC) project, validated the Optimized Monier-Williams method-a standard testing method for sulfite presence that is generally accepted worldwide; and developed a reference material for sulfite testing in dried mangoes. The efficiency of the process was evaluated against other laboratories' by Food Analysis Performance Assessment Scheme (FAPAS). Phasing-in of this new testing service will help local dried mango processors comply with product quality set by the international market that may also result to lifting of the current trade barrier for Philippine export products.

Capability Building on Energy Efficiency and Conservation

In accordance with the Energy ConservationProgram of the government that aims to reduce energy consumption of government facilities, DOST-ITDI's technical expertise and assistance through its Chemicals and Energy Division was tapped in implementing the PCIEERD-funded project titled, Capability Building on Energy Efficiency and Conservation (EE&C) for State Universities and Colleges (SUCs) in six (6) Regions as Demonstration Sites.

The project aims to promote the judicious and efficient utilization of energy resources through the capability building on Energy Efficiency and Conservation (EE&C) starting with the State Universities and Colleges (SUCs) in various regions. This in turn capacitated the participating SUCs to conduct energy audit for the benefit of different industries local to the region.

To date, DOST-ITDI already completed the EE&C training, monitoring and evaluation in six cooperating regions including Cagayan State University in Region II, Mindoro State College of Arts and Technology in Region IV-B, Carlos Hilado Memorial State College in Region VI, Eastern Visayas State University in Region VIII and Xavier University in Region X and Mindanao State University in Region XII. Energy audit instruments such as infrared thermometer and stroboscope were transferred to the SUCs. A total of 152 people were trained upon completion of this project this year.

Training course for trainers in energy auditing for energy efficiency and conservation

RTE *arroz caldo*, smoked fish rice meal and cassava in light syrup

Shelf Stable Ready-to-Eat (RTE) Disaster/ Relief Foods

Branded as 'Pack of Hope' - in every pack is a hope to survive hunger. The product is lightweight and packed in an easy-open-retort pouch with at least one year shelf life. It can be consumed directly from the pouch. The RTE products for three stages include the following: chicken *arroz caldo* (1st stage), smoked fish rice meal (2nd stage), and cassava in light syrup and boiled sweet potato (3rd stage). DOST-ITDI coordinates with various government agencies for stockpiling of RTEs as disaster/relief foods and for distribution to calamity survivors.

A total of 39,980 pouches of RTE chicken *arroz caldo* and 3,000 pouches of RTE smoked fish rice meal were stockpiled in the following DSWD regional offices: CAR, 1, 2, 3, 4A, 4B and 8 and DOST regional offices: 3, 4A and 4B. An additional 3,000 pouches of RTEs were also sent to DOST Region 2 for the survivors of the earthquake that hit Batanes last July 27. The DOST, DILG, DSWD and NDRRMC are now collaborating to put in place, a more effective distribution system of RTEs to disaster victims.

DOST Intervention for and Reconstruction

ITDI Livelihood Program for Rehabilitation and Reconstruction of Marawi

Aims to establish sustainable livelihoods for the Maranaos through a series of training-workshops and creation of livelihood

Maranao People Development Center, Inc. (MARADECA)

DOST-ARMM

PSTC

identified NGO's and DILG

BANGON MARAWI

Actual Impacts:

1 **Increased knowledge on production, management and marketing of personal care products, charcoal briiquettes, and herbal products.**

Marawi Rehabilitation

Deployment of Innovative Rainwater Collection Systems in Marawi

Intends to deploy 50 units of ITDI's innovative rainwater collection system to help the people cope with challenges especially concerning water issues

Manly Plastics

Philippine Army

2 **Increased capacity of the Maranao community in coping with drinking water-related problems.**

DOST Intervention for Marawi Rehabilitation and Reconstruction

Various government agencies through Task Force *Bangon Marawi* were tasked to aid the conflict-stricken city towards recovery, reconstruction, and rehabilitation. DOST-ITDI is actively implementing initiatives in support of this national call to help Marawi rise again after the war.

Through the project ITDI Livelihood Program for Rehabilitation and Reconstruction of Marawi, sustainable livelihoods were established for the Maranaos through a series of training-workshops that include technology on personal care products, charcoal briquetting, herbal processing and essential oil extraction, and creation of livelihood center.

The following technologies from DOST-ITDI were turned over to MARADECA, Inc.:

1. Essential Oil Extractor - extracts essential oils from Citronella grass and other plant materials that are abundant in Marawi City.
2. Charcoal Briquetting Equipment – consists of ITDI modified drum carbonizer, crusher, mixer, and manual briquettor.
3. Tea Bag Processing Equipment – Internally Displaced Persons (IDPs) from Marawi were trained on herbal processing, and are now able to produce *Moringa* Herbal Tea and Turmeric Herbal Tea.

The project Deployment of Innovative Rainwater Collection Systems in Marawi focused on stationing rainwater collection systems (RWCS) to selected barangays and households to address the problem of water scarcity in the community. Rainwater collection currently appears to be one of the most promising alternatives for supplying freshwater in the area. The DOST-ITDI-developed modular-type rain water catchment system developed from local indigenous materials can store up to 1 cubic meter of water for non-potable domestic use such as washing, flushing, and watering of lawns/gardens.

Since its inception, DOST-ITDI has already collaborated with Manly Plastics Inc. on the design and fabrication of RWCS and with the Research and Development Center, Army Support Command of the Philippine Army on the deployment and evaluation of the RWCS units. A total of 30 pillow-type and 15 modular-type rainwater collection systems were already deployed in Marawi. There are 10 pillow-type and 15 modular-type RWCS currently housed in DOST-ITDI ready for deployment once Philippine Army mobile assets are available early next year.

Abaca Fiber-Reinforced Composites for Transport Applications

DOST-ITDI utilized vacuum-assisted resin transfer molding (VARTM) or resin infusion process which is an innovative technique in fabricating abaca fiber-reinforced composites in more complex structures for different transport modes such as tricycle roof, fuselage for drones and boat body. This technology uses abaca fibers which are abundant and environment-friendly. Composite materials developed using VARTM are lighter, more saltwater decomposition-proof, more corrosion-resistant, and has lower heat conductivity.

Three boat prototypes, for rescue operations in flood-prone areas or water-logged communities, were produced and field-tested in Laguna Lake and Pinagbuhatan, Pasig City. A pre-sea trial was also conducted in Wawa Dam Pumping Station last September 2019 to test the actual buoyancy prior to the assessment by the Maritime Industry Authority (MARINA). Abaca fiber-reinforced boats are currently in the final phases of testing to establish its usability or applicability.

It is envisioned that this technology can help rev up the local abaca industry. To apprise the industry of this value-adding technology and to forge possible partnerships for technology commercialization, the Abaca Fiber Composite Stakeholders Forum was held last September 13, 2019. The event gathered forty-five stakeholders – 3 from Abaca farmers association, 6 fabricators, 5 resin suppliers, 22 from other government agencies, 4 from academe, 3 from media, 1 private individual, and 1 Abaca composite producer. SV Hesed Solution, Inc., an abaca supplier, expressed its willingness to supply abaca ropes to DOST-ITDI and DOST-PTRI that can be used to produce abaca mat and for other applications.

Emergency Disinfection System (EDS) for Drinking Water

DOST-ITDI developed an Emergency Disinfection System (EDS) which is a mobile, cost-efficient and ready-to-use treatment system for water from different possible sources including flood water. The system has an integrated solar panel for reliable and uninterruptable power supply. This year, one unit was already deployed to Taguig City Environment and Natural Resources Office (CENRO).

As one of the initiatives of DOST-ITDI on disaster preparedness, the Environment and Biotechnology Division conducted a lecture and training on the Emergency Disinfection of Drinking Water to technical staff of DOST XII at the Philippine National Halal Laboratory and Science Center, Brgy. Paraiso, Koronadal City on November 19, 2019. In coordination with DOST XII, the team also extended emergency support to earthquake survivors of Brgy. Malabuan and Brgy. Malungon, Makilala, Cotabato Province last November 20, 2019 by providing training on Water Treatment Technology for Emergency Response.

DOST-ITDI's Emergency Disinfection System and Community-Based Water Treatment System were also introduced during the training. DSWD and LGU-Cotabato expressed their interests in adopting these technologies.

ITDI MAJOR PROGRAMS

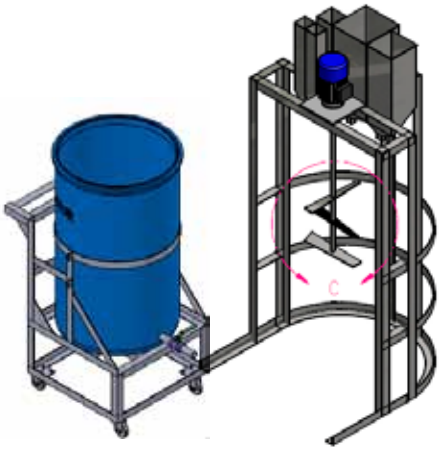
ASSISTANCE TO MSMEs

This program aims to hasten industrial development by providing technological innovations that will address the concerns of industry, mainly the micro, small, and medium enterprises (MSMEs); or advance their existing processes to improve their operation, productivity, and competitiveness.

Semi-automated reactor for liquid detergent soap

In support to livelihood activities of communities on production of liquid detergent soap or dishwashing liquid, DOST-ITDI developed a locally-fabricated, low cost, and semi-automated reactor designed to ease up the production process, maintain consistent product quality, and ensure efficient use of materials.

(a)



(b)

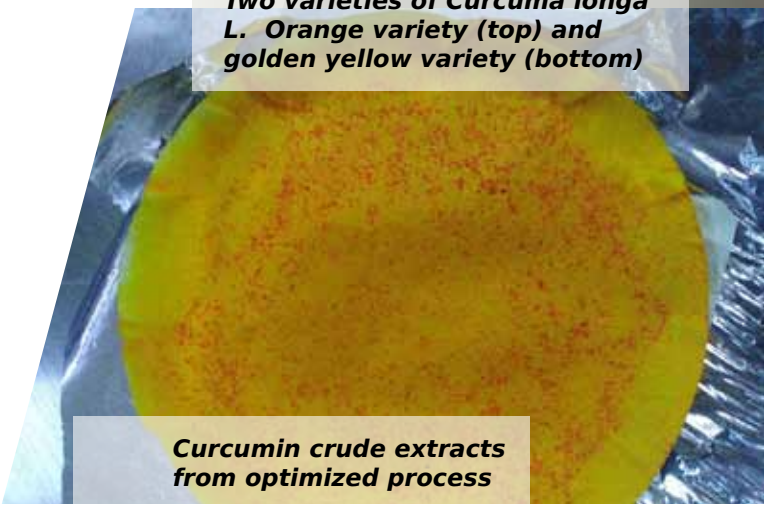
(a) Isometric view and (b) prototype unit of 100L reactor for liquid detergent/dishwashing

Isolation, purification and characterization of curcumin from Philippine turmeric

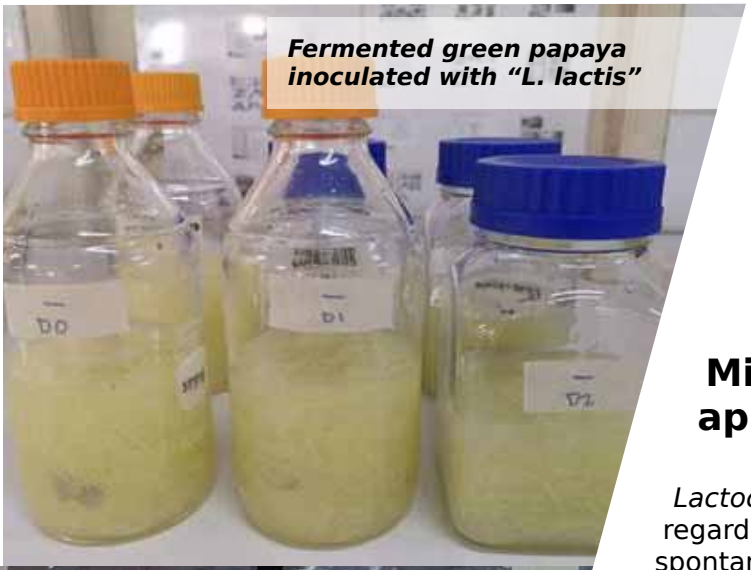
Curcumin is a naturally-occurring compound extracted from turmeric. The rhizome has long been used for a variety of medicinal applications such as anti-inflammatory and as antioxidant. However, high-purity curcumin is currently imported from other Asian countries such as China and India.

To support local herbal drug producers, DOST-ITDI has successfully isolated curcumin from Philippine turmeric through optimized solvent extraction. Result of analytical analysis revealed that the curcumin content of the extracts at 43 mg/g extract was significantly higher at around 34-65% than that of commercial counterparts in the form of nano-curcumin gel capsule at 32 mg/g extract and turmeric powder at 26 mg/g extract.

Two varieties of Curcuma longa L. Orange variety (top) and golden yellow variety (bottom)



Curcumin crude extracts from optimized process



Fermented green papaya inoculated with "L. lactis"

Microbial inocula for industrial applications

Lactococcus lactis, a lactic acid bacterium generally regarded as safe (GRAS) and isolated from spontaneously fermented green papaya, was used as an inoculant for controlled green papaya and chicken feed fermentation. The addition of *L. lactis* has been found to be effective in controlling the growth of pathogenic microorganisms such as *Escherichia coli* and *Salmonella spp* during the fermentation process. This inoculant may help prevent food safety hazards, specifically pathogenic contaminants from the environment and the fermentation process.

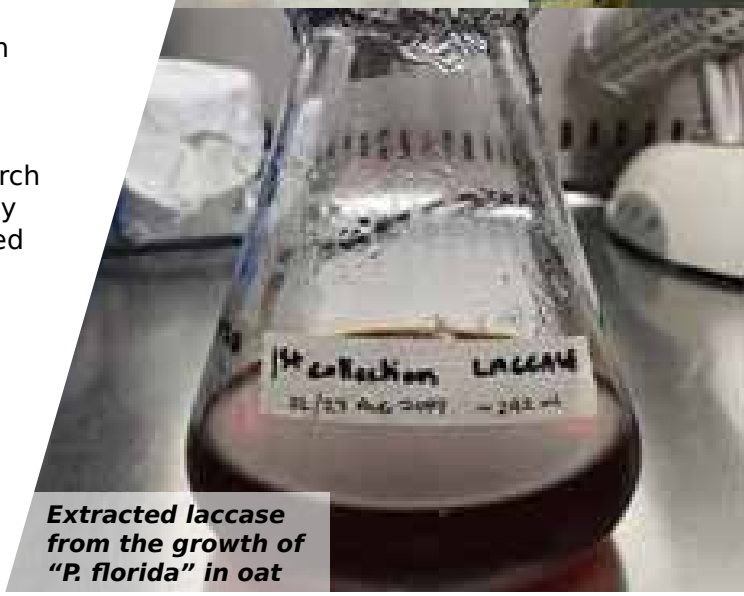
Chicken animal feed inoculated with "L. lactis"

Freeze-dried lacasse for biotechnological applications

As the textile industry in the Philippines continue to grow, the amount of wastewater discharge from these industrial plants which contain different dye stuff also increases. Thus, the Department of Environment and Natural Resource (DENR) implemented the revised general effluent standards which include color as a parameter.

In this study, freeze-dried laccase extracted from *Pleurotus florida* (Oyster Mushroom) ITDI 6003 was tested for its efficiency to decolorize textile wastewater (Remazol Blue RGB) collected from the dyeing facility of the Philippine Textile Research Institute – Department of Science and Technology (PTRI-DOST). Results showed that the freeze-dried laccase has an activity of 42 U/mL and can decolorize the wastewater by up to 70% with a minimum laccase concentration of 1.25 mg/mL. Data showed that with a minimal addition of freeze-dried laccase the blue textile wastewater had been decolorized to faint yellow color after 72 hours.

"Pleurotus florida" in oat growth



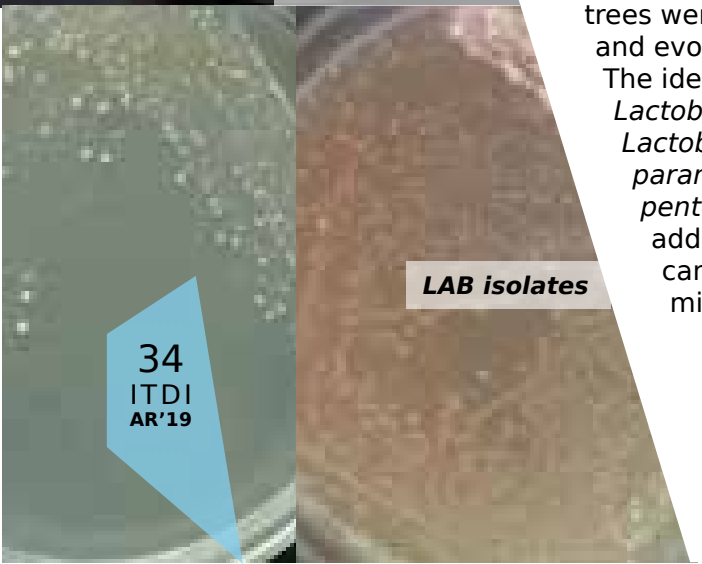
Extracted laccase from the growth of "P. florida" in oat

Molecular characterization of Lactic Acid Bacteria (LAB) from Philippine fermented foods

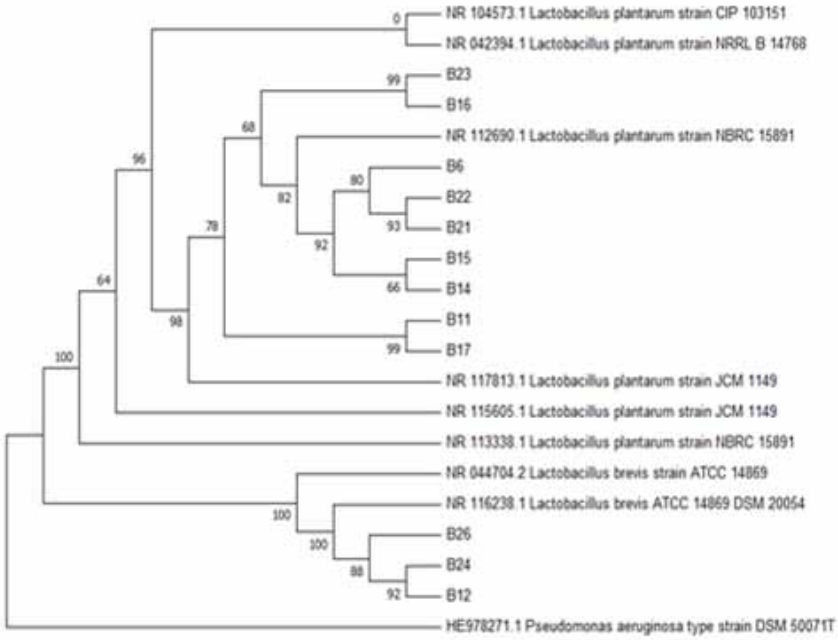
Microorganisms are responsible for the biochemical alteration of the food adding more flavor, increasing shelf-life, and nutritional value. Lactic acid bacteria (LAB) are known to produce lactic acid during fermentation and are labelled to be safe hence; are widely used in food manufacturing in milk, meat, and vegetable products.

With this, DOST-ITDI tested and characterized different LAB isolates from various local commercial and home-made fermented food products. Phylogenetic trees were also constructed to show relatedness and evolutionary distances among the isolates. The identified strains were the following: *Lactobacillus plantarum, Lactobacillus brevis, Lactobacillus musae, Weisella cibaria, Weisella paramesenteroides* and *Pediococcus pentosaceus.* These microorganisms can be added to the pool of microorganisms which can be made available for public and micro-small-and-medium enterprises (MSMEs).

Homemade Kimchi Sample



LAB isolates



Phylogenetic tree from a fermented sample

Food safety assessment of hazards from artisanal food processing equipment used in *taho, sorbetes* and peanut butter processing in Taguig City

Artisanal foods in the Philippines such as *Taho, Sorbetes,* and Peanut Butter are usually prepared with minimum preservation techniques making them more susceptible to contamination. Moreover, hygienic design of processing equipment plays an important role in controlling the safety and quality of the products by preventing microbial, chemical, or physical contamination during processing. Assessment of food processing equipment was conducted by DOST-ITDI which included five (5) artisanal processors (i.e. 3 *taho,* 1 *sorbetes,* and 1 peanut butter) within Taguig City. Results showed that heavy metals are leached from the equipment to the food during processing or cooking causing contamination of the product.

To help address this situation and ensure artisanal food product safety, results of this study including recommendations will be disseminated and discussed with regulatory agencies such as the Food and Drug Administration (FDA) and Local Government Units (LGUs). A Guidance Manual for Processing and Equipment Evaluation Checklist are currently being prepared and will be distributed to both processors and regulatory agencies. A follow-up collaborative project on food contact surface evaluation will also be conducted.

Application of osmotic dehydration as a pre-treatment for vacuum frying selected fruits

Osmotic dehydration (OD) is an operation used for the partial removal of water from foods by immersion in a sugar or salt solution to reduce moisture content before actual drying process. DOST-ITDI studied the application of osmotic dehydration as a pre-treatment for vacuum frying selected fruits. Different types of carbohydrate based osmotic agents (disaccharides and polysaccharides) were studied together with different parameters like soaking time, frying temperature, loading, etc.

Through this project, two new vacuum-fried products were developed. The project also demonstrated the applicability of OD as a pre-treatment prior to vacuum frying of mango and pineapple. A method and appropriate osmotic solution formulation using disacharrides A and B for osmotic dehydration of mango and pineapple pieces were also developed which resulted in higher yield and sensorial acceptability.

