DOST-ITDI

ANNUAL REPORT 2022

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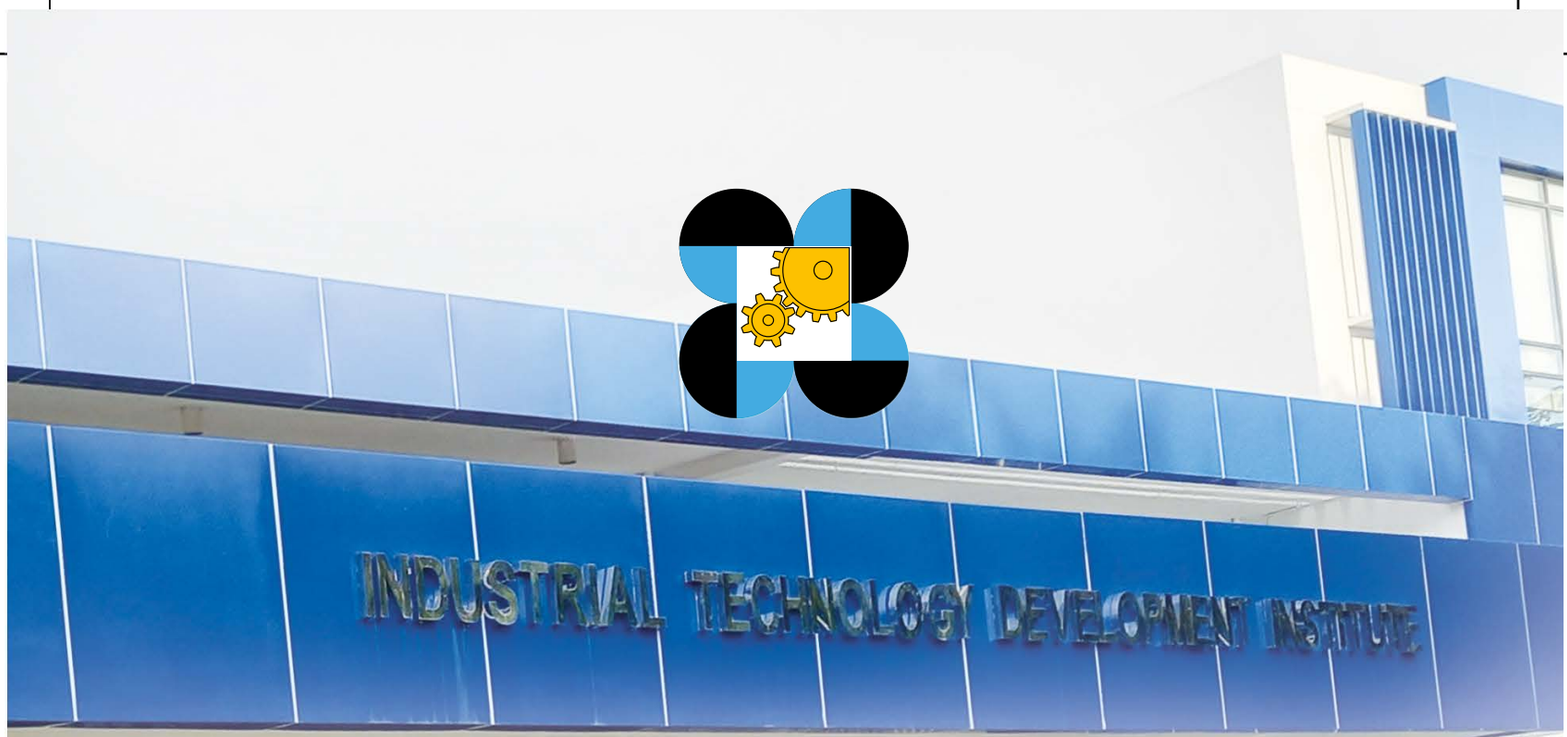
"Inspired by Technology,
Driven by Innovation."



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

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

MANDATE

- Undertake applied research and development to generate new knowledge, technologies, and innovations in the field of industrial manufacturing, mineral processing, and energy.
- Conduct knowledge translation or technology transfer and commercialization.
- Provide technical services, tests and analyses, and metrology to ensure international traceability of the national units of measure.