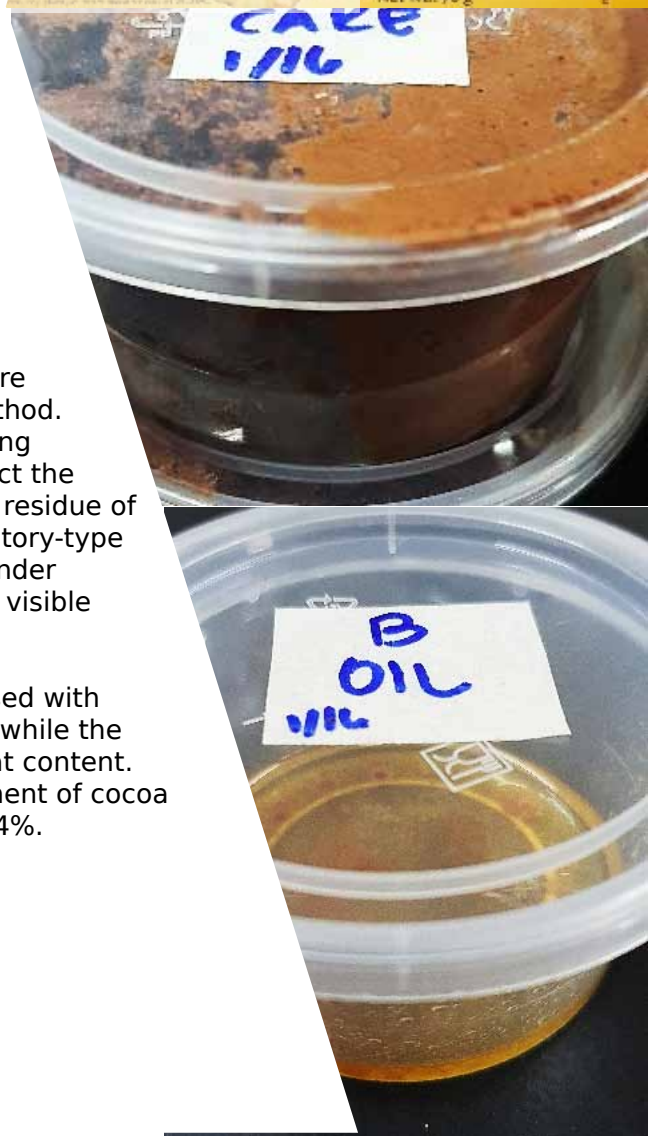
Vacuum fried mango and pineapple

Exploratory studies on separation techniques of cocoa butter and cocoa cake

Cocoa butter and cocoa cake are by-products of cocoa/ cocoa bean processing industry and are important ingredients not only in confectionery industries but also in pharmaceuticals, cosmetics, and personal care manufacturing industries.

In this exploratory study, two separation techniques were studied; (1) pressing method and (2) centrifugation method. The pressing method utilized the Instron Universal Testing Machine (UTM) to determine the force required to extract the cocoa butter and cocoa nibs, leaving the cocoa cake as residue of the process. The centrifugation method used the laboratory-type centrifuge to subject the cacao nibs, diluted in water, under centrifugal force in order to expel the butter and create visible layers of both butter and cake.

Results of the studies showed that cacao samples pressed with 125-150 KN produced cocoa cake with 24% fat content while the samples from centrifugation produced cake with 34% fat content. These fat content are higher than the industry requirement of cocoa cake in terms of fat content which is between 10% to 24%.



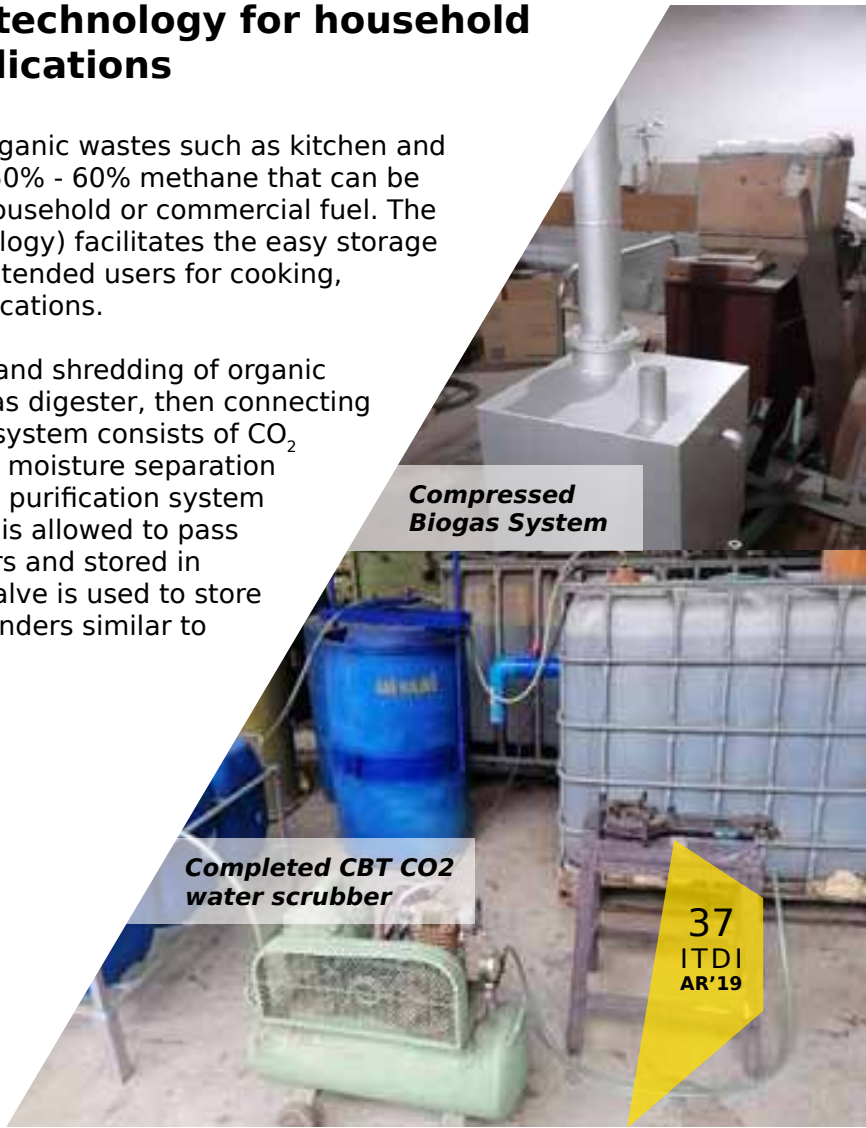
ENVIRONMENT AND ENERGY

To address the emerging need for cleaner and efficient environmentally-friendly technologies, the Institute develops significant products and processes for waste management, renewable energy systems, and bio-based fuel alternatives. These technologies can provide solutions to the persistent problems affecting the environment and energy sectors such as inappropriate waste disposal practices, dependence on petroleum-based chemicals, and inefficient energy production.

Compressed biogas technology for household and commercial applications

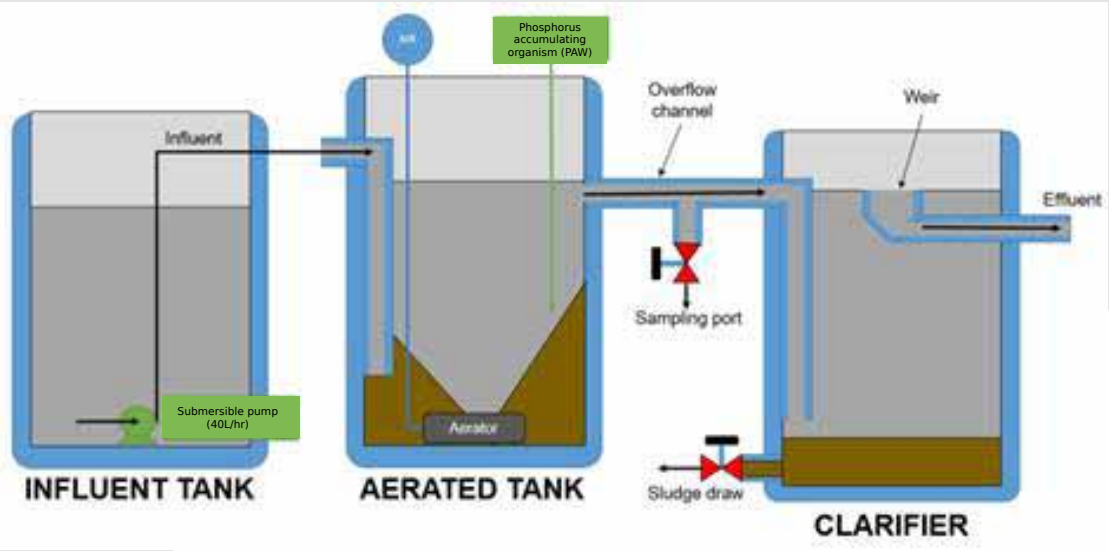
Biogas, which is derived from organic wastes such as kitchen and animal manure contains about 50% - 60% methane that can be used as alternative to LPG for household or commercial fuel. The CBT (compressed biogas technology) facilitates the easy storage and transport of the biogas to intended users for cooking, lighting, and other heating applications.

The process involves collecting and shredding of organic wastes, transferring to the biogas digester, then connecting to the purification system. This system consists of CO_2 separation, H2S separation, and moisture separation units. The clean biogas from the purification system which is now about > 90% pure is allowed to pass through a compressor at 4-5 bars and stored in bottles/cylinders. A three-way valve is used to store compressed biogas in metal cylinders similar to LPG tanks.



Compressed Biogas System

Completed CBT CO2 water scrubber



Nutrient removal of anaerobically-treated piggery wastewater

Increased concentrations of nutrients especially in the form of phosphates and nitrates have deleterious effects on the quality of water and the whole aquatic biota itself. This was addressed by the issuance of DENR Administrative Order No. 08 series of 2016 which aims to set new water quality guidelines and general effluent standards specifically restricting the nitrates and phosphates concentration in wastewater to 14ppm and 1ppm, respectively.

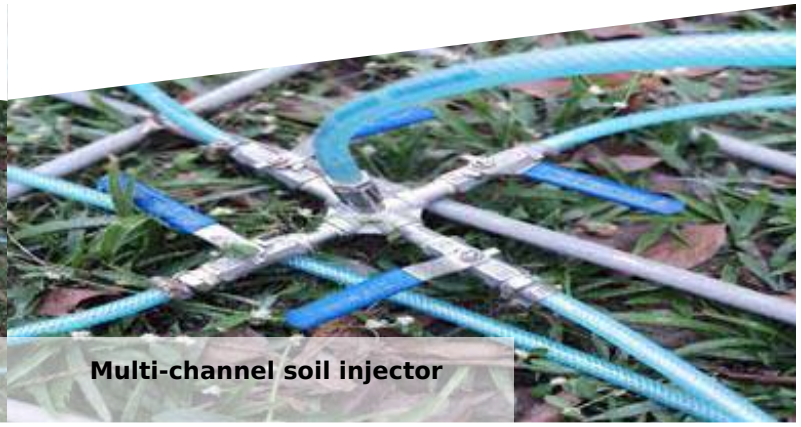
The study aims to assess the capability of aerobic sludge collected from an existing aerobic digestion system in providing nutrient removal for anaerobically treated piggery wastewater. In the study, a bench-scale set-up consisting of an aerated tank and clarifier was fabricated using 60L containers. Varying ratios of collected sludge and piggery effluent were mixed and acclimatized aerobically. After acclimatization, piggery wastewater was loaded to the system at 15L batches at 24-hour retention time and aeration rates of 8L/min. No additional nutrient source was added on system during the treatment process and the microorganisms in the aerated tank were left to rely on the nutrients and BOD/organic matter present in the effluent to survive. Treated effluent samples were collected periodically and analyzed for nitrate and phosphate removal efficiency. Upon analysis, phosphate removal rates of 95-98% were achieved.

Development of chemical oxidant delivery system for remediation of petroleum contaminated soil

A multi-channel chemical oxidant delivery system was developed consisting of four channels injection probe for the remediation of petroleum contaminated soil. Remediation of simulated petroleum contaminated soil was carried out through degradation of organic contaminants in a process known as “Fenton Oxidation”.

Significant reduction of diesel range hydrocarbons from 95% to 99% was obtained after 20 days of treatment. Petroleum contamination of soils, whether from oil well accidents, unregulated industrial waste or leaky underground storage tanks, pose a serious risk to both human and the environment. It can also have adverse effects on the local economy, considering that soils contaminated with petroleum are economically useless, as resources cannot be extracted from nor can crops be properly grown in these areas.

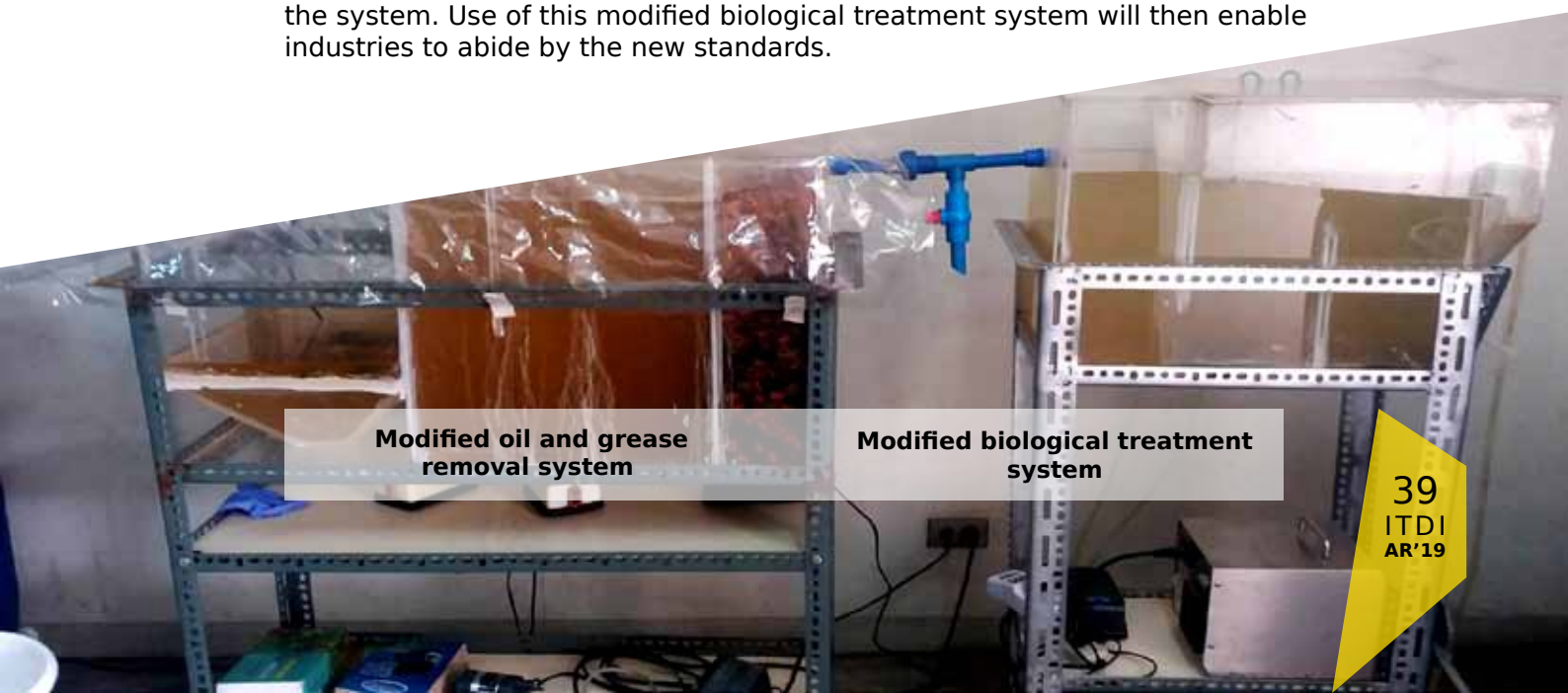
Multi-channel chemical oxidant delivery system



Multi-channel soil injector

Development of a bench-scale biological wastewater treatment design facility

In compliance with the revised general effluent standards which further include nitrates and phosphates in the Clean Water Act, industries are obliged to improve their existing wastewater treatment systems. To address this need, ITDI developed a Bench-Scale Biological Wastewater Treatment Facility and improved the designs for Oil & Grease Separator and Activated Sludge System which includes aeration to simulate dissolved air floatation system (DAF) for a more efficient O&G removal. Further, the design has a provision for scum removal by which O&G removed from the system can be easily collected. An anoxic chamber filled with media where biofilms can attach to promote nutrient removal was also added in the system. Use of this modified biological treatment system will then enable industries to abide by the new standards.



Modified oil and grease removal system

Modified biological treatment system

Installed pilot-scale wastewater treatment system

Aerobic treatment of anaerobically pre-digested swine industry wastewater

Pig farming for meat production to meet the need for animal protein of the rapidly growing human population worldwide has kept increasing exponentially. The wastewater treatment system developed can treat anaerobically pre-digested wastewater from the swine industry to comply with the effluent standards of the Clean Water Act of 2004 (RA 9275). The system consists of an activated sludge system, a suspended growth secondary treatment process that primarily removes dissolved organic solids as well as settleable and non-settleable suspended solids, and a modified trickling filter, which is a bed of solid media where bacteria attach on its surfaces and serves as a biological filter. One (1) cubic meter IBC tanks were used as the activated sludge reactor/s while the clarifier and the trickling filter were fabricated.

ComWaTS unit installed in Brgy. Santiago, Lubao, Pampanga

Community based filters for metal in waters (ComWaTS)

A locally fabricated community-based water treatment system (ComWaTS) with the capacity to remove water contaminants including heavy metals was developed to provide sustainable and safe drinking water that meets the requirements of the to Philippine National Standard for Drinking Water (PNSDW) of 2017. The ComWaTS is a continuous-type water treatment system designed to treat 200 litres/hour of water with heavy metal contamination. The system has a capacity of about 1.6 cubic meters per day (1.6m^3) for a daily 8-hour operation.

One (1) unit of the fabricated system was pilot-tested in Brgy. Santiago, Lubao, Pampanga and results showed that the treated water was able to meet the standard limits for mandatory parameters (arsenic, cadmium, apparent color, true color, nitrate, sulfate, total dissolved solids, turbidity, lead, total coliform, *E. coli,* fecal coliform, and heterotrophic plate count) being monitored in the PNSDW of 2017.

PACKAGING TECHNOLOGY

In support of local producers in preserving product quality and improving their position in the local and international market, innovative packaging technology development is one of the priority programs of the Institute.

Effect of shock and vibration on the quality and shelf life of mangosteen

The aim of this study was to determine the effect of drop and vibration on the quality and shelf life of mangosteen. The shock and vibration absorbed by mangosteen during handling and distribution were measured using a data logger. Mangosteen fruits were dropped at different drop heights from 10 to 180 cm. The impact of dropping mangosteen affected the quality of fruits measured in terms of weight loss, browning of calyx, hardness, and browning of endocarp and aril. Hardening of mangosteen pericarp which was also manifested by cracking of surface shown in Figure 1 increased with time of storage, the increase being greater with increasing drop heights. End of shelf life was when the hardness of mangosteen reached a reading value of 3.5 kg. At this point, the mangosteen could no longer be opened easily by using hand force.

Based on the result, vibration could also affect the endocarp and aril of mangosteen. Discoloration or browning was faster for mangosteen fruits that has undergone vibration compared to the samples that were not subjected to vibration (control). Level 7 or 100% browning of aril was reached after 6 days of storage for mangosteen with cushion and 7 days for samples without cushion. Figure 2 shows the browning of endocarp and aril of mangosteen.

Figure 2.
Browning of endocarp and aril of mangosteen due to vibration

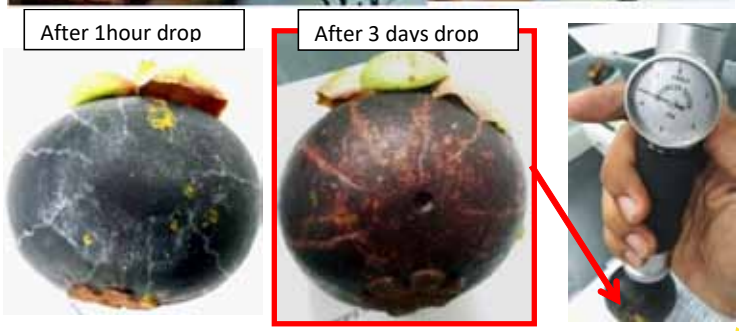


Figure 1.
Effect of drop impact in hardening of mangosteen

Branding “Brand Development”

Branding is a process of giving identity and image to a product as to create an impression in the mind of the consumer. It involves developing a strategy to create a point of differentiation from competitors as well as point of similarity with product class. Packaging of the products also forms part of branding strategy. DOST-ITDI selected six unique products that have undergone brand and logo development which include the following: (1) *bukayo* (2) *kalamansi* (3) *suman* (4) *laing* (5) *langkit,* and (6) Benguet vegetables. Different brand concepts and logo marks for each product were developed based on market research, visit to potential users, and focus group inputs and comments.

The development of branding for packaging technologies developed by the Packaging Technology Division (PTD) was an exploratory study to determine if branding can accelerate the transfer/adoption of the technology. The two packaging technologies selected were (1) Active Packaging Technology to Delay the Ripening of Mango and Banana, and (2) Packaging Technology for Pork Lechon. The brands developed include brand usage manual and promotional materials like posters and flyers.

Nano-coating materials as post-harvest treatment for selected tropical fruits

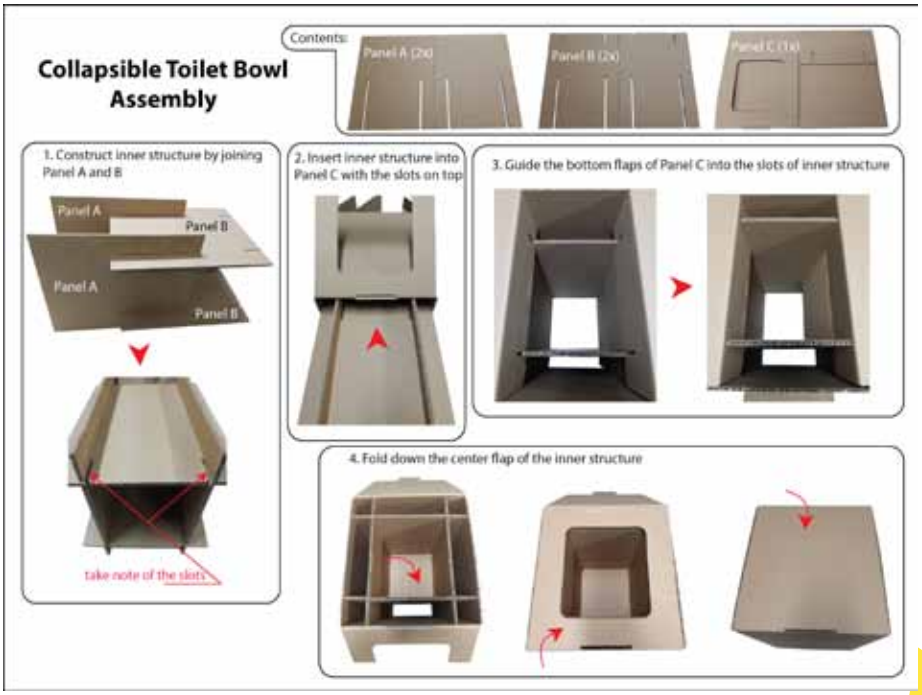
DOST-ITDI developed a chitosan-based edible coating material containing nanoparticles as preservation factor in prolonging the shelf life of tropical fruits. This postharvest treatment aims to prevent the postharvest losses during storage and distribution of the product. Chitosan-based coating was then applied to *‘Lakatan’* banana to delay its ripening and to extend its shelf life. In combination with low temperature storage of 13°C, appropriate concentration of chitosan in the coating solution has delayed the ripening of banana from 7 to 14 days. This promising technology would allow farmers and fruit distributors to extend the market reach of their products.

DISASTER PREPAREDNESS

This program addresses the immediate assistance for basic provision and other essential needs such as temporary shelter and transport for Filipinos in calamity and disaster-stricken areas.

Collapsible toilet bowl

One of the primary concerns for displaced evacuees due to natural disasters or calamities is the inconvenience caused by the absence of sanitary facilities particularly the toilet. To address this, DOST-ITDI developed an effective, easy to install and use, collapsible toilet bowl made from corrugated fiber board sheets that can withstand a maximum weight of 370 kilograms. It is individually packed in Polyethylene (PE) or plastic bags per kit. A kit contains the collapsed toilet structure, plastic bag, antimicrobial/disinfectant, toilet paper, coagulating agents to contain the waste, and a user's manual. To facilitate transport in bulk, a master box or distribution box is currently being constructed.



Utility tent

During calamities, displaced families are housed in evacuation centers that, if in large numbers, may result to overcrowding of the said centers. Temporary shelters that are sturdy enough to accommodate a family yet are easy to install will be of great use especially to LGUs. Shelters or utility tents fabricated from local materials can also provide a cheaper alternative to the currently available ones in the market. Thus, more shelter units can be made available to the evacuees.

DOST-ITDI developed a material for utility tent using locally available nano precipitated calcium carbonate-reinforced thermoplastic and high density polyethylene (HDPE). The prototype is now being tested for its material and structural integrity and suitability to various environments such as heavy rains or strong currents and make the necessary improvements.

Floating baby capsule

Abaca fiber-reinforced composite was used to fabricate a baby capsule that can provide transportation means for infants and important supplies during flooding. The use of this sturdy boat-like vehicle is especially important during rescue operations involving alleys or areas that are too narrow for rescue boats to penetrate. Initial field-testing showed that the prototype baby capsule can stably float on still water and can sustain a baby's weight and infant supplies. The suitability of the prototype however, on other environments such as during the occurrence of heavy rains or strong currents still needs to be established.

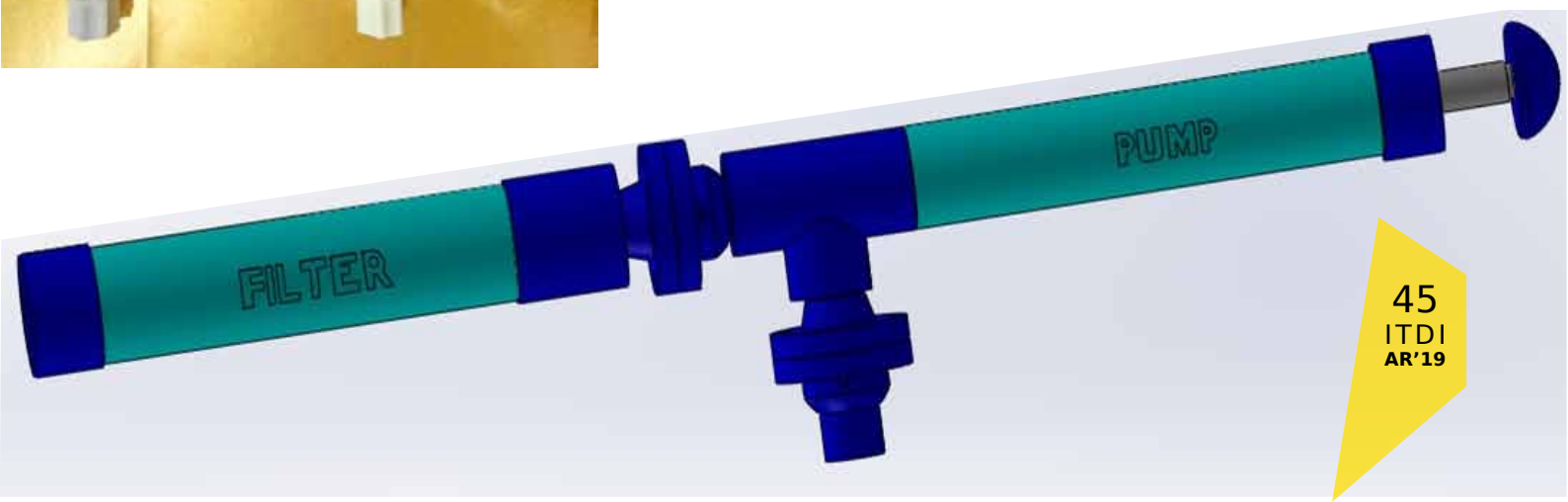
Hull and Deck of the Floating Baby Capsule

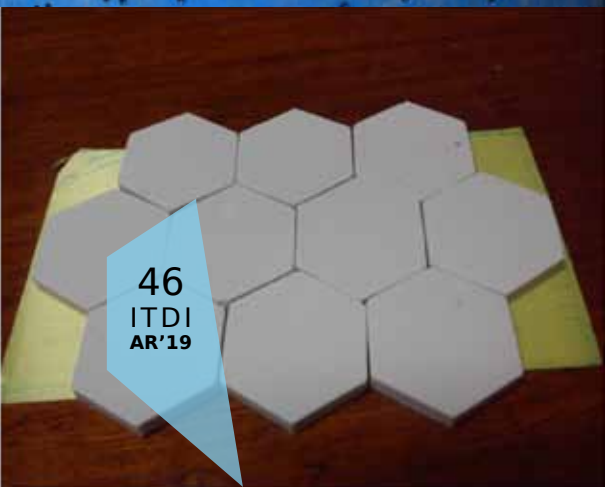
MILITARY DEFENSE AND SURVIVAL

This program was specially designed for the Philippine military forces for combat adaptation and survival in the field. Technologies under this program included the development of materials for bullet proof vest and water filtration system.

Portable drinking water filtration system

The development of a portable drinking water treatment system for the Philippine Army using membrane technology is now on its last phase. This will allow field military personnel to have access to potable and safe drinking water as it effectively removes microbial and particulate contaminants from surface water sources such as lakes, rivers, springs, and ponds including rainwater. A built-in sterile container for storage of treated water is also being developed for the system. Further improvements being made will eventually enable it to remove heavy metals (e.g. arsenic, lead, chromium etc.) and chemicals (e.g. hormones, drugs, organics) and even filter extremely contaminated water sources such as canals, urine, and wastewater.





Soft ballistic armor component and ceramic inserts for bullet proof vests

Development of ballistic armor systems for the Philippine Army that will help the country's defense force lessen its dependence on imported armor materials was also conducted. Two projects focused on utilizing locally available materials for soft ballistic armor component and ceramic inserts for bullet proof vests.

For soft ballistic component, Philippine natural fibers were tapped combined with advanced composite technology to produce laminated composites with high strength-to-weight ratio resulting to materials with comparable properties to commercially available ballistic armor.

Composites of natural fabrics as hybrid of silk, cotton, piña, abaca and ultra-high molecular weight polyethylene (UHMWPE) or aramid fibers were fabricated using different resins and varying laying up sequence. Ballistic testing yielded promising results for hybrids of piña-silk, cotton-abaca and abaca; with UHMWPE and aramid fibers.

Another important component of ballistics armor system are ceramic plates used as inserts in bullet proof vests. Local resources of clay, feldspar, alumina, and silica were used to formulate and develop ceramic ballistics that are low in density and high in compressive strength and hardness. Rectangular and hexagonal-shaped test pieces were prepared and physico-mechanical properties were determined. It was found that the developed ceramic insert trapped the bullet when used in cotton-abaca fabric as well as in hybrid of piña-silk and UHMWPE. Results of initial testing were promising and further performance tests will be undertaken.

INNOVATIVE TECHNOLOGY TRANSFER

Supporting activities to bolster success rate of technology transfer were carried out in a two-year project led by the Technological Services Division (TSD). With the aid of different tools in technology evaluation and open platform for pitching, researchers were able to reach out to industry and other relevant stakeholders and introduced developed products and processes.

Pilot implementation of ITDI's pre-commercialization tools/strategies

The project implemented by the Technological Services Division and funded by the Philippine Council for Industry Energy an Emerging Research and Development, which commenced in 2017 and ended in 2019, aimed to bridge the gaps/ disparities among researchers and technology transfer officers in undertaking technology transfer initiatives. The project introduced innovative approaches perceived to enhance the technology transfer dynamics of the Institute.

Project highlights included the conduct of technology audit workshops, market validation and technology offerings – a series of organized kick off/demo-days for businessmen/investors that featured/pitched 27 technologies with marketability/ commercial opportunity.

22 technology generators, six trade partners from DTI-EMB and 15 industry influencers were engaged in the conduct of Technology Readiness Assessment (TRA) review of 27 technologies (12 food processing, 6 health and wellness, 6 green engineering and 3 nano technologies). As an offshoot, the *2017 Compendere of ITDI Technologies titled: Business Guide on Natural Green Tech* was published and launched during the project's culminating activity held in March 2019.

Pilot-tested schemes and practices served as basis in the crafting of policies on research and development and/or technology transfer that will hasten or enhance the transfer of ITDI generated technologies.

2019
COMPLETED PROJECTS

*A total of **44** projects were completed for this year. Of these projects, **31** are regular or GAA-funded and **12** are GIA or externally-funded focusing on ITDI R&D areas as food, packaging, environment, energy, material science and chemical synthesis.*

GAA-funded

PROJECT TITLE	LEAD
Development of prototype 100L low cost semi-automated reactor for the production of liquid detergent soap	O. C. Evangelista
Compressed Biogas Technology (CBT) for household and commercial applications	A. V. O. Bawagan
Isolation, purification and characterization of curcumin from Philippine Turmeric *(Curcuma longa L.)*	E. B. Manongsong
Extraction and characterization of rubber seed oil and its synthesis to biolubricant	C. G. Bilbao
ITDI livelihood program for reconstruction and rehabilitation of Marawi	E. A. Ongo
Development of microbial inocula for industrial applications	U. G. Bigol
Production of freeze-dried lacasse for biotechnological application: 1. Xylanase	U. G. Bigol
Molecular characterization of Lactic Acid Bacteria (LAB) from fermented foods in the Philippines	E. G. Panerio
Genotypic screening of industrially important enzymes produced by *Bacillus sp.* isolated from soil	E. G. Panerio
Nutrient removal of anaerobically-treated piggery wastewater	D. L. Herrera

GAA-funded

PROJECT TITLE	LEAD
Development of chemical oxidant delivery system for remediation of petroleum contaminated soil	J. C. Tejano
Development of a bench-scale biological wastewater treatment design facility	R. L. Retamar
Development of an Emergency Disinfection System of drinking water	R. L. Retamar
Food safety assessment of hazards from artisanal food processing equipment used in *taho, sorbetes*, and peanut butter processing in Taguig City, Metro Manila	L. S. Montevirgen
Application of osmotic dehydration as a pre-treatment for vacuum frying selected fruits	R. M. Belandres
Exploratory studies on: Separation techniques for cocoa butter and cocoa cake	M. D. L. Villaseñor
Development of a low-mineral sweet sorghum syrup as an alternative sweetener	M. E. M. Falco
Clarification and concentration of coconut water and Philippine calamansi extracts using microfiltration and reverse osmosis	M. E. M. Falco
Comparison of quality of dried products using conventional dryer and heat-pump dryer	J. C. Ocasla
Development of shelf-stable food products as ready food reserve	M. D. L. Villaseñor
Development of soft ballistic component of bullet proof vest from hybrid composite local materials	M. A. Paglicawan
Functional coating: Production and performance testing of nano silica-based hydrophobic coating	J. R. Celorico
Development of ultrafiltration/nanofiltration hollow fiber membrane for drinking water application (Phase 2)	M. T. Margarito
Innovative ceramic materials for ballistic protection	J. R. Celorico
Fabrication of prototype utility tent as temporary shelter for disaster and natural calamity victims	P. A. N. de Yro
Fabrication of prototype and field testing performance of floating baby capsule	C. S. Emolaga

GAA-funded

PROJECT TITLE	LEAD
Asia Nano Forum 2019	P. A. N. De Yro
Southeast Asian atmospheric corrosion exposure study of electronic equipment and components under marine environment in the Philippines (SEA ACES) Year 5	A. M. Monsada
Deployment of innovative rainwater collection systems in Marawi	B. A. Basilia
Effect of shock and vibration on the quality and shelf life of mangosteen	E. S. Orendain
Branding as a tool in promoting packaging technologies developed by PTD	K. J. R. Dizon
Development of collapsible toilet bowl for emergency/ disaster operations (Preliminary study)	E. T. Nolasco
Brand development of unique Philippine product	K. J. R. Dizon
Development of nanocoating materials as postharvest treatment for selected tropical fruits (Phase 1)	R. A. G. M. Garalde/ A. T. Basbasan, Jr.

GIA/Externally-funded

Project 2: Development of gourmet salt products and micro-sized salt in laboratory scale	A. V. Briones
Characterization/performance testing of the biodiesel/diesel blends from combined feedstock of various vegetable and used cooking oils	A. V. Briones
Capability building on energy efficiency and conservation (EE&C) for state universities and colleges of six (6) regions as demonstration sites	A. V. O. Bawagan
Aerobic treatment of anaerobically pre-digested swine wastewater using activated sludge and subsequent polishing using biological filters, trickling filter system	R. L. Retamar
Assessment of metal content of food and water resources in volcanic impacted areas PROJECT 3: Household and community based filters for metal in waters	B. A. Basilia R. L. Esguerra

GIA/Externally-funded

PROJECT TITLE	LEAD
Assessment of metal content of food and water resources in volcanic impacted areas PROJECT 2: Metal content of water supplies in volcanic impacted area and its impact to vegetation	E. A. Ongo
Development of corn-based products for Candaba and Bacoor, Pampanga	M. D. L. Villaseñor
Fabrication and performance evaluation of abaca fiber-reinforced composites for boat applications	M. A. Paglicawan
OneLab capability assurance system for metal content assessment in agricultural produce, water and environmental samples	R. T. Fuertes
Pilot implementation of ITDIs pre-commercialization tools/ strategies for effective transfer and commercialization of generated technologies and intellectual properties	N. E. C. Florendo

DOST-GIA

Program: Advanced Additive Manufacturing R&D	
Project 1: Development of Multiple Materials Platform for Additive Manufacturing (MATDEV)	B. A. Basilia
Environment, health and safety research in the risk assessment of nanomaterials	B. A. Basilia

PCIEERD-GIA

PROJECT TITLE	
Assessment of metal content of food and water resources in volcanic impacted areas	
Project 3: Household based filters for metals in water	B. A. Basilia
ADMATEL expansion and business continuity	A. M. Monsada

PCIEERD-GIA

PROJECT TITLE	LEAD
Design and fabrication of an airframe for a medium-range, short take-off and landing UAV (collaborative project with PhilFIDA/FEATI)	B. A. Basilia M. A. Paglicawan
Prototype development of severe weather amphibious navigator using local abaca composites (collaborative project with Wesleyan University of the Philippines, Holy Angel University, Don Honorio Ventura State University)	B. A. Basilia M. A. Paglicawan
Intelligent Data Analysis System (IDAS) for drug trafficking investigation in the Philippines	A. M. Monsada
Project 1: Application of multivariate analysis on methamphetamine HCl chemical fingerprints and kinetic stability modelling (collaborative project with PDEA/ASTI) Year 2,	A. M. Monsada

TAPI-TECHNICOM

Fabrication and performance evaluation of abaca fiber-reinforced composites for boat applications	M. A. Paglicawan

MOA

NDRRMC: Deployment of innovative rainwater collection system in Marawi	B. A. Basilia
Philippine Army: Development of portable drinking water treatment system for field troops of the Philippine Army	B. A. Basilia
Philippine Army: Deployment of low cost type rainwater collection and treatment system using locally available materials	B. A. Basilia
San Miguel Yamamura Asia Corp.: Application of nanotechnology in glass container production (2019 – 2020)	B. A. Basilia

COMMERCIALIZED TECHNOLOGIES

*Through DOST-ITDI's strengthened efforts towards technology transfer and commercialization, the Institute was able to seal **13** agreements with **12** industry partners for various technologies.*

TECHNOLOGY TRANSFER

BestMark Agro-Industrial Enterprises	ITDI Dual Drum Composter ITDI Bioreactor
MagicMelt Foods Inc.	RTE Arroz Caldo Technology
K&E Industrial Lime	Production of Nano Precipitated Calcium Carbonate
Argao Guilang Tableya	Market Testing of Ready-to-Drink Tablea
Optiwhite, Inc.	Production of Nanoclay
Khenzee Tech, Inc. Angelica Jazon Livegreen International Corporation	Vacuum Fried Squash
Khenzee Tech, Inc. Livegreen International Corporation	Vacuum Fried Okra
Livegreen International Corporation	Vacuum Fried Sweet Potato
Greenwood Resources Inc.	Portable Biogas Digester
Caridad Ilaya	Salt Production Iodization
GOT Heart Foundation Inc.	Natural Analgesic Balm
Corban Community Farms	Solar Biomass Dryer

TECHNOLOGY TRANSFER ACTIVITIES

*Technology transfer efforts of the institute in 2019 hammered out **13** memoranda of agreement with various stakeholders/ sectors that may lead to the eventual application of technologies in the production sector (Table 1).*
*A total of **PhP 726,965.45** royalty/technology fees was also generated while drafts of two protocols were drafted; one, the IRR for the Payment of Royalty fee, and another, for TRA (Technology Readiness Assessment).*

In March of 2019, ITDI's project, Pre-Commercialization Tools / Strategies for Effective Transfer and Commercialization of Generated Technologies and Intellectual Properties funded by PCIEERD also culminated through a launch of a technology business guide on its 27 technologies with nearly 200 of the business, science, and public sectors in attendance.

The event, with the theme, *"Tayo Na Pillipinas, Angkinin AmBisyon Natin! (Ugnayan sa Taas-Antas ng Teknolohiya ng ITDI)*, held at Crimson Hotel in Alabang, Muntinlupa City, aimed to boost transfer of generated technologies for public use and consumption. It was an outcome of DOST-ITDI's partnership with the Department of Trade and Industry's Export Marketing Bureau (DTI-EMB) on a new technology check strategy to rank market readiness of ITDI's 27 technologies, that aimed to improve the current technology transfer process and increase the chances of innovations being adopted in the production sector.

Results of the project have been compiled into a 226-page compendere supported by 27 Technology Readiness Assessment full reports. Given these, the project is expected to impact various industry sectors such as those from manufacturing, accommodation and food service, and other services establishments.

A remarkable component of the event was a pledge of commitment among the key players namely, the government, industry, and youth sectors to help make this endeavor a success. Interestingly, the youth sector represented by Grade 6-10 students expressed their appreciation, and said *"Sa pangkahalatan, kami na mga kabataan ay kasamang makikinabang sa pagunlad ng ekonomiya dahil sa mga na-develop o nalinang na teknolohiya ng DOST-ITDI. Kaya't kami po ay talagang nagpapasalamat sa DOST-ITDI."* Both the government and industry sectors meanwhile expressed their full support.

Table 1. Technologies Transferred (2019)

TECHNOLOGY	COMPANY	CLIENT ADDRESS
ITDI Electric Densifier, ITDI Modified Drum Carbonizer and Dual Drum Composter (Tech Licensing)	Loida P. Angeles L. Angeles Machineries Corporation (LAMACO)	86 Laurel St., Anibal I, City of Bacoor, Cavite
Analgesic Balm Formulation (Tech Licensing)	Melissa Yeung Yap Got Heart Foundation Inc.	43 Chico St., Quirino 2A, Quezon City
ITDI Electric Densifier, ITDI Modified Drum Carbonizer and Dual Drum Composter (Tech Licensing)	Victoriano B. Ocon Suki Trading	Fuentes Rd., Agus Ibabao, Lapu-Lapu City, Cebu
ITDI Dual Drum Composter (Tech Licensing)	Marcos M. Aquino BestMark Agro-Industrial Enterprises	151 Banaoang, Santa Barbara, Pangasinan
ITDI Bioreactor (Tech Licensing)	Marcos M. Aquino BestMark Agro-Industrial Enterprises	151 Banaoang, Santa Barbara, Pangasinan
ITDI Bioreactor Fabricator (Renewal of license)	Rogelio Pimentel Pimentel Creative Builders & Gen. Services	Balukot, Tambulig, Zamboanga del Sur
RTE Arroz Caldo Technology (Tech Licensing)	Ms. Carolyne Go MagicMelt Foods Inc.	Bankal, Lapu-Lapu City, Cebu
Nanoclay Technology (Tech Licensing)	Mr. Enrico L. Borja Optiwhite, Inc.	1275 A. Rodriguez Ave., Dela Paz, Pasig City
ITDI Portable Biogas Digester (Tech Assistance)	Francisco Josef Greenwood Resources Inc.	161 Mabato, Rosario, Batangas
Solar Biomas Dryer (Tech Assistance)	Corban Community Farms	Maculbo, Occidental Mindoro
Salt Cooking Furnace (Tech Assistance)	Caridad Ilaya Multi-Purpose Cooperative	Caridad Ilaya, Atimonan, Quezon
Vacuum Fried Squash (Training)	Angelica Jazon	Metro Manila
Vacuum Fried Squash, Okra, Sweet Potato (Training)	Mr. Pris Uy LiveGreen International Corp.	#139, Scout Limbaga, Brgy. Sacred Heart, Quezon City

Communication initiatives

Serving as gateway for a more vigorous engagement with stakeholders, other pre-commercialization channels were aggressively pursued.