MISSION

"To contribute to making local industries globally competitive through research and development, transfer and commercialization of innovative and sustainable technologies, and provision of appropriate technical services"

VISION

"By 2030, DOST-ITDI is the country's leading industry partner in Science, Technology, and Innovation"

Cover Design by: Isidro E. Villamar
Narrative by: Reginald Roy U. dela Cruz

ABOUT THE COVER

This avant-garde cover design depicting Knowledge Translation (KT) or technology transfer by which DOST-ITDI has made it possible for people from all walks of life to have access to different resources. Furthermore, KT is also being used to equip people who need a certain type of assistance to improve their quality of life and help them avail of opportunities that would otherwise be inaccessible. It also conveys KT as a process of communicating and delivering results stemming from scientific and technological research to the market place and to wider society, along with associated skills and procedures, and is as such an intrinsic part of the technological innovation process.

The gears on the front cover, which symbolize industry, are being held by series of hands, depicting the transfer of developed technologies from its technology generators at DOST-ITDI to its intended users or adopters, particularly industries and MSMEs, among other stakeholders.

Aside from being the official color of the DOST, the overall blue color palette of the cover aims to express loyalty, confidence, security, and reliable authority – qualities the Institute aims to evoke to its stakeholders and the public.

Meanwhile, the images on the back show four of the Institute's technical services, namely the Advanced Device and Materials Testing Laboratory (ADMATEL), Materials Development (MATDEV), Biosafety Lab Level 2+ (BSL-2+), and the Simulation Packaging Testing Laboratory (SPTL). These services cater to the industries on failure analysis of electronics/semiconductors, materials development for 3D printing, virology and vaccine research, and transport packaging testing, respectively. These and the other technical services being offered by the Institute are aimed to help improve capability and maximize productivity of the industries.

INTRODUCTION

This year's annual report presents several impactful and ground-breaking go-to solutions that will bring significant changes to the conventional model of doing business transactions. Ranging from bioinspired technologies, alternative energy, food processing and packaging, 3D printing and nanotechnologies, ITDI offers several kind of R&D innovations that will contribute hugely to the nation's economic success.

Over the past 120 years, ITDI explores and expands science, technology, and innovation to improve the quality of lives of Filipinos. The following core values serve as its lifeblood, heart, and soul to drive its mission and vision in serving the Filipino people, achieving a remarkable and inclusive recovery, and creating long-term sustainability.

- Innovativeness. Fountain of creativity and new ideas fueling better products, services, and processes.
- Technical competence. Diverse pool of experts in different field.
- Dependability. Unwearing support and assistance to the public.
- Integrity. Diligence in striving to do what is right and just.

WE ARE ITDI.

Inspired by Technology, Driven by Innovation.

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Message of the Secretary

Congratulations to the DOST- Industrial Technology Development Institute (ITDI) for successfully weathering the global challenges brought by the COVID-19 pandemic.

While some social scientists claimed then that the pandemic posed to millions of enterprises, including ours, “risks that threaten the destruction of humanity’s long-term potential”, the ravages of the COVID-19 pandemic that we faced were pain-filled, the loss of human life worldwide that brought an unequaled summons to public health, food systems, and the workplace, and devastation of tens of millions of people that put them at risk of impoverishment, the DOST-ITDI managed to find ways for the Philippine industry to transition from the ‘New Normal’ to the ‘Now Normal’ phase.

I take pride in DOST-ITDI’s leveling up its organization’s performance by attaining the Philippine Quality Award (PQA) Program Level 1 given by the Department of Trade and Industry on May 17, 2022, aside from maintaining its ISO 9001 :2015 certification for its Quality Management System.

For CY2022, among its accomplishments I would like to highlight 18 new products and 26 new testing processes and standards brought to us by the Institute. These technologies address food safety and security concerns, clean and green environment, energy, sustainability, and health. I commend DOST-ITDI for its efforts in transferring 57 technologies to various sectors, of which 17 technologies were transferred by commercialization, 14 by extension, and 26 as a public good. New facilities, the Simulation Packaging Testing Laboratory (SPTL) and Green Packaging Laboratory (GPL) were unveiled on June 20, 2022, a testimony of DOST and DOST-ITDI’s continuous commitment to elevate the level of packaging research in the country. SPTL provides a venue to simulate the actual hazards that packaged products will undergo during distribution. On the other hand, setting up the GPI- is one of the DOST’s endeavors to provide packaging options, alternative packaging materials, and green and sustainable technologies.

As it welcomes 2023, I encourage DOST-ITDI to continue its program and projects anchored on the DOST's four (4) strategic pillars namely: Promotion of Human Well-being, Wealth Creation, Wealth Protection, and Sustainability. **The call to action is ambitious, but it is urgent.**

Let us continue hurdling the challenges towards good health, secured livelihoods, and guaranteed food security and nutrition for Filipinos to ensure that our 'Now Normal' is fitter through science, technology, and innovation.