Among these were knowledge translation initiatives which include the production and farming out of various communication collaterals, tri-media engagements, visits and study tours, and participation to exhibitions both local and international. The institute leveraged as well on the prospects of social media for technology promotion. In 2019, the following KT initiatives were implemented:

- 154 press releases
- 162 radio/TV interviews and guestings
- 1 annual report
- 2 issues Techno Bulletin
- 10 issues Miscellanews
- 27 study tours & visits
- 24 exhibits
- 43 technology flyers
- 33 posters
- Social Media
  - Postings: 330
  - Audience Reach: 808,205
  - Engagements: 88,279
  - Total Likes: 7,969
- FB / Email Inquiries
  - Total messages replied – 2,497
- 19 ISBN
- 19 Copyright

Tri-media engagements in 2019 focused mostly on 3D printing or Advanced Manufacturing Center (AMCen), groundbreaking of construction of laboratories and facilities notably the Metrology in Chemistry or MiC-NML, and Packaging testing lab, Asian scientists, Metrology day and new labs, MARAWI interventions, biodegradable plastics, packaging conference, RTE foods/food processing technologies, and abaca fiber-reinforced composite.

Participation to exhibitions meanwhile included those on the 2019 NSTW and RSTW, World Metrological Day, *"Tayo na Pilipinas, Angkinin Ambisyon Natin…"*, S&T Innovation for Possible Adoption to Waste Management and Manila Bay Rehabilitation Efforts in Pampanga, and 4th Cordillera Environmental Summit.

ITDI likewise participated in three international exhibitions, the IFEX 2019 NXT Food Asia, ASEAN-INDIA Grassroots Innovation Forum and Innotech Summit, and Powertrends.

ITDI's participation to IFEX 2019, an international exhibition was proposal-driven, with funding from DOST-GIA. In IFEX 2019, it is noteworthy to mention that a more personal business approach was adopted wherein company owners were personally visited/ approached in their respective booths, to introduce the technologies and services of ITDI that may be beneficial to them, resulting to a more fruitful engagement with clients and more leads for possible technology adoption.

Consultative Engagements

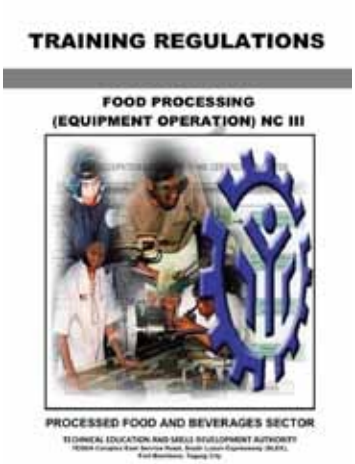
Beefing up these various outings were the conduct of consultative meetings with specific industry groups. For this year's IFEX, a post-exhibit consultative meeting, "Food Engagement with the Industry" was conducted as an initiative to reconnect and facilitate active engagement with more food industries encountered during the exhibition. Out of the 60 companies from the gathered IFEX contacts, 51 attended.

Overall, the technology engagement proved fruitful in understanding the needs of the industry and in facilitating partnerships. After the event, ITDI got letters of intent for possible technology adoption from two companies This activity is recommended for future IFEX participations and other exhibitions.

In addition, meetings were conducted with three more industry groups; the abaca stakeholders, natural colorants stakeholders, and those from the specialty foods for bottled food products. In these dialogs, technologies and/ or services were presented in more detail, challenges and concerns (e.g., sustainability of raw materials, yield/efficiency versus raw material requirement, cost) were discussed along with the possible solutions or recommendations. Insights from the bottled food sector/group were likewise gathered which will be useful in crafting a project proposal on food safety.

Training and Technical Assistance

To help keep its technology transfer program rolling, the institute continues to conduct trainings and provide technical assistance to its stakeholders. In 2019, a total of 103 trainings were conducted with 2,165 participants coming from various sectors namely, MSMEs, LGUs, private individuals, academe, associations and cooperatives. A total income of PhP 1,395,513.19 was generated.



Most of the training courses conducted during the year covered the following areas or fields: metrology and calibration, food processing (fruits and vegetables, salt, fish, nipa sugar), personal care and household care products, essential oils, Waste Analysis and Characterization Study (WACS), solid waste management technologies, and pottery and brick making.

A training on vacuum frying technology was also conducted for two clients to facilitate technology adoption.

New training designs were developed, notably, the Training Regulations for Food Processing Equipment NC III with TESDA. Other new modules include: Introductory Course on Validation of Chemical Methods of Analysis, Trainer's Training on Waste Analysis and Characterization Study (WACS) Plan Preparation, and Awareness Seminar and Workshop of Technology Transfer and Other Modes of Engagements.

During the year, the Guidelines on the Computation of DOST Training Fees (DOST Training Harmonization) was completed while the Administrative Order to this effect has been finalized and approved by the DOST Secretary.

Likewise, technical assistance were rendered to twenty-three clients in the areas of solid waste management technologies (bioreactor, dual drum composter), Waste Analysis and Characterization Study (WACS), essential oil production, process and product improvement of foods, salt making and iodization, and waste water treatment. Clients served comprised of MSMEs, LGUS, and associations from the various regions of the country.

In the pipeline as well is the establishment of Common Service Facility (CSF) for a Muscovado Processing Plant in Santiago City, Isabela. Major processing equipment and a furnace were already installed. The furnace has already undergone testing and firing.

ITDI, since 2013 has also expanded its training services across borders through the TCCP-DFA Project (Technical Cooperation Council of the Philippines (TCCP) of the Department of Foreign Affairs (DFA), and has already provided trainings in East Timor and Vanuatu.

In 2019, and again in Vanuatu, a training program on food processing was conducted for participants from the private sector, cooperative, government, and students. Twenty observers were also invited. The program focused on processing of coconut, tomato, root crops, and fish.

Aside from the conduct of trainings, DOST-ITDI was also part of the Philippine delegation to undertake Training Needs Assessment (TNA) in New Caledonia and Sri Lanka. The TNA hopes to implement appropriate knowledge-sharing interventions to be employed based on beneficiaries' needs and requirements and enhance their capacity to produce goods or products to improve their livelihood while maximizing the use of available resources.

Among those identified as appropriate for New Caledonia was the provision of assistance on food processing and preservation, product quality and process improvement, and packaging and labeling requirement; while conduct of a livelihood training program for unemployed Filipinos in Sri Lanka was proposed. An exchange/immersion program for experts with the Sri Lankan Industrial Technology Institute (ITI) was also envisioned and both institutions shall then plan for future interventions based on their collaborative findings.

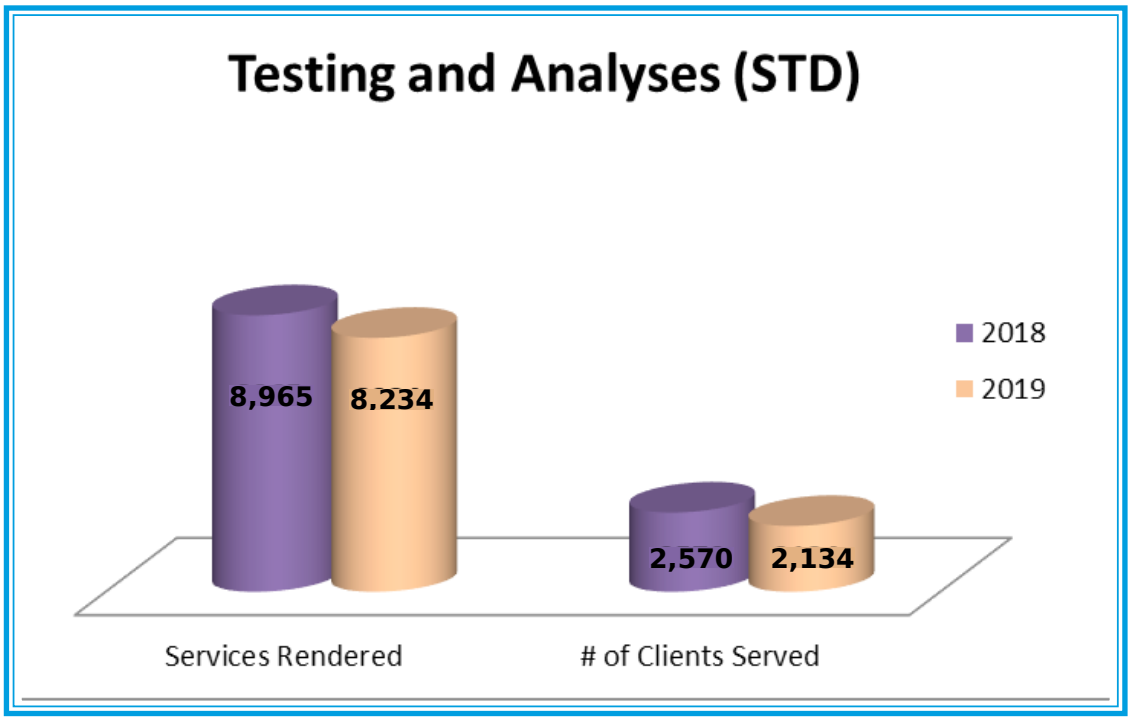
Corporate Social Responsibility (CSR)

As a way of giving back to its neighboring communities ITDI conducts its yearly CSR program sponsored by its Gender and Development Program (GAD). For the last two consecutive years, this was spearheaded by the TSD and facilitated in cooperation with the other divisions. Brgy. Lower Bicutan in Bicutan, Taguig City was the beneficiary for this year's CSR activity, themed *"Sagot Ko Pasko Mo sa ITDI Pinoy Tek: Pangkabuhayang Handog kay Juan at Juana."*

Twenty three beneficiaries were provided with technology livelihood trainings on preparation of meatless burger, *lumpia*, and papaya *atchara*; and formulation of dishwashing detergent while a total of 100 individuals including trainees composed of senior citizens and adults benefitted from gift giving of assorted food items and raffle prizes.

TECHNICAL SERVICES

*This year, the total revenue generated from Technical Services amounted to **PHP 37.5M** which is 13% lower than last year's revenue of PHP 43.1M.*



For testing and analyses, services rendered and number of clients served from Standards and Testing Division (STD) were slightly less this year compared to 2018 by 8% and 17%, respectively.

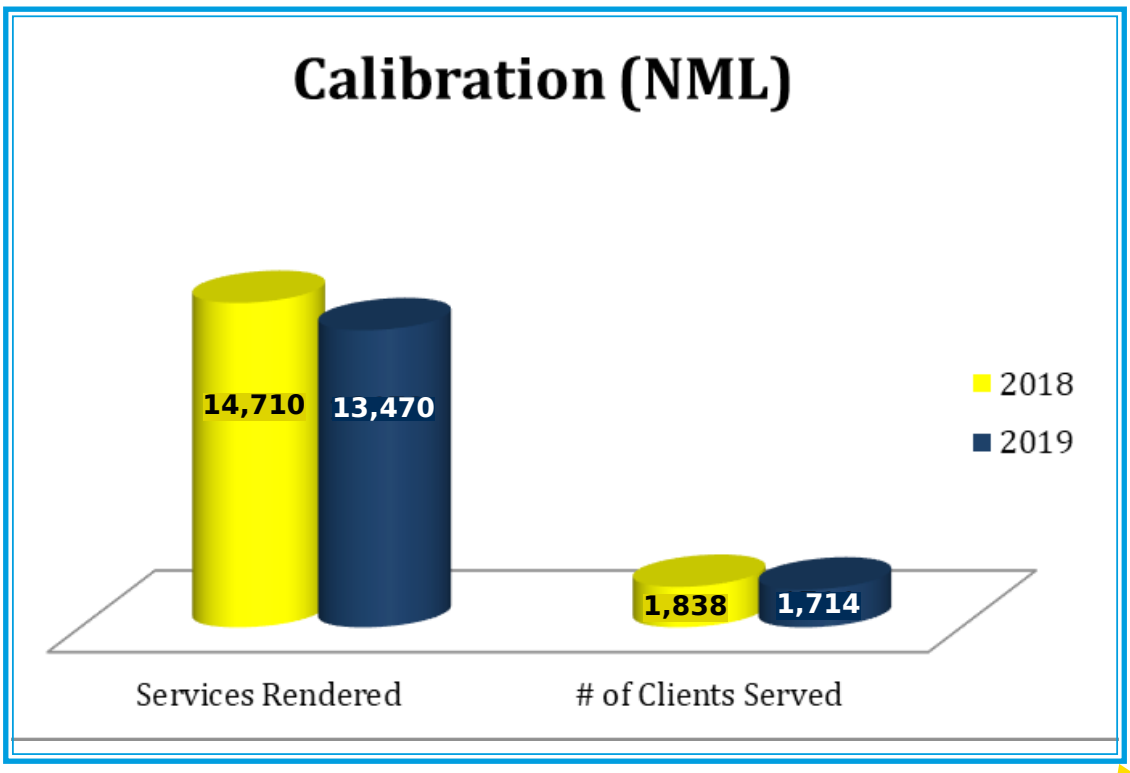
New testing services offered this year were the following:

- Mercury, Total (Hg) in Water by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (US EPA 7473) Inorganic Chemistry Section, Chemistry Laboratory
- Mercury, Total (Hg) in Fish by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (US EPA 7473) Inorganic Chemistry Section, Chemistry Laboratory
- Mercury, Total (Hg) in Salt by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (US EPA 7473) Inorganic Chemistry Section, Chemistry Laboratory
- Mercury, Total (Hg) in Soil by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (US EPA 7473) Inorganic Chemistry Section, Chemistry Laboratory
- Nitrite (NO_3) in Water by UV-Visible Spectrophotometry with Fiber Optic Probe (Colorimetric) Inorganic Chemistry Section, Chemistry Laboratory
- Sugar Profiling in Sugar Products by High Performance Liquid Chromatography (HPLC) Organic Chemistry Section, Chemistry Laboratory
- Sulfite (SO_3) as SO_2 in Mango and Mango Products by Monier-Williams (AOAC 990.28) Organic Chemistry Section, Chemistry Laboratory
- International Rubber hardness Degree Method M by ISO 48 Performance Testing Section, Physical and Performance Testing Laboratory
- International Rubber hardness Degree Method N by ISO 48 Performance Testing Section, Physical and Performance Testing Laboratory
- Flexibility of Rubber Hoses at Low Temperature by ISO 10619-2 Performance Testing Section, Physical and Performance Testing Laboratory

For calibration services, total number of services rendered and number of clients served registered a lower count this year at 8% and 7% less than 2018. The National Metrology Laboratory (NML) generated a total income of **PHP 17M**.

These were the additional NML Calibration Services for this year:

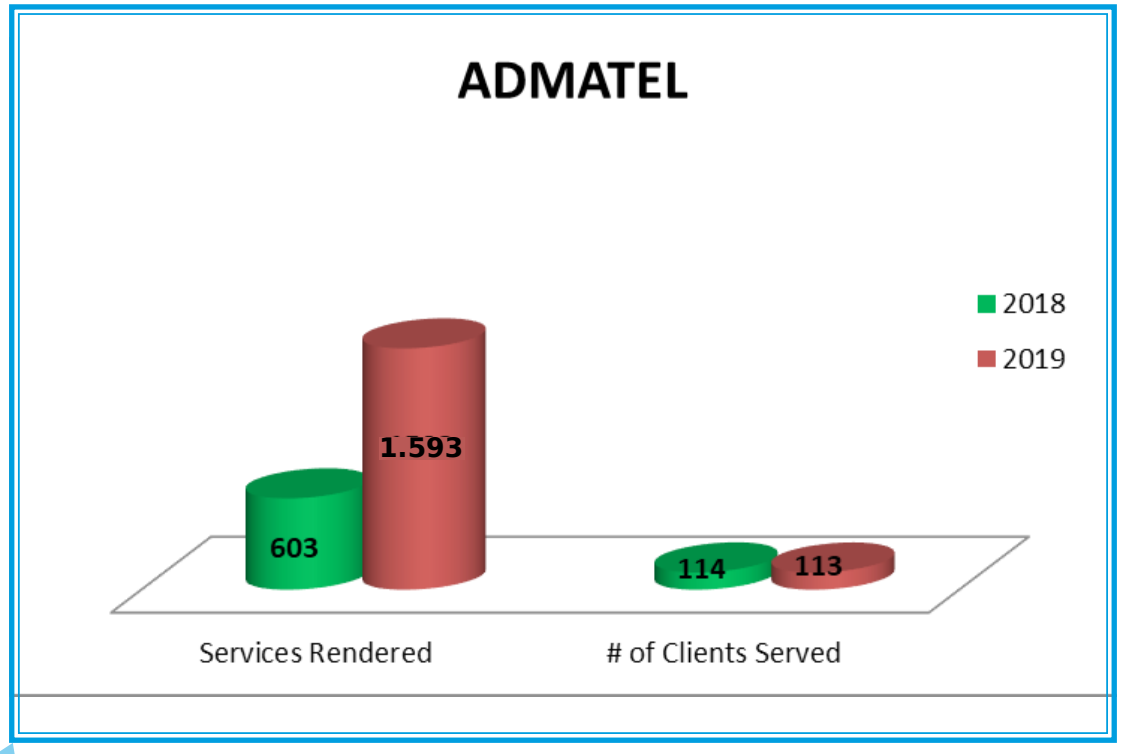
- Calibration of Load/ Cell Providing Ring
- Calibration of Force Testing Machines
- Calibration of Push-Pull Gauges
- Calibration of Dynamometer
- Calibration of Crane Scale
- Calibration of Low Accuracy Force Transducers
- Calibration of Platform Weighing Scales (Axle Weigher)



The Advanced Device and Materials Testing Laboratory (ADMATEL) significantly increased its number of services rendered of up to 164% compared last year with a minimal reduction on the number of clients served at <1%. This could be credited to the intensified marketing strategy of ADMATEL as it caters to various clients including educational institutions, government agencies, semiconductor and electronics (S&E) and other allied businesses. With this, ADMATEL posted a **PHP 13.2M** total income for this year.

The following were the new services offered by ADMATEL:

- Laser Decapsulation
- Laser Decapsulation with 2D X-ray
- 3D CT X-Ray Single Scan
- 3D CT X-Ray Bulk Price add-on
- 3D CT X-Ray Additional Scan add-on
- 3D CT X-Ray Analysis add-on
- 3D CT X-Reference Comparison add-on



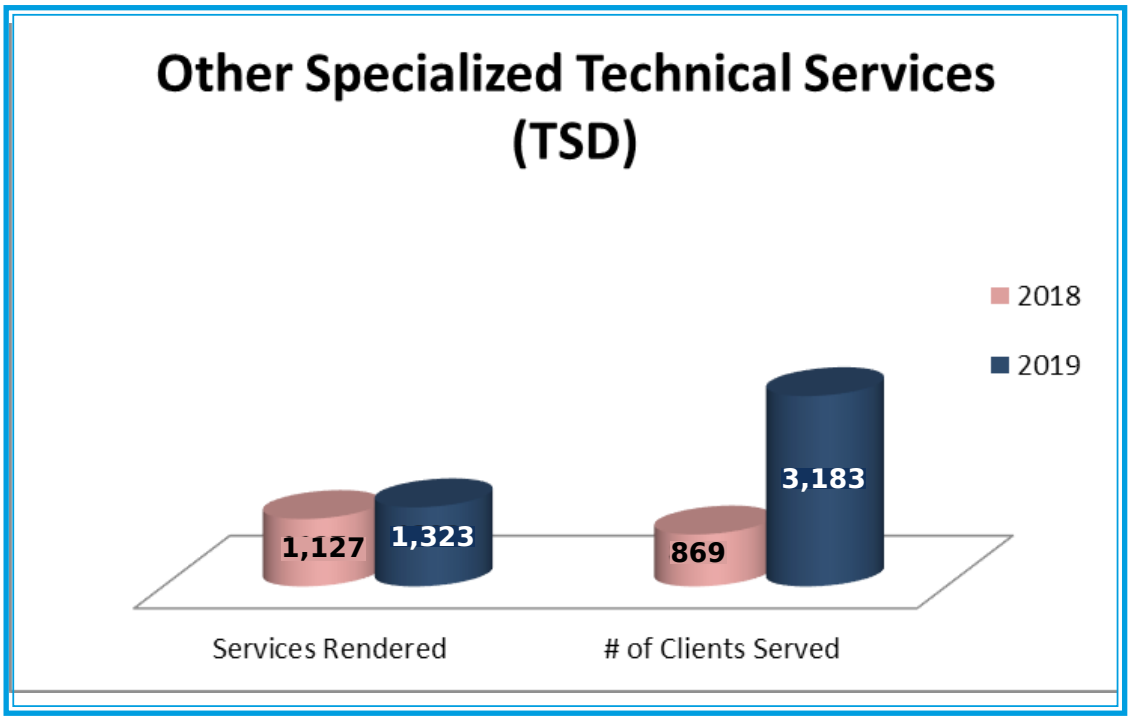
ADMATEL is one of the Philippine government's nation-building initiatives in bolstering local and international industries in the country as well as academic research by providing advanced, quality test sevices.

The year 2019 has seen significant milestones for ADMATEL such as the launching of new test services, mainly 3D CT-Xray and Laser Decapsulation and the ISO/IEC 17025:2017 accreditation of the laboratory. As part of ADMATEL's commitment to its patrons, the laboratory continuously strives for excellence by: developing in-house experts through basic and advanced training in both principle and hands-on equipment operation, expanding its market reach for increased accessibility, offering new services that address existing industrial issues, and tailor-fitting its services to cater to various business sectors.

At present, ADMATEL does not only provide support to the Semiconductors and Electronics industry but also to Aerospace, Arsenal, Petro-Chemicals, Medical and various other businesses. The visibility of Admatel also can be seen through the hosting of major events including Project Spices of DOST and CFAR, through exhibits on major events such as AIAP, SEIPI, etc., and even on social media.

ADMATEL's success and relevance in the various fields it supports encourages the laboratory to continue pursuing new initiatives to further strengthen and expand its services.

For other specialized technical services, the Technological Services Division (TSD) posted a 17% increase on services rendered and a significant increase of 266% for the total number of clients served compared to last year's figures. This is an indication of the effectiveness of TSD's initiatives to promote the services of the Institute to the public.



POLICIES DEVELOPED

*DOST-ITDI continues to support the national pursuit of standardized methodologies and guidelines for different industrial sectors. By its active involvement in various Technical Working Groups (TWGs)/Technical Committees (TCs) of agencies and international organizations such as the Department of Trade and Industry-Bureau of Philippine Standards (DTI-BPS), Department of Environment and Natural Resources (DENR) and United Nations Industrial Development Organization (UNIDO), the Institute was able to develop **50** new policies on nanotechnology, waste management, waste-to-energy, and packaging technology.*

Nanotechnology **19 standards developed**
1 protocol prepared

ISO/TR 11360:2010 Nanotechnologies	Methodology for the classification and categorization of nanomaterials
ISO/TR 12802:2010 Nanotechnologies	Model taxonomic framework for use in developing vocabularies-Core concepts
ISO/TR 14786:2014 Nanotechnologies	Considerations for the development of chemical nomenclature for selected nano-objects
ISO/TR 17302:2015 Nanotechnologies	Framework for identifying vocabulary development for nanotechnology applications in human healthcare
ISO/TR 18401:2017 Nanotechnologies	Plain language explanation of selected terms from the ISO/IEC 80004 series
ISO/TS 20477:2017 Nanotechnologies	Standard terms and their definition for cellulose nanomaterial
IEC/TS 80004-9:2017 Nanotechnologies	Vocabulary – Part 9: Nano-enabled electrotechnical products and systems
ISO/TS 80004-11:2017 Nanotechnologies	Vocabulary – Part 11: Nanolayer, nanocoating, nanofilm, and related terms

ISO/TS 80004-13:2017 Nanotechnologies	Vocabulary – Part 13: Graphene and related two-dimensional (2D) materials
ISO/TS 12025:2012 Nanotechnologies	Quantification of nano-object release from powders by generation of aerosols
ISO/TS 13830:2013 Nanotechnologies	Guidance on voluntary labelling for consumer products containing manufactured nano-objects
ISO/TS 10797:2012 Nanotechnologies	Characterization of single-wall carbon nanotubes using transmission electron microscopy
ISO/TS 10798:2011 Nanotechnologies	Characterization of single-wall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis
ISO 10801:2010 Nanotechnologies	Generation of metal nanoparticles for inhalation toxicity testing using the evaporation/condensation method
ISO 10808:2010 Nanotechnologies	Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing
ISO/TS 12805:2011 Nanotechnologies	Materials specifications – Guidance on specifying nano-objects
ISO/TS 17200:2013 Nanotechnology	Nanoparticles in powder form – Characteristics and measurements
ISO/TS 11931:2012 Nanotechnologies	Nanoscale calcium carbonate in powder form – Characteristics and measurement
ISO/TS 11937:2012 Nanotechnologies	Nanoscale titanium dioxide in powder form – Characteristics and measurement

Protocol for Interlaboratory Comparison on Nanomaterial Characterization by Dimensional Analysis

On June 11, 2019, ITDI requested from PAB-DTI for the approval of the local interlaboratory comparison protocol and on August 6, 2019, PAB-DTI gave comments to improve the protocol which include the following: the plan requirement for the production of test item and quality controls, protocols for the collusion between participants or falsification of results, statistical analysis to be used for homogeneity testing, method precision, stability testing, and determination of assigned value, procedure for lost or damaged test items, metrological traceability, and confidentiality agreement.

ISO/TR 12885:2018 Nanotechnologies	Health and safety practices in occupational settings
ISO/TS 12901-1:2012 Nanotechnologies	Occupational risk management applied to engineered nanomaterials – Part 1: Principles and approaches
ISO/TS 12901-2:2014 Nanotechnologies	Occupational risk management applied to engineered nanomaterials – Part 2: Use of the control banding approach
ISO/TR 13329:2012 Nanotechnologies	Preparation of material safety data sheet (MSDS)
ISO/TS 10797:2012 Nanotechnologies	Characterization of single-wall carbon nanotubes using transmission electron microscopy
ISO/TS 10798:2011 Nanotechnologies	Characterization of single-wall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis
ISO 10801:2010 Nanotechnologies	Generation of metal nanoparticles for inhalation toxicity testing using the evaporation/condensation method
ISO 10808:2010 Nanotechnologies	Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing
ISO/TS 12805:2011 Nanotechnologies	Materials specifications – Guidance on specifying nano-objects
ISO/TS 17200:2013 Nanotechnology	Nanoparticles in powder form – Characteristics and measurements
ISO/TS 11931:2012 Nanotechnologies	Nanoscale calcium carbonate in powder form – Characteristics and measurement
ISO/TS 11937:2012 Nanotechnologies	Nanoscale titanium dioxide in powder form – Characteristics and measurement

Environmental Management – 2 plans/guidelines prepared

National Action Plan (NAP) on Phase out of Mercury Added Products (MAP) and Management of Wastes Containing Mercury (Hg)

Guidelines Governing Waste-to-Energy (WtE) Facilities for the Integrated Management of Municipal Solid Wastes

Packaging Technology – 3 standards developed

DPNS ISO 9100-8:2018 Glass containers – vacuum lug finishes

DPNS 2121:2017 Paper packaging – corrugated carton box – RSC

DPNS ISO 9058: 2017 Glass containers – standard tolerances for bottles

Standards and Testing - 9 policies promulgated through Technical Committee Involvements

PNS ISO 27668-1:2019 Gel ink ball pens and refills – Part 1: General Use

PNS ISO 27668-1:2019 Gel ink ball pens and refills – Part 2: Documentary use (DOC)

PNS on Hand-held Cutter

PNS on Clip, fold back (binder clip)

PNS on Correction Tape

PNS ISO 1360-1 Watch
- case and accessories
- Gold alloy covering

Part I: General Requirements

PNS ISO 1360-2 Watch
- case and accessories
- Gold alloy covering

Part 2: Determination of fineness, thickness, corrosion, resistance, and adhesion

PNS ASTM F2923 Standard Specification for Consumer Product Safety for Children's Jewelry

PNS ASTM F2999 Standard Consumer Safety Specification for Adult Jewelry

PUBLICATIONS

Effect of storage temperature on the compressive strength and microstructural properties of commercially sold starch-based biodegradable cup

R. Garalde, E. Orendain and J. Urbona; IOP Conference Series: Materials Science and Engineering, 2019, (634, 012026) doi:10.1088/1757-899X/634/1/012026

Abstract

The effect of storage environment on the overall crystallinity and compressive load of commercially sold starch-based biodegradable cup was determined. Using FTIR and DSC, the components of the cup was identified as starch, polypropylene (PP) and organic acid as compatibilizer. Using TGA, the weight percentage of starch and PP components were 13 and58%, respectively. The samples were stored 20°C, 80% RH and 40°C, 40% RH for 4 months. Using DSC, the overall crystallinity was evaluated based on the heat of fusion (Hf). Using XRD, the crystalline structure was evaluated based on peaks and full width at maximum height (FWMH). After 4 months, DSC results showed only one endothermic peak with melting point of ≈165°C at both conditions. The Hf was retained ≈ 50 J/g. Based on XRD results, there were no development of new crystalline peaks and the peak FHWM remained unchanged. Initially, the percentage samples below the set limit of compressive load was ≈20%. The percentage below the set limit was ≈40% for samples stored at 20°C, 80% RH, whereas ≈20% for samples stored at 40°C, 40% RH. The 80% RH at 20°C increased the moisture content from 2% to3.1%. The overall crystallinity remained unchanged after storage. Water became a plasticizer for the starch component. The increase in moisture content could have decreased the compressive load during storage.

Hydrothermal synthesis of Carbon Quantum Dots from biowaste for bio-imaging

P. A. de Yro, G. M. Quaichon, R. A. Cruz, C. Emolaga, M. C. Que, E. R. Magdaluyo, Jr, and B. Basilia; AIP Conference Proceedings 2083, 020007 (2019); https://doi.org/10.1063/1.5094310

Abstract

Carbon Quantum Dots (CQDs) are one of the new types of carbon-based nanomaterials which are rapidly gaining attention due to their excellent properties. In this study, a facile approach was used for synthesizing fluorescent carbon quantum dots using hydrothermal treatment of calamansi (Citrofortunella microcarpa) and pineapples (Ananas comosus) wastes as a carbon source. The carbon quantum dots were synthesized using a 23 factorial design for the temperature, presence of TEPA, and acid type as the processing parameters to determine the best response. The composition and optical properties of the produced CQDs were characterized using a series of spectral analyses. The as-synthesized CQDs exhibited coagulation in aqueous solution and a strong blue fluorescence under UV light (= 365 nm). FTIR analysis confirmed the presence of functional group C-N on the surface of the CQDs which was more pronounced with the incorporation of TEPA.

Functionalized Carbon-based Quantum Dots: Optical characterization and potential application as bio-fluorophore

R. A. Cruz, A. Soriano, P. A de Yro, G. M. Quiachon, C. S. Emolaga, M. L. Ysulat, U. G. Bigol and B. Basilia; ICSMA 2019 Conference Proceedings IOP Conf. Series: Materials Science and Engineering 559 (2019) 012003 IOP; doi:10.1088/1757-899X/559/1/012003

Abstract

Carbon quantum dots (CQDs), in comparison to heavy metal-based quantum dots offer renewable, non-toxic, low cost and easy synthesis production route while having excellent physicochemical properties for biomedical or environmental use. This paper discusses development and application of functionalized carbon quantum dots from glycerol as primary carbon source and tetraethylene pentamine as functionalizing agent. As-synthesized CQDs were characterized by Fourier Transform Infrared Spectrometer (FTIR), UV-Vis Spectrophotometer and Spectrofluorometer. FTIR spectra confirmed functionalization of resulting CQDs with emission wavelength peaks at 314.18 nm and 381.15 nm and observed strong blue luminescence under UV lamp. The performance of produced CQDs as bio-fluorophore for Gram-stained bacterial models was validated. Results indicated that CQDs can effect fluoresced images but a more distinct image can be observed on S. aureus compared to E. coli. An attachment mechanism of carbon quantum dots to the bacteria surfaces was also proposed.

Thermo-mechanical properties of woven abaca fiber-reinforced polyethylene nanocomposites

M. A. Paglicawan, M. P Rodriquez and J. R. Celorico; Polymer Composites First published: 03 January 2020; https://doi.org/10.1002/pc.25495

Abstract

In this study, natural fiber-reinforced polymer nanocomposites were prepared from high-density polyethylene (HDPE), abaca fiber, and nanoprecipitated calcium carbonate (NPCC) using the hot press technique. The study investigated the influence of untreated and alkali-treated woven abaca fabric and NPCC hybrid reinforcement on the thermo-mechanical behavior of the natural fiber composites. The HDPE with different amounts of NPCC was melt-blended in a twin-screw extruder followed by hot press to produce sheets. A lamination of composites containing alternating layers of HDPE sheets with different amounts of NPCC and layers of untreated and alkali-treated woven abaca fabric was produced using a hot press machine. The resulting material was composed of 20% weight ratio of woven abaca fibers. The tensile strength showed that the nanocomposite exhibited a high tensile value of 60.1 MPa with alkali-treated abaca and 1% NPCC. However, a further increase in the NPCC concentration beyond 1% reduced the mechanical strength of the nanocomposite. The thermal stability of the abaca fiber-reinforced nanocomposite improved with addition of NPCC. Scanning electron microscopic analysis demonstrated that alkali-treated abaca and 1% NPCC improved the adhesion and compatibility between the fiber and polymer matrix. The potential applications of this natural fiber-reinforced composite are for automotive and construction materials.

Thermolytic growth of zinc sulfide quantum dots in ethylene-vinyl acetate matrix utilizing zinc pyrrolidinedithiocarbamate

M. C. Que, P. A. de Yro, X. Y. Andal, P. A. Espiel, B. Basilia and E. Magdaluyo, Jr.; AIP Conference Proceedings 2083, 020006 (2019); https://doi.org/10.1063/1.5094309

Abstract

The formation of ZnS quantum dots in ethylene-vinyl acetate (EVA) matrix using the thermolysis process of zinc pyrrolidinedithiocarbamate (ZnPDTC). The annealing time and precursor concentration showed no significant effect on the radius of the quantum dots, but there is a significant difference seen on the annealing temperature at 220°C. Quantum confinement effect in semiconductor quantum dots of ZnS has been studied using the Brus Equation. Results showed that ground state confinement energy is inversely proportional to the size (radius) and exhibited a strong quantum confinement. The absorption peak of the obtained quantum dots showed in the range of 310-330 nm, a blue shift compared to that of the ZnS crystal structure. Growth kinetics follows the linear relationship of the third power of the particle size versus the time and a diffusion-limited Ostwald ripening mechanism was involved.

Solar photovoltaic systems in the built environment: Today trends and future challenges

R. Valancius, A. Mutiari, A. Singh, C. Alexander, D. A. Dela Cruz, F. E. Del Pozo Jr.; Journal of Sustainable Architecture and Civil Engineering. Vol 23, No. 2 (2018) pp 25-38;

Abstract

Over the last decade, the research trends on PV systems are mainly focused on improving reliability, efficiency, and power quality, reducing the cost, integrating at various scales with a grid and contributing to development of micro grid and smart grid solutions. At the same time, many companies in recent years have been focusing on building-integrated PV systems, solar flowers, solar roadways, solar street lights and other innovative solutions for the built environment. This paper presents a review of the past and present status, as well as the future challenges of solar photovoltaic technology in the built environment. The main focus of the paper is on a current technology, contemporary research trends and future challenges. The various aspects related to the global renewable energy sources and the PV markets, the cost and technology of photovoltaic modules were addressed and discussed.

Physicochemical properties and stability of microencapsulated betacyanin pigments from red dragon fruit peels and flesh

R. C. Torres, R. M. Yumang, C. K. Jose, D. C. Canillo; Open Journal of Pharmaceutical Science and Research, Jan 2020; DOI Number: 10.36811/ojsr.2020.110008

Abstract

Dragon fruit (Hylocereus polyrhizus) is known for its purple-coloured peels and pulp, which can be attributed to the presence of betalains. In this study, the potential of red dragon fruit as a source of natural colorant was investigated. Betacyanins were extracted from red dragon fruit peels and flesh in 1:3 ratio with water. Microencapsulation by spray-drying was done by adding 5% and 10% (w/v) maltodextrin (DE 11.8) to peels and flesh extracts, respectively. The spray-dried colorant powders all obtained <10% moisture content, 5.261-6.409 g/100g hygroscopic moisture content, and 5.317-7.349(mg/100L) betacyanin content. Morphological characterization revealed spherical, agglomerated particles with visible cracks on the surface. The stability study conducted showed that pigment retention was lowest at 70°C and highest at 4°C.

Development of packaging system and transport packaging technology for Philippine broccoli

D. Tañafranca & E. Nolasco; 29th IAPRI Symposium on Packaging Proceedings Book pp 377-389 Published by: University of Twente, Enschede, Netherlands; ISBN: 978-90365-4731-4

Agriculture remains a main industry in the Philippines. However, productivity in the agriculture sector remains low due to issues on high postharvest loss and inappropriate use of packaging from farm to market. The study was implemented with the objective of reducing the damage on broccoli by 20% through the development of packaging system and packaging technology. By simulating the actual handling practices, packaging currently being used by the farmers and transporting by using a closed type unrefrigerated truck as mode of transport, the actual damage gathered on fresh broccoli was 69%. The use of plastic crates has reduced the damage to 32.5% which is about 53% reduction based on 69% as baseline. By using a reefer van as a mode of transport, from 69% the damage was reduced to 46% for broccoli packed in current polyethylene (PE) bag used by the farmers. Result indicated that by trimming the broccoli and removing the leaves, the transport efficiency increased and the damage reduced significantly. The use of corrugated box instead of the current PE bag and recycled corrugated box also reduced the damage by more than 20%. Double-layered placement of broccoli inside the corrugated box reduced the damage to 37% compared to the 46% damage on random placement of broccoli. Individual wrapping of broccoli with plastic film has significantly decreased the damage to 8.33%. Based on the result of storage study, the freshness and shelf life of broccoli could be extended up to 22 days if wrapped in plastic film and stored at 1-3°C compared to the 5 days if stored at room temperature (30+2°C).

Isolation, identification and heavy metal biosorption assessment of yeast isolates indigenous to abandoned mine sites of Itogon, Benguet, Philippines

C. C. Gacho, F. F. Coronado, M. L. Tansengco, J. R. Barcelo, C. C. Borromeo, and B. J. Gutierrez; Journal of Environmental Science and Management 21, no. 2 (June 2019): 14–26.

Abstract

Water samples collected from abandoned mining sites in Itogon, Benguet, Philippines were screened for metal resistant microorganisms, in particular yeasts that will be used to remove toxic metals such as Zn, Cu, Pb, Cr and Ni from aqueous media. Among the five yeast strains selected and five heavy metals tested, Nodulisporium sp. exhibited the highest removal efficiency of 80% and biosorption capacity of 56.7 mg g-1 for Pb. This was based on the model equation for each metal that was generated to derive optimum response for removal efficiency. The metal accumulation potential for all selected yeast isolates was generally higher at the lower initial metal concentration of 25 mg L-1, indicating rapid metal absorbing ability of the isolate and that adsorption sites in the biomass are taking up available metal ions more quickly. An increased removal capability was observed when the best isolate was applied in a semi-continuous treatment system thru an Aerobic Cascading Filter Bed Baffled Reactor (ACFBBR). The reactor design including the packing material remarkably enhanced the contact between the yeast biomass and Pb contaminated wastewater resulting in a much greater biosorption capacity of 170.14 mg g-1 as compared to the biosorption of 56.7 mg g-1 achieved during the batch adsorption experiment.

Microencapsulation of betalain from Philippine *Beta vulgaris* as stable colorant powder

R. C. Torres, R. M. Yumang, C. K. Jose, D. C. Canillo; Open Journal of Food and Nutritional Research, Dec 2019 DOI Number: 10.36811/ojfnr.2019.110003

Abstract

Safe and non-toxic natural colorants are now gaining a lot of interest due to the negative effects of synthetic colorants to the human body and to the environment. However, processing of natural colorants is highly dependent on several parameters, thus, making it unstable. Accordingly, this study aims to produce stable beetroot colorant powder through microencapsulating betalain pigment from Beta vulgaris by spray drying technique. The red beetroots (B. vulgaris) were subjected to aqueous solid-liquid extraction. The extract was then microencapsulated using 3%w/v and 5%w/v maltodextrin DE 12 through spray-drying technology with varying parameters such as inlet temperature and feed flow rate. The physicochemical properties of the beetroot colorant were evaluated including microbial analysis, heavy metal content, and dermal irritation test. Results showed that the lowest moisture content yielded at 160°C however, a significant reduction on betalain content followed. BRB2 colorant produced at 150°C, 15mL/min with 5% MD was found to be the most favorable condition given the set of parameters. After 8 weeks, there was no significant difference on the color of each colorant indicating its stability. Moreover, the microencapsulated betalain is deemed safe as it falls under the reference limits for its toxicity evaluation.

Nanostructured membrane of sodium montmorillonite reinforced cellulose acetate for adsorption of Ca (II) and Mg (II) ions in hard water

Ruth R. Aquino, Marvin S. Tolentino, Diana Jean C. Ramolete, Arra M. Calingasan, Minerthiza N. Dela Cruz and Blessie A. Basilia, , Key Engineering Materials, ISSN: 1662-9795, VOL. 801, PP 331-336.

Abstract

Permanent hard water softening was conducted with the use of cellulose acetate (CA)/ sodium montmorillonite (Na+-MMT) nanostructured membranes. Fabrication of the nanostructured membranes with various Na+-MMT loading (0%, 5%, 10%, 15%) was made possible by electrospinning technique, which was carried out at 25°C, 30 kV applied voltage, needle size of 25G and a tip to collector distance of 18 cm. The effect of Na+-MMT content on the morphology of the fiber was examined with the use of Scanning Electron Microscope (SEM). It was determined that increasing the Na+-MMT loading decreases the average fiber diameter. The molecular structure of the blend nanostructured membranes were investigated using Fourier Transform Infrared (FTIR) Spectroscopy and the existence of CA and Na+-MMT in the electrospun nanostructured membrane was confirmed. Better adsorption performance was observed for the blend with 15% Na+-MMT as compared to pure CA and maximum uptake rate was attained at 7 hours for pure CA and only 5 hours for CA/Na+-MMT (85%/15%) blend. Increasing the initial hard water concentration increases the driving force for diffusion and in turn increases adsorption capacity of both pure CA and the CA/Na+-MMT (85%/15%) blend. More so, the results of the experiment best fitted the pseudo-second order kinetic model and the Freundlich isotherm model. Integration of Na+-MMT in CA increases the surface area for adsorption of the nanostructured membrane, and thus, could be used as an effective adsorbent for hard water softening.

Preparation of natural antioxidant health supplements from Philippine-grown medicinal plants

R. C. Torres, C. O. Manalo, and E. B. Manongsong, Open Journal of Pharmaceutical Science and Research, Nov 2019; DOI Number: 10.36811/ojpsr.2019.110007

Abstract

Natural antioxidants are molecules that prevent cell damage against free radicals and are significant for maintaining optimum health in both animals and human. Insufficient levels of antioxidants, or inhibition of the antioxidant enzymes, cause oxidative stress which contributes to the development of a wide range of diseases including Alzheimer's disease, Parkinson's disease, diabetes, rheumatoid arthritis and neurodegeneration in motor neuron diseases. Due to the importance of natural antioxidants in the prevention of these diseases, this study was therefore undertaken to extract, characterize and evaluate the antioxidant activity of some Philippine-grown medicinal plants for the development of natural antioxidant dietary supplements.

The collected plant materials namely Fragaria vesca (strawberry), Solanum melongena (eggplant), Nephelium lappaceum (rambutan), Mangifera indica (mango), Antidesma bunius (bignay), Basella rubra (alugbati), Garcinia mangostana (mangosteen), Syzygium cumini (duhat) Dioscorea alata (ube), Citrus grandis (suha), Annona muricata (guyabano) and Curcuma longa (turmeric) were extracted using 95% EtOH. The total phenolic content of the plant extracts was tested by Folin-Ciocalteau method. Flavonoid content of the plant was determined by qualitative phytochemical analysis.

The study also prepared a natural-based antioxidant dietary supplement product in the form of capsule and chewable tablet that contains a combination of two (2) to three (3) plant materials that exhibited the most promising antioxidant activity. Results suggest that N. lappaceum peels exhibited the highest antioxidant activity with 40.70% total phenolics expressed as gallic acid followed by G. mangostana pericarp at 29.00% and S. cumini fruit at 14.30 %. All the plant samples indicated the presence of flavonoids. An antioxidant dietary supplement in capsule and in chewable tablet were developed using a combination of two (2) to three (3) plant extracts. The formulated products exhibited very promising antioxidant activities. The antioxidant activities exhibited by some Philippine-grown medicinal plants led to the preparation of a more sustainable and cost effective natural antioxidant dietary supplement.