Kudos to the DOST-ITDI!

RENATO U. SOLIDUM, JR., PhD
Secretary

Message of the Director

We are here again to celebrate the accomplishments of the Industrial Technology Development Institute (ITDI). Along with the changing of the guard within the Department of Science and Technology (DOST), we have always strived to support the endeavors and even surpass the expectations of the Department, clients, stakeholders, and the public.

As the world continues to heal from the onslaught of the COVID-19 global pandemic, the Institute aims to stay true to its mandate of developing worthwhile innovations that benefit the Philippine industries and the Filipino people. The past year was indeed challenging. However, we overcame these and came out stronger.

A major highlight of our 2022 is the conferment of our Philippine Quality Award (PQA) Level 1, a proud distinction indicative of our exemplary performance as an organization. Thank you, my ITDI family, for your diligent dedication to our work and to providing quality service to the people.

Our R&D has also come in full swing. We have developed 18 innovations in our five research areas: personal care products, energy materials, packaging materials, and more. We have also established 26 new processes, mostly on test methods and standards development.

We also reached 101 places through various consultancies, training, technology transfer activities, and product launches. Among these is the unveiling of the Simulation Packaging Testing Laboratory and the Green Packaging Laboratory, one of DOST's Big 21 in 2021. We also revitalized the salt industries by deploying our salt technologies in Occidental Mindoro. We also launched InnovEats, which featured 31 qualified food product prototypes from the various Food Innovation Centers (FICs).

We also gained 62 partnerships in 2022, focusing on R&D collaboration, technical training, and systems development and deployment. Swisspharma Research Laboratories, Inc. has partnered with us to do contract research to support the Institute's wide array of R&D and technical services. The Batangas Egg Producers Cooperative (BEPCO) has adopted the RTE Chicken Egg. At the same time, household care

manufacturer ZAMCOR has teamed up with DOST-ITDI to formulate a pet shampoo and pet deodorizer and analyze its existing product line of detergents, soaps, and other cleaning agents. ITDI, NRCP, and UP Diliman Institute of Chemistry also inked a partnership for the Reactivation of the Pharmaceutical Section as a Tuklas Lunas Center for Pharmaceutical Development.

Also, in line with establishing the Fuel Cell R&D and Testing Center, the Institute has signed an MOU for developing, analyzing, and testing energy materials and fuel cell components. Lastly, our online business talk show, #TekNegoShow, is now institutionalized, with three topics airing via Facebook: ADMATEL services, SPTL and GPL services, and the Institute's involvement in the DOST's Halal Program.

Add to this the positive movement of the establishment of the Virology and Vaccine Institute of the Philippines in both houses of Congress, and we are undoubtedly engaged in giving back our technical services and dedication to science, technology, and innovation, especially as we continue to heal and cope in this *"New Normal."* As we progress, this year's accomplishment is a gratifying reminder to do more for the coming year, inspired by technology and driven by innovation.

Cheers, DOST-ITDI!

ANNABELLE V. BRIONES, PhD
Director

PHILIPPINE QUALITY AWARD of DOST-ITDI

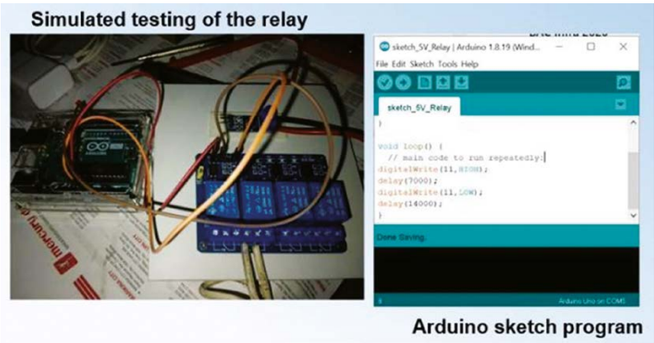
DOST's Industrial Technology Development Institute proudly accepted its Philippine Quality Award (PQA) Program Level 1 in a conferment ceremony held at the rooftop conference room of DOST ITDI's Metrology in Chemistry Laboratory on May 17, 2022. Given by the Department of Trade and Industry (DTI), the PQA is the highest national recognition being given to private and public organizations in the Philippines for their exemplary organizational performance.