Surface modification of abaca fibers by permanganate and alkaline treatment via factorial design

A. G. Batara, P. S. Llanos, P. A. de Yro, G. C. Sanglay, and E. Magdaluyo Jr.; AIP Conference Proceedings 2083, 030007 (2019); https://doi org/10.1063/1.5094317

Abstract

Natural fibers are utilized as alternative for synthetic fibers in various fiber-reinforced composites, and abaca fibers are the most commonly used for their strength and abundance. However, natural fibers can form a weak interfacial bonding with the polymer matrix due to their hydrophilic properties. In this study, the permanganate (KMNO4) and alkaline (NaOH) chemical treatment were used to modify abaca fibers. The effects of varying concentrations and soaking time to the fiber-matrix bonding were investigated. Fibers treated with permanganate only produced the highest tensile strength, with an increase of as much as 26.37%. Moreover, the same treatment resulted to the lowest moisture regain due to the gum removal, and effectively getting rid of polar groups in the treated fibers. Surface texture of the treated fibers had a rougher surface, which can possibly contribute to better mechanical interlocking of the fiber and matrix. However, excess gum removal at high concentrations resulted to fiber damage and lower mechanical strength as observed in the treatment combination of sodium hydroxide and permanganate at the longest soaking time.

Chemicals and Energy Division (CED)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Mar 11 2019	Synthesis of nanoparticle loaded with herbal extract Micro-sizing of sea salt by nano spray-dryer	NRCP Annual Scientific Conference / PICC, Pasay City, NCR	R. Z. M. L. Walde P. Y. M. Rubio A. A. Alfuen
Apr 24-26 2019	Comparative study of using concentrator as solar energy enhancer in solar photovoltaic LED streetlight	17th Philippine Association of Colleges and Universities of Industrial Technology (PACUIT) National Conference and 3rd International Conference Ampid, San Mateo, Rizal	F. E. Del Pozo Jr.
Apr 24-25 2019	Development of bionanoparticles loaded with *Moringa oleifera (Malunggay), Curcuma longa* (Turmeric) and *Cocos nucifera* (Coconut water)	2019 Luzon Regional Scientific Meeting (RSM) Don Leopoldo Sison Convetion Center, Alaminos, Pangasinan	R. Z. M. L. Walde P. Y. M. Rubio
May 20 2019	Solar photovoltaic systems in the built environment: Today trends and future challenges Solar PV systems in Philippine buildings: Today trends and future challenges Integration of convex glass on solar panel for improvement of harnessing solar energy	Asian Power and Energy Summit, The Future Energy Show Philippines 2019 SMX, Pasay City	F. E. del Pozo Jr.
May 28-30 2019	Umami flavor from seagrapes *(Caulerpa lentillifera)*, black tiger shrimp *(Penaeus monodon)* head and dried shiitake mushroom *(Lentinula edodes)* Development of gourmet salt products and micro-sized salts in laboratory scale	34th Philippine Chemistry Congress Cebu Waterfront Hotel	M.B. Carandang

Chemicals and Energy Division (CED)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Sept 11 2019	Rubber seed oil as potential source of biodiesel	PHILAAST Convention Hotel Jen, Pasay City	A. V. Briones C. A. Bulan V. A. Ablang
	Modification of native starch from *Manihot esculenta* (Cassava) as source of resistant starch for dietary application		C. A. Bulan V. A. Ablang C. G. Mendoza
Nov 7 2019	Design and prototyping of continuous screw type salt iodizing machine	**2**019 Regional Invention Contest and Exhibits, TIP, Cubao, Quezon City	O. C. Evangelista

Environment and Biotechnology Division (EBD)

Mar 11 2019 Sept 11 2019	Pre-treatment of kitchen waste to optimize biogas production using *Trichoderma harzianum*	86th NRCP GMA / PICC, NCR PHILAAST Convention Hotel Jen, Pasay City	D. L. Herrera, M. L. Tansengco J. R. Barcelo
Apr 3 2019	Wow Cacao: DOST *Tablea*: Delight in every bite!	National R&D Conference Philippine International Convention Center, Pasay City	E. G. Panerio
Apr 27 2019	Preparation of WACS plan for academic institutions	54th BIOTA Annual Convention DLSU Manila	M. L. Tansengco J. R. Barcelo R. L. Esguerra
Jul 17-19 2019	Food colorant from *Monascus purpureus*	National Science and Technology Week (NSTW) World Trade Center, Pasay City	U. G. Bigol E. G. Panerio J. P. M. D. Guzman S. D. Mantaring I. L. Castro N. M. Unciano
	Phenotypic and genotypic characterization of isolates from the fermentation process of papaya *(Carica papaya L.)* and *sitaw (Vigna unguiculata L.) Walp.)*	PSM 48th Annual Convention and Scientific Meeting, Clark Marriott Hotel, Clark Freeport Zone, Pampanga	U. G. Bigol E. G. Panerio J. P. M. D. Guzman S. D. Mantaring I. L. Castro N. M. Unciano
	Bacterial community analysis of bench-scale compact activated sludge system developed for treatment of quick service restaurants wastewater		J. P. G. Jose

Environment and Biotechnology Division (EBD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Sept 11 2019	How much waste does Boracay Island produce during and after its rehabilitation	PHILAAST Convention Hotel Jen, Pasay City	M. L. Tansengco J. R. Barcelo D. L. Herrera
	Inhibition of chicken feed pathogens through fermentation using *Lactococcus lactis* ITDI 0100		U. G. Bigol J. P. M. D. Guzman S. D. A. Mantaring J. P. G. Jose I. J. L. Castro
	Remediation of petroleum contaminated soil by chemical oxidation		M. C. B. Latosa
Dec 10-13 2019	DOST's initiatives to Boracay Island rehabilitation Support to the solid waste management program of Boracay Island	4th Philippine Solid & Hazardous Waste Management Conference Aquino Center and Museum Convention Hall, Tarlac City	J. R. Barcelo

Materials Science Division (MSD)

Jan 4-7 2019	Green synthesis of quantum dots from biowaste	International Conference on Nano and Materials Science, San Francisco, California, USA	P. A. N. de Yro
Jan 30-Feb 1 2019	Nanosafety initiatives in the Philippines	Japan Nano Exhibition Tokyo, Japan	B. A. Basilia P. A. N. de Yro
Feb 27-Mar 2 2019	Establishment of the Advanced Manufacturing Center (AMCen) in the Philippines	80th PIChE National Convention, Crowne Plaza Hotel, Manila	B. A. Basilia M. T. Margarito A. M. Monsada J. C. Sy F. P. Liza J. Alfred V. Garcia R. A. Advincula
	3D X-ray computed tomography for non-destructive inspection of internal structure of solid materials for failure analysis, research and product development and industrial applications		A. M. Monsada A. A. Jalandoon B. T. Salon P. J. Antonio J. L. Jagape J. A. P. Guevara B. A. Basilia

Materials Science Division (MSD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Mar 5 2019	Accessible technology for pollutant removal in drinking water	Safe Water for All Seminar Workshop NCR	J. R. Celorico
May 28–30 2019	Surface functionalization of nano-silica for hydrophobic nanocoating application	34th Philippine Chemistry Congress, Waterfront Hotel, Cebu City	J. R Celorico J. Laga H. Lyn M. C. O. Que A. K. M. Collera L. C. Milo B. A. Basilia
	Surface functionalization of nano-silica for hydrophobic coating application		J. R. Celorico J. L. H. Laga M. C. O. Que A. K. M. Collera L. C. Milo B. A. Basilia
May 28-29 2019	Preparation and characterization of nanocellulose biopolymer from pineapple crown leaf fibre	International Nanotechnology Conference in the Philippines 2019 Taal Vista Hotel, Tagaytay City	M. A. Paglicawan M. T. V. Navarro D. M. Belandres C. A. E. Gentallan
	Starch nanocrystal characterized by Fourier-transform infrared spectroscopy		M. A. Paglicawan C. S. Emolaga B. A. Basilia
	Synthesis and characterization of flourescent carbon nanoparticles from abaca-derived cellulose		J. M. Cabañero Jr. B. A. Basilia P. A. N. de Yro
	Influence of nanoclay additive on the performance of Polyvinylidene Difluoride (PVDF) hollow fiber membranes		V. Lagura S. Cayabyab M. Margarito B. Visaya D. Pattyn F. F. Jiang B. A. Basilia
	Synthesis and characterization of lemon *(Citrus Limon)* peelings derived Carbon Quantum Dots-Polyaniline (CQD-Pani) composites		M. D. R. Herrera G. M. G. Antipasado R. L. C. Mores M. A. Paela M. K. G. Peroja R. A. B. Raymundo N. R. Castro

Materials Science Division (MSD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
May 28-29 2019	Synthesis and characterization of lemon *(Citrus Limon)* peelings derived Carbon Quantum Dots-Polyaniline (CQD-Pani) composites	International Nanotechnology Conference in the Philippines 2019 Taal Vista Hotel, Tagaytay City	J. E. R. Magdaluyo Jr. P. A. N. de Yro G.M. O. Quiachon B. A. Basilia
	Hydrothermal synthesis of CQD from glycerol for flourescent imaging		R. A. T. Cruz P. A. N. de Yro G. M. O. Quiachon C. S. Emolaga M. L. M. Ysulat U. G. Bigol B. A. Basilia
	The design of a bench-scale adsorbent column based on nanoclay-loaded electrospun fiber membrane for the removal of arsenic in wastewater		E. M. B. Dela Peña K. Arano M. L. Dela Cruz, P. A. N. de Yro L. J. Diaz
	Surface modification of local nanozeolites using iron for removal of heavy metal contamination		J. R. Celorico M. C. O. Que A. K. M. Collera S. Cayabyab J. L. Laga L. Samson R. Antinopo R. Loberiano B. A. Basilia
	Synthesis and characterization of fluorescent carbon nanoparticles from abaca-derived cellulose		J. M. Cabañero Jr.
	AFM surface studies of polysiloxane nanocoating applied on glass containers		J. C. J. T. Ochoa V. U. Lagura J. M. Cabañero Jr. L. C. Milo G. S. Alvarez J. C. Aquino M. T. Margarito A. M. Monsada B. A. Basilia
	Development and physico-chemical characterization of Polyvinylidene Flouride (PVDF) flat sheet membranes with silver-modified montmorillonite nanoclay with antibacterial properties against *E. Coli* and *S. Aureus*		

Materials Science Division (MSD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Jun 13-14 2019	Characterization and preliminary evaluation of antifouling performance of composite polymer-metal complex membrane for membrane bioreactor application	Membrane Science and Technology 2019 (MST 2019) Nanyang Executive Center in Singapore	M. T. Margarito A. Beltran A. Orbecido M. A. Promentilla, B.A. Basilia R. Damalerio
	Evaluation of tensile properties and water absorption of abaca fiber thermoplastic composite relative to the fiber length, type of matrix and nanoprecipitated calcium carbonate	22th International Conference on Composite Materials (ICCM 2) Melbourne, Australia	M. A. Paglicawan C. S. Emolaga J. R. Celorico B. A. Basilia R. M. Sese
Aug 11-16 2019	Development of soft ballistic component of bullet proof vest from hybrid composite local materials	68th Annual Convention of the Philippine Association for the Advancement of Science and Technology Hotel Jen, Roxas Boulevard, Pasay City	M. A. Paglicawan C. S. Emolaga M. T. V. Navarro B. A. Visaya P. A. N. de Yro J. A. C. Sy B. A. Basilia
Sept 11-12 2019	Case studies on additive manufacturing	Philippine Additive Manufacturing Day Titanium Auditorium, MIRDC, Taguig City	V. U. Lagura
Sept 25 2019	Additive manufacturing towards smart manufacturing		M. T. Margarito
	3D printing technology of nanocomposites		B. A. Basilia
Oct 30-31 2019	Fabrication of polythiourea-copper complex composite membrane and its anti-fouling property	26th Regional Symposium on Chemical Engineering (RSCE 2019) Armada Hotel, Petaling Jaya, Kuala Lumpur Malaysia	M. T. Margarito A. B. Beltran M. A. Promentilla A. Orbecido B. Basilia R. Damalerio U. Bigol

Packaging Technology Division (PTD)

Apr 18-20 2019	Production of instant soy-based milk product as alternative food for the lactose-intolerant	7th Seoul International Congress of Endocrinology and Metabolism Grand Walkerhill Seoul & Vista Walkerhill, Seoul Hotel, South Korea	C. Saldaña

Packaging Technology Division (PTD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
May 28-29 2019	The design of a bench-scale absorbent column based on nanoclay-loaded electrospun fiber membrane for the removal of arsenic in wastewater (oral)	International Nanotechnology Conference in the Philippines 2019 Taal Vista Hotel, Tagaytay City	E. M. B. Dela Peña K. Arano M. L. Dela Cruz P. A. N. de Yro
Jun 12 2019	Development of packaging system and transport packaging technology for Philippine broccoli	29th IAPRI Packaging SymposiumTwente University, Enschede, Netherlands	D. E. Tañafranca
Jul 8-11 2019	Effect of storage environment on the crystallinity and compressive load of starch based biodegradable cup	The 6th Global Conference on Polymer and Composite Materials (PCM 2019)Pathumwan Princess Hotel, Bangkok, Thailand	R. Garalde
Sept 11-12 2019	Application of chitosan-tri-polyphosphate coating to delay the ripening of *'Lakatan'* banana	68th Annual Convention of the Philippine Association for the Advancement of Science and Technology (PHILASST) Hotel Jen, Pasay Ciy	A. T. Basbasan Jr. R. Garalde D. Ortiz D. E. Tañafranca
Oct 22 2019	Application of retort pouch packaging technology in the development of RTE relief foods in the Philippines	Asia Packaging Network (APN) International Packaging Symposium Dusit Thani Hotel, Makati City	G. D. Noceja
	Application of active packaging technology to delay the ripening of mango and banana		A. T. Basbasan, Jr.
Oct 24 2019	The challenges of developing transport packaging for fresh produce in the Philippines	ISTA-APD International Symposium on Distribution Packaging Dusit Thani Hotel, Makati City	E. T. Nolasco

Planning & Management Information Systems Division (PMISD)

Jan 19-22 2019	Functionalized Carbon-based Quantum Dots: Optical characterization and potential application as bio-fluorophore	International Conference on Smart Materials Application / Tokyo, Japan	R. A. T. Cruz

Standards and Testing Division (STD)

Date	Title of the Paper Presented	Conference / Event	Presenter / Author
Feb 20-22 2019	Use of laboratory animals in safety evaluation of nanomaterials: Overview	86th Philippine Veterinary Medical Association Scientific Conference and Annual Convention, Iloilo Convention Center, Iloilo City	C. N. Ochona
Mar 6 2019	Productivity and efficiency through better laboratory practices	PALEU Seminar on 360º Approach to Health, Environment, Safety and Quality – Part 1, Quezon City	A. R. C. Dablio
Mar 7 2019	Effects of toxic chemicals on health and how these can be avoided		R. C. Torres
May 21, 2019	Laboratory animal care and use in bioassays for drug development	2nd Philippine College of Laboratory Animal Annual Scientific Convention, Bureau of Animal Industry, Visayas Ave., Quezon City	C. N. Ochona
May 28-30 2019	Validation of test method for arsenic in rice	34th Philippine Chemistry Congress, Waterfront Hotel, Cebu City	C. N. Ochona
	Effect of spray drying parameters on physico-chemical properties of encapsulated betalain powder from *Beta vulgaris L.*		R. C. Torres R. M. G. Yumang M. D. A. Casais
Jun 6-7 2019	Veterinarian's role in planning and designing of laboratory animal facility	47th Veterinary Practitioners' Association of the Philippines, Crowne Plaza Hotel, Ortigas, Pasig City	J. C. O. Alfaro
Sept 4 2019	Total quality management for a microbiology laboratory	PALEU Seminar on 360º Approach to Health, Environment, Safety and Quality – Part 2, Taguig City	M. S. A. Aguinaldo
	Larvicidal activity of Philippine medicinal plants against dengue vector *Aedes aegypti*		R. C. Torres

Standards and Testing Division (STD)

Date	Title of the Paper Presented	Conference/ Event	Presenter / Author
Sept 8-11 2019	Microencapsulation of betalains from Philippine *beta vulgaris* (beet root)	International Symposium on Dyes and Pigments, Seville, Spain	R. C. Torres
Sept 11-12 2019	Development of microencapsulated colorant from red dragon fruit *(Hylocereus polyrhizus)* peels	68th Annual Convention of the PhilAAST, Hotel Jen, Pasay City	R. C. Torres
Sept 16-18 2019	Isolation and identification of microorganisms from processed milkfish products for the development of matrix-based PT material for *Salmonella sp.* in milkfish	IMEKO Foods 2019, Belgium	M. S. A. Aguinaldo
Nov 21-22 2019	Evaluation of uncertainty of measurement	Philippine Accreditation Bureau (PAB) – DTI Assessors and Experts' Forum, Clark City, Pampanga	A. R. C. Dablio
Nov 27 2019	Philippine medicinal plants against dengue vector, *Aedes aegypti*	2019 National Biotechnology Week-DOST NRCP Forum on Communicating Basic Research Results to the People: Biotechnology vs Dengue	R. C. Torres

PARTNERSHIPS

For this year, DOST-ITDI continued to strengthen its network and linkages with **69** stakeholders from various local and international associations and industries with scientific linkages as follows:

Technical Cooperation/Capacity Building

Asia Pacific Food Analysis Network (APFAN)

Atarashii Technologies International

Bureau of Animal Industry (BAI)

Bureau of Philippine Standards
Department of Trade and Industry (BPS-DTI)

Camp Bagong Diwa

Center for Laboratory Proficiency Testing,
Ministry of Science & Technology, Thailand
ASEAN Consultative Committee for Standards and Quality for Rubber-based Product Working Group (ACCSQ-RBPWG)

Enviro Wave Integrative Environmental Research

Food and Drug Administration (FDA)

GIZ, Germany

Integrated Chemists of the Philippines (ICP)

Institute for Global Environmental Strategy

LGU of Lubao, Pampanga

Maritime Industry Authority (MARINA)

MSC Software

Technical Cooperation/Capacity Building

Norde International

OmniFab Inc.

OneLab Network Referral System

Organization on the Prohibition of Chemical Weapons (OPCW) through the Anti-Terrorism Council Philippine National Authority (ATC-PNA)

Philippine Accreditation Bureau Department of Trade and Industry (PAB-DTI)

Philippine Association of Laboratory Equipment Users (PALEU)

Philippine Rubber Industry Association (PRIA)

Puzzlebox 3D

Taguig City Environment and Natural Resources Office (CENRO)

Technology Resource Center

Funding/Sponsorship
United Nations Industrial Development Organization

R&D Collaboration

Bage Bakeshop

Central Macaroni Corporation Inc. (CENMACO)

Cleanway Environmental Management Solutions, Inc. (CEMSI)

Corban Community Farms, Inc.

DILG CARAGA

DOST-FPRDI

DOST Region III

DSWD & DILG Regions 1, 2, 8, CAR and MIMAROPA

DSWD & DILG Regions CALABARZON, 11 & 12

DSWD Region IV A

Fish2Go

Frux Foods

GDC Salt Mfg. Co.

Imus Taho and Tokwa Factory

K&E Industrial Lime

LGU of Malay, Aklan

Malayan Laboratory Malaysia

Maliig Livelihood Women's Creation Marketing Cooperative

Mama Rossa Distributing Company

Manly Plastics Inc.

Marc Daniel's Soya Products

Metals Industry Research and Development Center (MIRDC)

Nestle

Pan de Monggo

R&D Collaboration

Philippine Army

Premiere Physics Metrologie (PPM)

Raymund's Bakeshop

SEE's International Food Mfg. Corp

Trashtalk Waste Management and Green Energy Solutions, Inc.

Villa Socorro

Waste and Resource Management Incorporated (WARM)

Trashtalk Waste Management and Green Energy Solutions, Inc.

MOA Signing with Optiwhite

Central Macaroni Corporation (CENMACO)

MOA Signing with Phil. Army

Manly Plastics Inc. & DOST-FPRDI

Network & Membership

Asia Nano Forum (ANF)

Asia Packaging Network (APN)

Global Innovation Exchange

International Association of Packaging Research Institutes (IAPRI)

International Association of Transport Packaging (ISTA) Global

ISTA-Asia Pacific Division

Japan Environmental Management Association, Inc.

JICA and GIZ for Marine Litter

Ministry of Environment of Japan

Mycological Society of the Philippines

National Solid Waste Management Commission

Philippine Business for Environment

Philippine Society for Microbiology

INTELLECTUAL PROPERTIES

This year DOST-ITDI has filed for a total of **14** intellectual properties (IPs) and **5** IPs were granted to the Institute, **3** of which are utility models for materials development and food product innovation while the other **2** are trademarks for packaging technologies.

FILED/APPLIED

TECHNOLOGY/PRODUCT/PROCESS	**IP CLASSIFICATION**
Waste analysis and characterization study in households and public market in Boracay Island during its rehabilitation period in 2018	Copyright
Waste analysis and characterization study in Kabulihan Sanitary Landfill, Malay, Aklan	Copyright
Development of household composter for the management of biodegradable waste	Copyright
Training manual - home care product formulation, personal care product formulation, herbal processing, and essential oil extraction (for Marawi)	Copyright
Design, prototyping of salt processing equipment: Spin dryer	Utility Model
Point of use ceramic water filtration system with nano anti microbial coating	Utility Model 2-2019-050098
Beet root natural colorants	Utility Model
Trichoderma harzianum for the pre-treatment of kitchen waste for biogas production	Utility Model
Processes for extracting the colorant from the cooked peels of purple yam (Development of natural food color)	Utility Model
Processes of extracting the natural pigments from purple sweet potatoes (Development of natural food color)	Utility Model
Process for extracting the anthocyanin pigment from Roselle *(Hibiscus sabdariffa)* (Development of natural food color)	Utility Model

FILED/APPLIED

TECHNOLOGY/PRODUCT/PROCESS	IP CLASSIFICATION
Design, prototyping of salt processing equipment: A continuous screw-type salt washer	Patent 12019000386
A wastewater treatment system using bio-augmentation and the apparatus used in said system	Patent 12019000029
Development of packaging technology for pork *lechon*	Patent

GRANTED

Iron modified nano zeolite and method for preparing the same	Utility Model 2-2018-050-289
Iron modified nano zeolite and method for preparing the same	Utility Model 2-2018-050-290
Nano precipitated calcium carbonate and the method for preparing the same	Utility model 2-2016-000865
Silver modified nano zeolite and method for preparing the same	Utility model 2-2018-050240
Silver modified nano zeolite and method for preparing the same	Utility model 2-2018-050236
Vacuum-fried carrot cuts with Philippine flavours	Utility model 2-2018-050237
Mighty *kamote* Philippines	Trademark 4/2018/00002263
Pack of Hope	Trademark 4/2018/00002264
Tatlong Mangga Dahil Mahal Kita	Copyright

INTERNATIONAL CONFERENCES HOSTED

Two international conferences in the fields of packaging technology and nanotechnology were organized by DOST-ITDI this year.

"6th Asia Packaging Network (APN) International Packaging Symposium and 4th ISTA-APD International Symposium on Distribution Packaging

Through the Packaging Technology Division of the DOST-ITDI, the Philippines hosted the International Packaging Research and Innovation Symposium and 6th Asia Packaging Network (APN) meeting last October 22-23, 2019. Back to back with the symposium, the ISTA-APD (International Safe Transit Association-Asia Pacific Division) International Symposium on Distribution Packaging was also hosted last October 24, 2019.

APN is a network of researchers in packaging related universities and research institutions and was attended by 40 speakers from Asia (32), Europe (4) and USA (4) and 326 participants mainly from research institutions of government agencies, private industries, academe and industry associations in Asia. The symposium aimed to empower organizations and their people to minimize product damage throughout distribution and optimize resource usage through effective package design. It also served as a venue to update and share among packaging researchers and industry experts the latest packaging technology development, innovation and regulations.

The annual board meeting of APN was held on October 23, 2019 attended by representatives from member institutions, namely; South Korea (3), Thailand (2), and Malaysia (1); while PTD represented the Philippines. One observer each from Japan and Thailand also attended.

On October 24, 2019, the ISTA-APD board meeting was also held. Member countries/representatives that were present during the meeting include: China (2), Thailand (1), Philippines (1), South Korea (2), and USA (3). Member countries, Singapore and Malaysia were absent.

Asia Nano Forum Summit

Asia Nano Forum (ANF) is a network organization which aims to promote responsible development of nanotechnology by fostering international network collaboration that benefits each economy educationally, socially, environmentally, and economically. It is composed of 17-member economies mostly in the Asia Pacific Region, wherein the Philippines is represented by DOST-ITDI. Of the 17, 15-member economies participated during the Summit.

Concurrent to the ANF Summit, the International Conference on Nanotechnology, in cooperation with the Philippine Association of Microscopists Incorporated, with the theme “Nanotechnology for Sustainable Development” was also held at Taal Vista Lodge last 27-29 May 2019. The Conference was attended by 307 participants from industry, academe and government, with over 30 local and international plenary speakers. One of the highlights of the Summit was its B2B (Business to Business) platform which connected six Philippine local companies with possible international business partners.

AWARDS & RECOGNITIONS

DOST-ITDI was recognized as one of the Best Institutes during the 4th DOST Intellectual Property Awards given by the National Academy of Science and Technology on December 5, 2019. The institute was cited for having the highest number of granted Utility Models this year.

DOST-ITDI staff were also awarded individually for their 7 utility models and 11 international publications.

2019 Granted Patent / Utility Model Registration Award

Method for making spray dried blood food product
(Maria Patricia V. Azanza, Ma. Dolor L. Villaseñor, Joanna Marie C. Magora, Carinna T Saldaña, and Valerie Fay A. Remorasa) 2-2017-050217

Process for producing flavoured or unflavoured edible oil infused with *Capsicum fruiescen, "Siling Labuyo"*
(Maria Patricia V. Azanza, Ma. Dolor L. Villaseñor, Joanna Marie C. Magora, Anna Patricia R. Condemilicor, and Rommel M. Belandres) 2-2016-000861

Method for making spray dried microencapsulated cucumber
(Maria Patricia V. Azanza, Ma. Dolor L. Villaseñor, Joanna Marie C. Magora, Carinna T. Saldaña, and Oliver C. Evangelista) 2-2016-000857

Method for making food-grade bile from ruminant livestock with improved shelf life
(Maria Patricia V. Azanza, Ma. Dolor L. Villaseñor, Joanna Marie C. Magora, and Carinna T. Saldaña) 2-2017-050220

An aerobic sequencing batch reactor
(Myra L. Tansengco, David L. Herrera, Judith C. Tejano, and Jose Ricky E. Beraye) 2-2016-000119

Process for the preparation of chitosan-calcium carbonate composite
(Emelda A. Ongo, Candy S. Valdecañas, and Bernard M. Gutierrez) 2-2016-000036

Chitosan-calcium carbonate composite for oil spill remediation
(Emelda A. Ongo, Candy S. Valdecañas, and Bernard M. Gutierrez) 2-2016-000037

2019 International Publication Award

Refereed Journals

Comparative antibacterial activity of commercial chitosan and chitosan extracted from *Auricularia sp.*
(Ursela G. Bigol, John Paul Matthew D. Guzman, Angela Kae T. Chang, Ronaldo R. Frias, Jr., and Lourdes V. Alvarez) Biocatalysis and Agricultural Biotechnology 17: 189-195, 2019

Nanobubbles from ethanol-water mixture: Generation and solute effects via solvent replacement method
(Blessie A. Basilia and Jeremiah C. Millare) Chemistry Select 3(32): 9268-9275, 2018

Dispersion and electrokinetics of scattered objects in ethanol-water mixtures
(Blessie A. Basilia, Jeremiah C. Millare) Fluid Phase Equilibria 481(): 44-54, 2018

Controlling the adsoption spectra of gold nanoparticles synthesized via green synthesis using brown seaweed *(Sargassum crassifolium)* extract
(Blessie A. Basilia and Mar Christian O. Que) Key Engineering Materials 772(): 78-82, 2018

Conference Proceedings

Fabrication and characterization of electrospun Polysulfone (PSf) / Halloysite (HAL) nanocomposite membrane
(Blessie A. Basilia, Ruth R. Aquino, Marvin S. Tolentino, Jeremiah C. Millare, Clarisse D. Balboa, and Christine Julia B. Castro) Materials Science Forum 934(): 55-60, 2018

Preparation of cellulose acetate blended with chitosan nanostructured membrane via electrospinning for Cd2+ adsorption in artificial wastewater
(Blessie A. Basilia, Ruth R. Aquino, Marvin S. Tolentino, Sydney Cate S. Amen, Mary Anne V. Arceo, and Mary Elaine S. Dolojan) IOP Conference Series: Earth and Environmental Science 191(012137), 2018

Conference Proceedings

Synthesis and characterization of Polysulfone (PSU)/Philippine Halloysite (PH-HAL) nanostructured membrane via electrospinning
(Blessie A. Basilia, Ruth R. Aquino, Marvin S. Tolentino, Niel Karl G. Arcamo, and John Patrick N. Gara) MATEC Web of Conferences 2261236X 213(03001), 2018

Adsorptive removal of lead (Pb2+) ion from water using cellulose acetate/polycaprolactone reinforced nanostructured membrane
(Blessie A. Basilia, Ruth R. Aquino, Marvin S. Tolentino, Raphael Michael Philippe D. Elacion, Roberto Ladrillo, and Toni Rose C. Laurenciana) IOP Conference Series: Earth and Environmental Science 191(012139), 2018

Thermolytic growth of zinc sulfide quantum dots in ethylene-vinyl acetate matrix utilizing zinc pyrrolidinedithiocarbamate
(Mar Christian O. Que, Persia Ada N. de Yro, and Blessie A. Basilia) AIP Conference Proceedings 2083(020006), 2019

Surface modification of abaca fibers by permanganate and alkaline treatment via factorial design
(Persia Ada N. de Yro) AIP Conference Proceedings 772(2083), 2019

Hydrothermal synthesis of carbon quantum dots from biowaste for bio-imaging
(Persia Ada N. de Yro, Gerald Mari O. Quaichon, Roland Andrew T. Cruz, Carlo S. Emolaga, Mar Christian O. Que) AIP Conference Proceedings 2083(020007), 2019

Facile synthesis of nitrogen-doped carbon quantum dots for bio-imaging
(Persia Ada N. de Yro, Beejay A. Salon, and Blessie A. Basilia) MATEC Web of Conferences 43(04002), 2016

The Institute also received the **GAWAD KATHA-LIKHA Award** under the RDI category awarded by DOST-TAPI. This award is given to worthy inventors, researchers and Institutes who have disclosed their valuable knowledge on their filed intellectual properties.

DOST-ITDI Director Dr. Annabelle V. Briones was among those awarded as **Woman Scientist of DOST.**

DOST Scientists, Dr. Marissa A. Paglicawan and **Dr. Rosalinda C. Torres,** were included in the list of **100 Asian Scientists 2019.** The list recognizes individuals whose research works had substantial contribution and impact to the society and the scientific community. The lady scientists were cited for their valuable works in their respective fields. Dr. Paglicawan, in the field of materials science for her research on utilizing Manila hemp or abaca as an engineering material; while Dr. Torres, in the field of chemistry for her research on the larvicidal ability of Philippine medicinal plants.

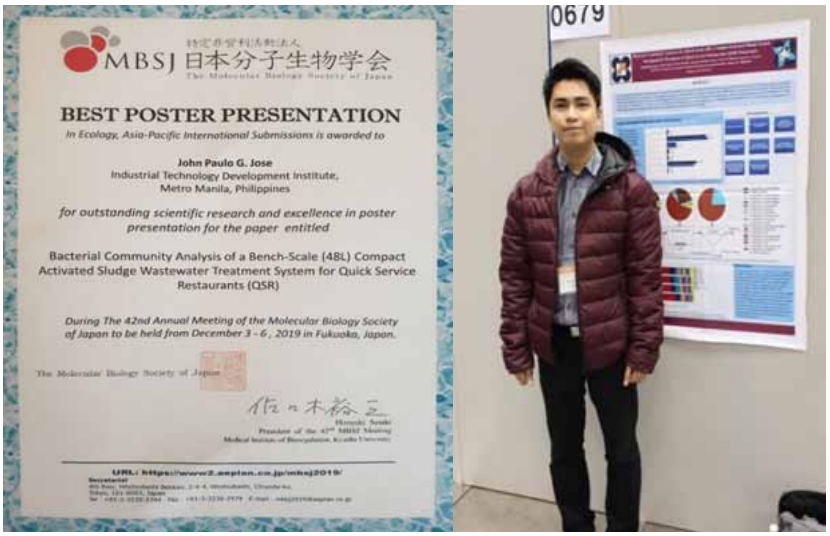
Two DOST-ITDI senior researchers were also appointed as **DOST Assistant Scientists, Dr. Benilda S. Ebarvia** and **Dr. Emelda A. Ongo.**

Dr. Ebarvia also garnered the **Developing Economies National Metrology Institute (DEN) Award** from the Asia-Pacific Metrology Programme held at Le Montage, Sydney Australia; making her the first Filipino to obtain an international award for metrology. She founded the developmental work of the first Reference Materials (RMs) in the Philippines that are used to approve methods and evaluate the accuracy of measurement results and make sure that these are internationally traceable. Her work is utilized by measurement laboratories for analyzing products such as food.

Dr. Persia Ada N. de Yro of the Materials Science Division was awarded the **Best Oral Presenter Award** during the 7th International Nano and Materials Conference 2019 in San Francisco, California, USA. Her work focused on the synthesis of carbon quantum dots from agricultural and biological waste materials and its industrial application.

Engr. Roland Andrew T. Cruz of the Planning and Management Information Systems Division bagged the **Best Oral Presenter Award** during the 2nd International Conference on Smart Materials Application 2019 in Tokyo, Japan. His research developed bio-fluorophores utilizing glycerol as source material for carbon quantum dots.

Mr. John Paolo G. Jose of the Environment and Biotechnology Division bagged the **Best Poster Presentation Award** during the 42nd Annual Meeting of the Molecular Biology Society of Japan in Fukuoka, Japan for the project on bacterial community analysis of a compact activated sludge wastewater treatment system for Quick Service Restaurants (QSR).


MBSJ 日本分子生物学会

BEST POSTER PRESENTATION

In Ecology, Asia-Pacific International Submissions is awarded to

John Paulo G. Jose
Industrial Technology Development Institute,
Metro Manila, Philippines

for outstanding scientific research and excellence in poster presentation for the paper entitled

Bacterial Community Analysis of a Bench-Scale (48L) Compact Activated Sludge Wastewater Treatment System for Quick Service Restaurants (QSR)

During The 42nd Annual Meeting of the Molecular Biology Society of Japan to be held from December 3 - 6 , 2019 in Fukuoka, Japan.

The team led by **Engr. Angel T. Basbasan, Jr.** of the Packaging Technology Division placed **1st in Poster Presentation** during the 86th PhilAAST Annual Convention for their work on the application of chitosan-tripolyphosphate coating that delays the ripening of *"lakatan"* banana.

The continuous screw-type salt iodizing technology developed by the Process Development Section-Chemicals and Energy Division bagged the **Likha Award (Creative Research)** for government-funded research during the Regional Invention Contest and Exhibits (RICE-NCR) at the Technological Institute of the Philippines, Quezon City Campus.

The **Inorganic Chemistry Section – Standards and Testing Division** was awarded as one of the 3 winners of the **Best Practice Award** by the OneLab Project of the DOST during its first ever Best Practice day for their work on Preparation of In-house Reference Materials from Chemical Wastes. This Best Practice Competition was participated by all the testing laboratories under the DOST system, from its research and development institutes, to its laboratories at the regional offices.

DOST-ITDI STRATEGIC PLANNING

To define the Institute's direction for the next five years, a preliminary strategic planning was conducted last January 4-5, 2019 at the Development Academy of the Philippines (DAP), Tagaytay City. Strategic planning is an imperative tool to outline goals and achieve desired outcomes of an organization as big and as complex as DOST-ITDI. The mission and vision of the Institute were revisited and revised by the DOST-ITDI ExeCom upon review of the Institute's performance for the last five years. The core values and five target goals to deliver better services to the industry were also established during the workshop.

The outputs of the ExeCom were then cascaded to each division through the conduct of a series of divisional strategic planning workshop slated from February 14, 2019 to March 01, 2019. The first part of the program was composed of a brief introduction to strategic planning process, overview of ITDI performance for the last five years and its current situation, and presentation of ExeCom outputs. The participants were provided with new knowledge about the Institute's internal operation and current status as the industry's trusted partner for the advancement of science, technology, and innovation.

During the workshop proper, each division contributed to the identification of Programs, Activities, and Projects (PAPs) for the five goals initially formulated by the ExeCom.

EXECOM members participated in the preliminary strategic planning held on January 4-5, 2019 at the Development Academy of the Philippines.

Materials Science Division, Feb 14, 2019, MSD Quadrangle

Advanced Device and Materials Testing Laboratory, Feb 14, 2019, MSD Quadrangle

National Metrology Lab, Feb 15, 2019, Metrology Conference Room

Standards and Testing Division, Feb 18, 2019, STD Conference Room

Environment and Biotechnology Division, Feb 19, 2019, EBD Conference Room

Food Processing Division, Feb 19, 2019, FPD Conference Room

Finance and Administrative Divisions, Feb 21, 2019, Metrology Conference Room

Packaging Technology Division, Feb 22, 2019, PTD Conference Room

Technological Services Division, Feb 26, 2019, Metrology Conference Room

Chemicals and Energy Division, March 01, 2019, Metrology Conference Room

Planning and Management Information Sytems Division

DOST-ITDI INDUSTRY ADVISORY COMMITTEE (IAC)

The Industry Advisory Committee (IAC) consists of a group of industry experts and business leaders from both private and public sectors that will provide insights and experiences on R&D, business development, and technology transfer to ensure that the Institute's efforts are geared to enhance local industry competitiveness.

DOST-ITDI formed the Industry Advisory Committee through an introductory meeting where ExeCom Members led by Dr. Annabelle V. Briones met with industry representatives from both public and private sectors last July 30, 2019 at Makati City. Two more meetings were conducted last September and November 2019.

Current IAC composition include executives from the Philippine Plastics Industry Association, INC. (PPIA), Laguna Food Processors, Nestle Philippines, Dow Chemical Pacific Limited, San Miguel Yamamura Packaging Corporation, UniLab Inc. and Department of Trade and Industry. The Planning and Management Information Systems Division (PMISD) acts as IAC Secretariat.

FINANCIAL MANAGEMENT REPORT

For this year 2019, the Institute has ***P 544,911,616.00** allotment of which P 258,349,616.00 was for Personal Services inclusive of RLIP, P 103,680,000.00 for Maintenance and Other Operating Expenses, and P 182,882,000.00 for Capital Outlay.
*(*Net of SPF)*

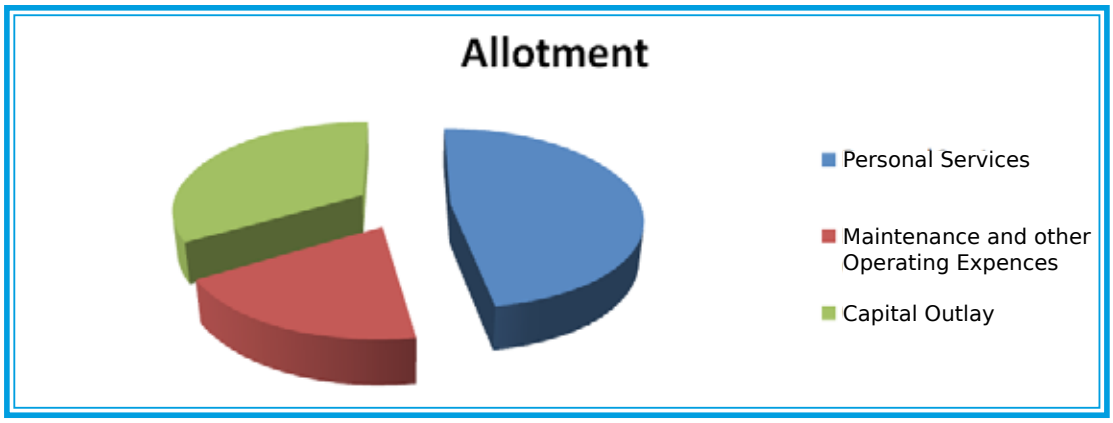


Figure 1

In terms of Programs, Projects and Activities,

GAS - P 100,891,616.00; R&D - P 160,972,000.00; Tech Transfer - P 45,078,000.00 and Testing and Analysis – P 237,970,000.00.

Aside from GAA Fund, the Institute has also other sources of funds which were categorized as Fund from DOST and Other Agencies; Technical Services; ITDI Training Fund and Bid Docs and Performance Bidders Bond.

As of December 31, 2019 ITDI received a total of P 432,643,356.94 broken-down as: P 421,653,318.08, Fund from DOST and Other Agencies; P 7,231,250.48, Technical Services; P 1,238,373.13, ITDI Training Fund; and P 2,520,415.25, Bid Docs and Performance Bidders Bond (Figure 2).

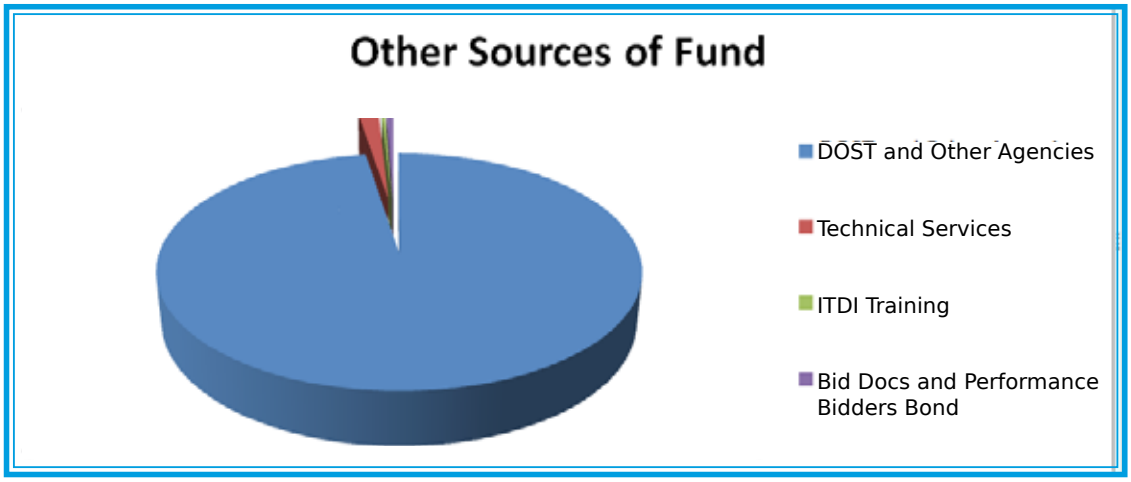


Figure 2

In 2019, ITDI generated a total income of P 48,428,110.29 broken-down into: P 20,537,632.00, Test and Analysis; P 17,031,085.47, Calibration; P 8,685,057.82, Other Miscellaneous Income; P 1,982,385.00, Clearance and Certification; and P 91,950.00, Rental Income. Most of the income came from Test and Analysis (Figure 3).

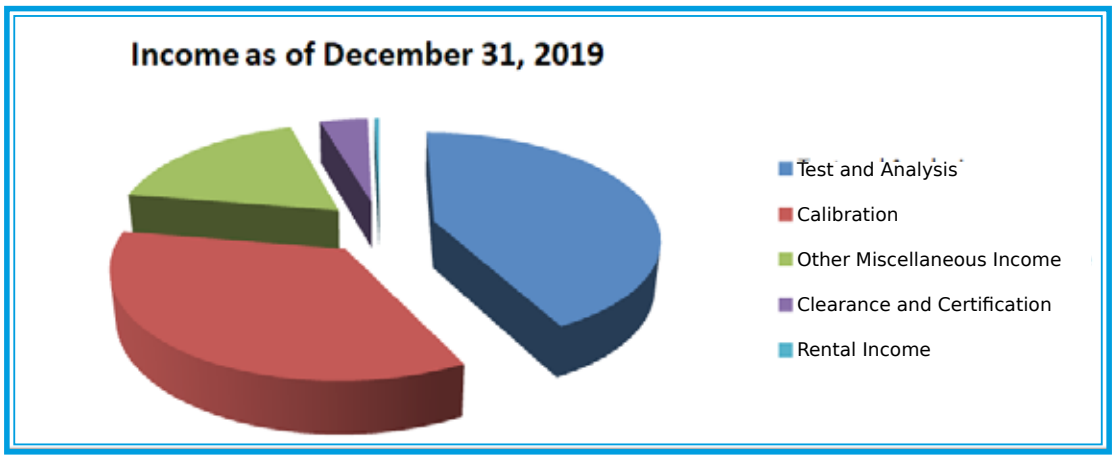
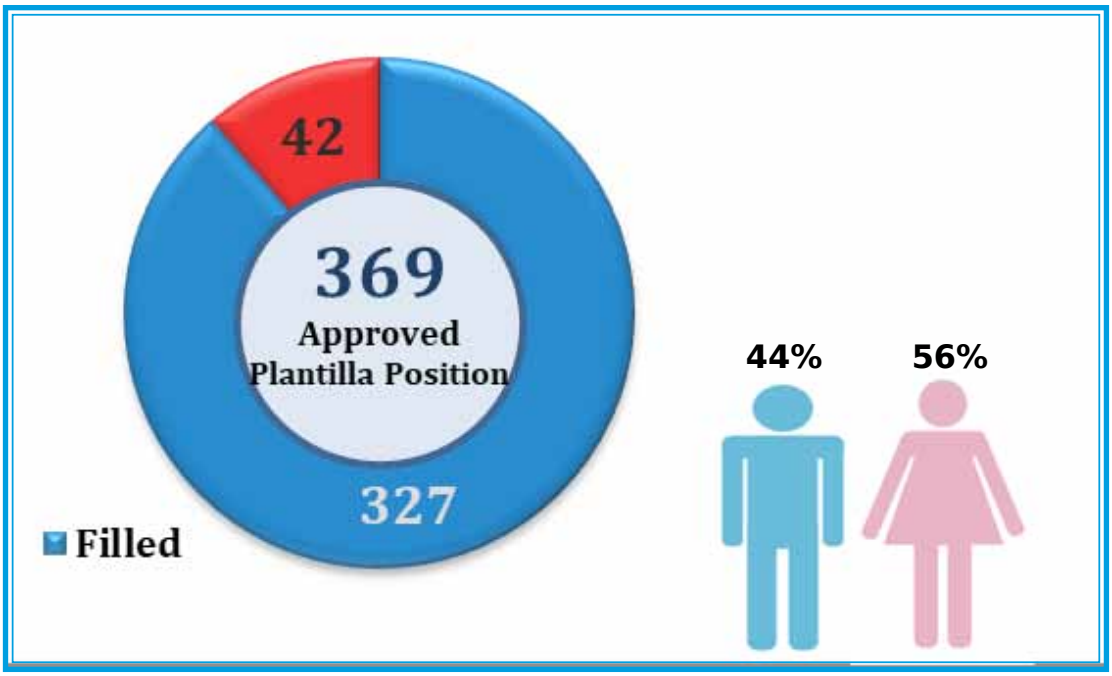


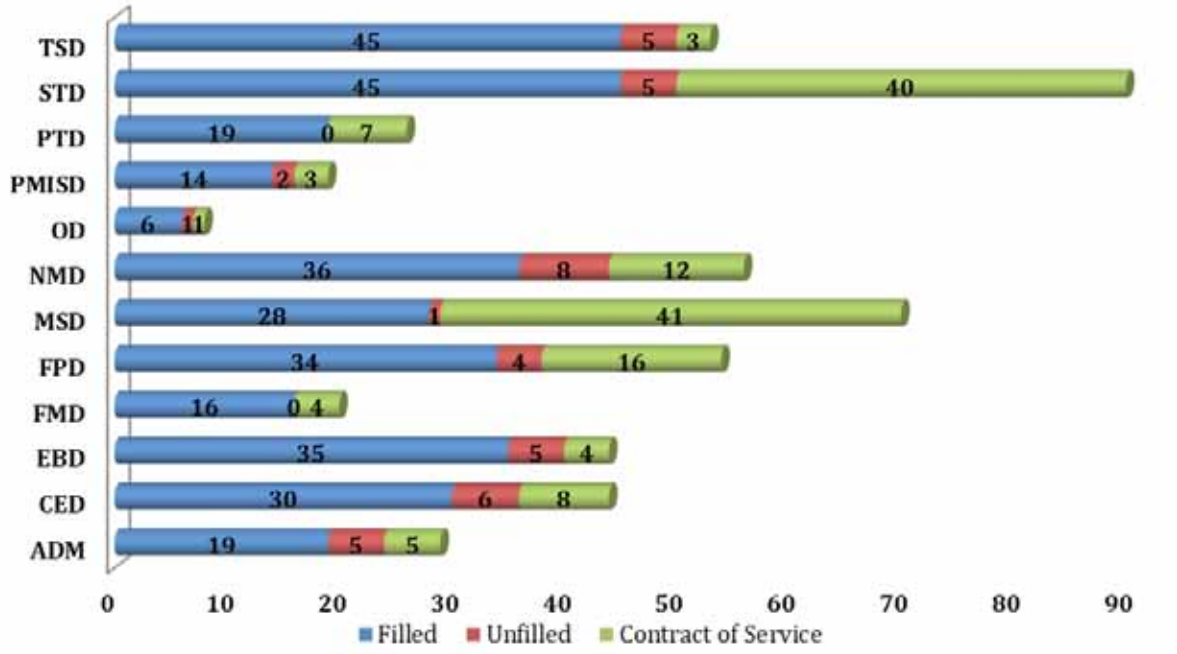
Figure 3

HUMAN RESOURCE REPORT

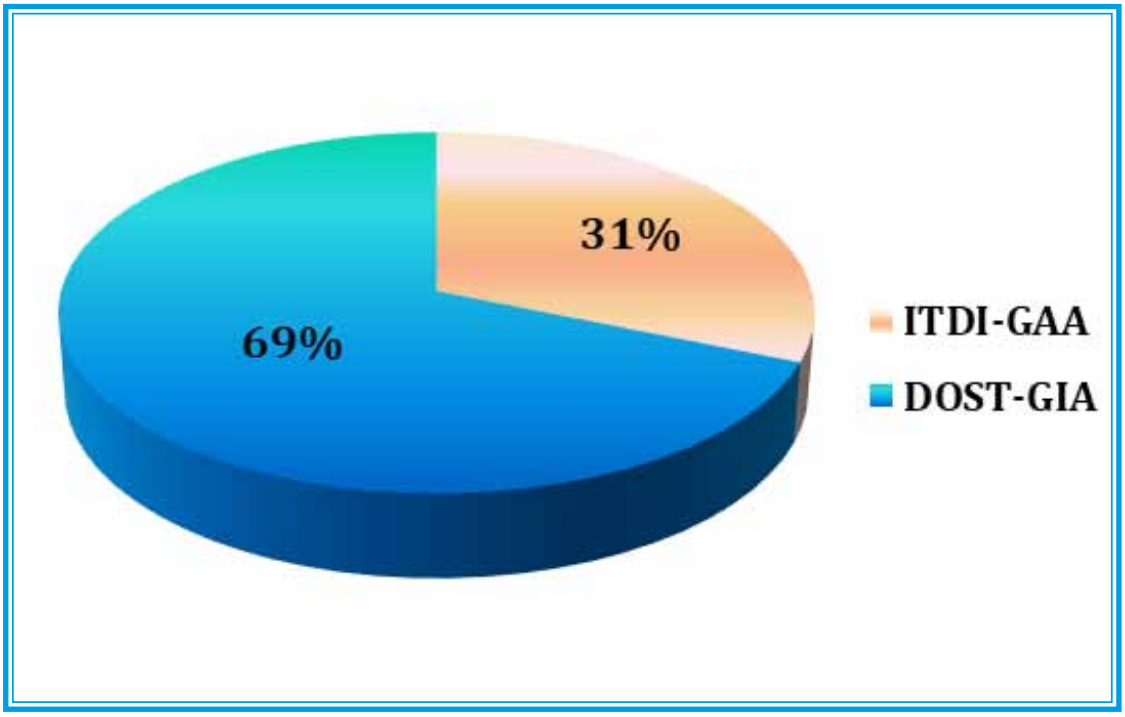
This year, a total of **327** positions were filled while **42** remain unfilled out of the **369** approved plantilla positions in DOST-ITDI. Female employees had the majority in number at **56%** in comparison to male employees accounting for **44%**. As an added workforce of the Institute, there are a total of **144** contract of service this year distributed among all the divisions with **99** of them or **69%** under DOST-GIA projects while the remaining **45** or **31%** under regular GAA funding.



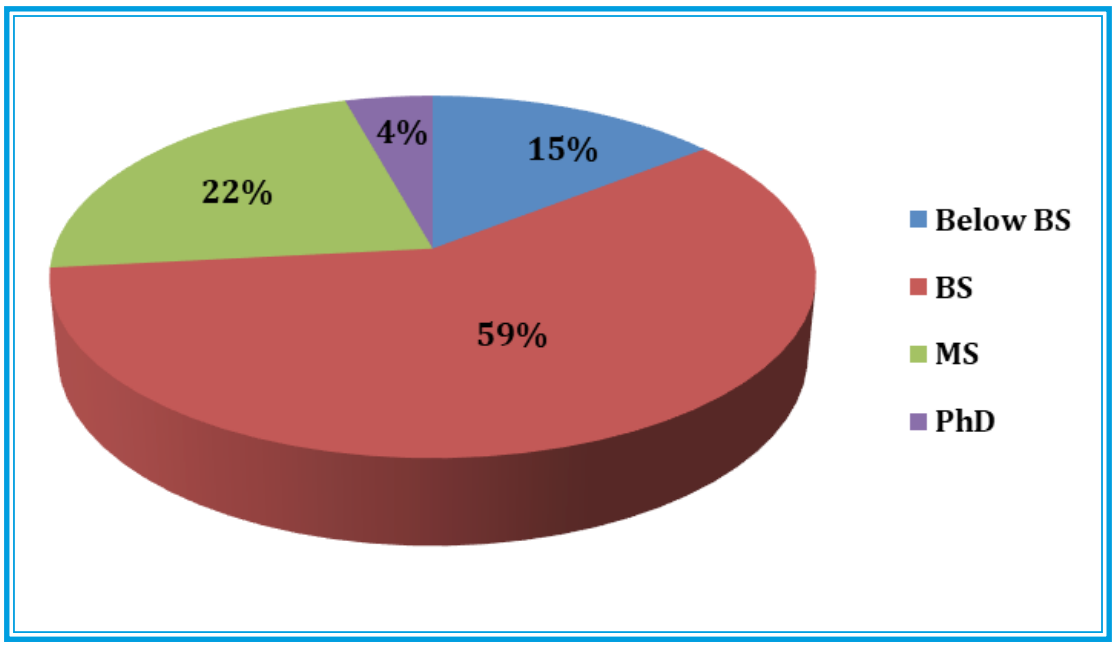
DOST-ITDI Manpower Profile



Human Capital Distribution by Division



Distribution of Contract of Service



Manpower Profile by Educational Attainment

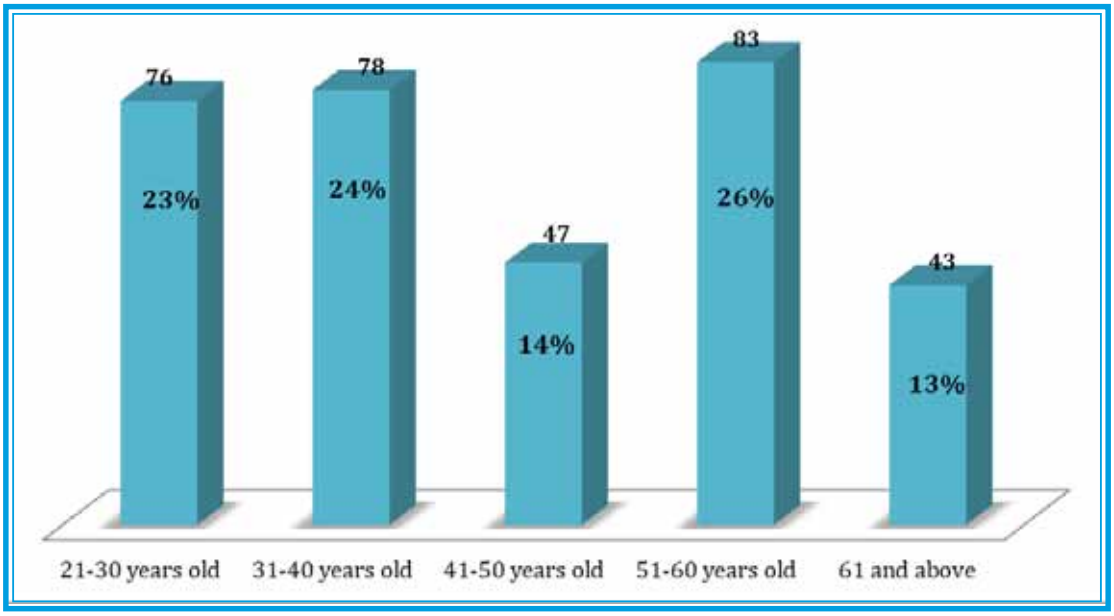
For ITDI to keep pace and be able to respond to the fast changing STI (science, technology, and innovation) landscape globally, ITDI staff continue to pursue academic advancement through MS and PhD in various fields. There are **37** currently pursuing **Master's degree** and **10** for **Doctorate Degree** in the following fields of specialization:

- Analytical Chemistry
- Biochemistry
- Biological Science
- Biology
- Business Administration
- Chemical Biology
- Chemical Engineering
- Chemistry
- Electrical Engineering
- Environmental Science
- Food Science
- Industrial Engineering
- Industrial Engineering & Management
- Information Technology
- Material Science & Engineering
- Microbiology
- Molecular Biology and Biotechnology
- Packaging Technology
- Public Administration
- Technology Management

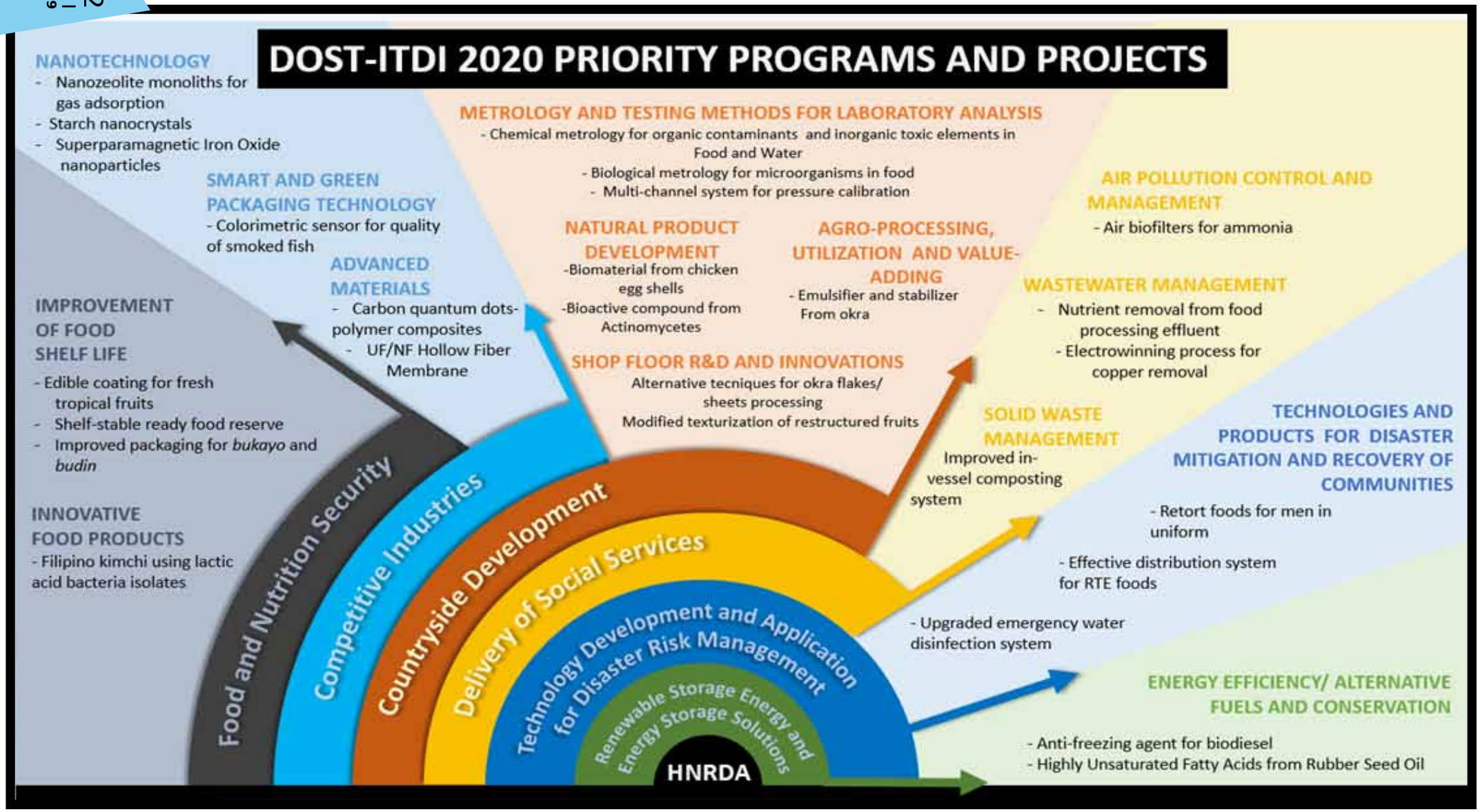
The following DOST-ITDI staff had completed their graduate studies in various fields of specialization:

MS Degree Holder	Field of Specialization
Alma B. Cruz	Applied Statistics
Bernard Jude M. Gutierrez	Chemistry
Reginald Roy U. Dela Cruz	Development Communication
Candy Valdecañas	Environmental Engineering
Monica Manalo	Food Science
Ellvin W. Collantes	Management Major in Public Administration
Michael Jason Solis	Manufacturing Technology
Ray Ann M. Garalde	Packaging Technology
Mary Joy P. Paico	Packaging Technology
Eric M. Charlon	Public Administration

Currently, 39% of DOST-ITDI's total workforce is within the retirement age range of 51-61 and above. This poses a challenge and an opportunity at the same time for DOST-ITDI to facilitate succession and knowledge transfer within the Institute, and ensure its future in the hands of its next leaders and the continuity of its much needed service to Philippine industries and the public.



Manpower Profile by Age


DOST-ITDI 2020 PRIORITY PROGRAMS AND PROJECTS
NANOTECHNOLOGY
- Nanozeolite monoliths for gas adsorption
- Starch nanocrystals
- Superparamagnetic Iron Oxide nanoparticles
SMART AND GREEN PACKAGING TECHNOLOGY
- Colorimetric sensor for quality of smoked fish
ADVANCED MATERIALS
- Carbon quantum dots-polymer composites
- UF/NF Hollow Fiber Membrane
IMPROVEMENT OF FOOD SHELF LIFE
- Edible coating for fresh tropical fruits
- Shelf-stable ready food reserve
- Improved packaging for bukayo and budin
INNOVATIVE FOOD PRODUCTS
- Filipino kimchi using lactic acid bacteria isolates
METROLOGY AND TESTING METHODS FOR LABORATORY ANALYSIS
- Chemical metrology for organic contaminants and inorganic toxic elements in Food and Water
- Biological metrology for microorganisms in food
- Multi-channel system for pressure calibration
NATURAL PRODUCT DEVELOPMENT
-Biomaterial from chicken egg shells
-Bioactive compound from Actinomycetes
AGRO-PROCESSING, UTILIZATION AND VALUE-ADDING
- Emulsifier and stabilizer From okra
SHOP FLOOR R&D AND INNOVATIONS
Alternative tecniques for okra flakes/ sheets processing
Modified texturization of restructured fruits
AIR POLLUTION CONTROL AND MANAGEMENT
- Air biofilters for ammonia
WASTEWATER MANAGEMENT
- Nutrient removal from food processing effluent
- Electrowinning process for copper removal
SOLID WASTE MANAGEMENT
Improved in-vessel composting system
TECHNOLOGIES AND PRODUCTS FOR DISASTER MITIGATION AND RECOVERY OF COMMUNITIES
- Retort foods for men in uniform
- Effective distribution system for RTE foods
- Upgraded emergency water disinfection system
ENERGY EFFICIENCY/ ALTERNATIVE FUELS AND CONSERVATION
- Anti-freezing agent for biodiesel
- Highly Unsaturated Fatty Acids from Rubber Seed Oil
Food and Nutrition Security
Competitive Industries
Countryside Development
Delivery of Social Services
Technology Development and Application for Disaster Risk Management
Renewable Storage Energy and Energy Storage Solutions
HNRDA

DOST-ITDI

ITDI Organizational Chart

Dr. Annabelle V. Briones
DIRECTOR

RESEARCH & DEVELOPMENT (R&D)

Dr. Annabelle V. Briones
DEPUTY DIRECTOR

Dr. Emelda A. Ongo
OIC, CHEMICALS & ENERGY DIVISION (CED)

Engr. Reynaldo L. Esguerra
ENVIRONMENT & BIOTECHNOLOGY DIVISION (EBD)

Dr. Norberto G. Ambagan
FOOD PROCESSING DIVISION (FPD)

Dr. Blessie A. Basilia
MATERIALS SCIENCE DIVISION (MSD)

Daisy E. Tañafranca
PACKAGING TECHNOLOGY DIVISION (PTD)

ADMINISTRATIVE AND TECHNICAL SERVICES (ATS)

Dr. Diana L. Ignacio
DEPUTY DIRECTOR

Dr. Janet F. Quizon
ADMINISTRATIVE DIVISION (AD)

Dr. Janet F. Quizon
FINANCIAL MANAGEMENT DIVISION (FMD)

Dr. Zorayda V. Ang
PLANNING & MANAGEMENT INFORMATION SYSTEMS DIVISION (PMISD)

Aurora V. Kimura
NATIONAL METROLOGY DIVISION (NMD)

Dr. Rosalinda C. Torres
STANDARDS & TESTING DIVISION (STD)

Nelia Elisa C. Florendo
TECHNOLOGICAL SERVICES DIVISION (TSD)

DOST-ITDI

Contact Us:
Dr. Annabelle V. Briones
Director

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INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE
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