Director Dr. Annabelle V. Briones accepted the award for the Institute, with Deputy Director for Administrative and Technical Services Dr. Zorayda V. Ang, Deputy Director for Research and Development Dr. Christine Marie C. Montesa, and members of the PQA teams from the ITDI divisions. Handing over the trophy was DTI Competitiveness Bureau Director Ms. Lilian G. Salonga, with DTI Competitiveness Bureau Assistant Director Mr. Jo-Dann N. Darong and National Quality and Competitiveness Division Chief Ms. Sheryl Santos, and her staff.

2022 Completed Projects

For this year, DOST-ITDI developed a total of **18 new products** which included personal care products, energy materials, extracts, and packaging materials, among others. There are **26 new processes** established by DOST-ITDI contributed mainly by test methods and standards development.

Development of Micro-controller & Mini-computer Applications for Selected Equipment Units of the MMIC and a Bench-Scale Hydrothermal Carbonization Equipment for the CED Laboratory



A microcontroller board (Arduino) and mini-computer (Raspberry Pi) systems (hardware and software) were developed and applied to the equipment units of Modular Multi-Industry Innovation Center (MMIC) or InnoHub. Freeware open-source software (FOSS) was also utilized in the applications that will be developed for techno-economics. The development of software (systems) and applications for the Arduino and Raspberry Pi can be included in the future modes of engagement of the equipment of the MMIC and can be additional features for promotion. With the developed systems being cheaper, simpler in form and applications, the knowledge acquisition, skills development, and technology transfer are easier.

Sensory and Physicochemical Refinements in Personal Care Products Using Calamansi Oil

Various existing DOST-ITDI pharmaceutical products were improved utilizing bioactive extracts, essential oils, and fixed oils developed by the Chemicals and Energy Division. Extracts and oils from calamansi wastes like peels, pulp, and seeds are added to toothpaste and mouthwash product formulations to provide new product variants that are natural and environment-friendly. For toothpaste, a balanced proportion of calamansi essential oil and hydrosol was used. For mouthwash, three variants were made – (1) alcohol-based variant with calamansi oil; (2) water-based variant with calamansi oil and; (3) oil-pulling with calamansi and coconut oils.

Development of Copper-Based Nanomaterial as Possible Framework for External Layer of Masks

Copper-based nanomaterial was developed to be used as additional layer for masks and provide additional protection in terms of reduced microbial contact. Concentration of copper in various matrices were optimized, physicochemical properties of copper-based nanomaterial were characterized, then incorporated in masks.

Design of Energy Material from Biomass-Derived Starting Material as Nanofiller for Fabrication of Hybrid Composite for Fuel Cell Application

An energy material was designed by functionalization of cellulose whisker as biomass-derived starting material from cotton wastes that will be utilized as fillers for hybrid composite. The hybrid composite with fillers contributed in the enhancement of electrochemical properties for electrolyte membrane component, hence, providing incremental improvement in developing localized materials for fuel cell technology advancement in our country.

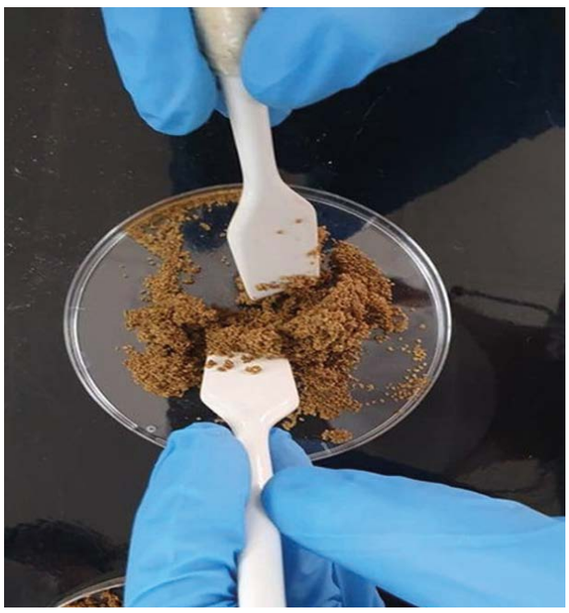
Biofilm inhibitory activity of Talisay (Terminalia catappa L.) leaf extract against shrimp pathogen Vibrio sp. and its potential as feed supplement Phase 1

Talisay (Terminalia catappa L.), a plant native to the Philippines, was used as biofilm inhibitor, and to potentially use its extracts as a cheap feed supplement to prevent infections caused by *Vibrio spp.* which cause huge economic losses in the shrimp farming industry.

The source of *Talisay* leaves which yielded the most effective crude extract, in terms of minimum inhibitory concentration, biofilm inhibition, and biofilm dispersal, was determined.

Shrimp bacterial challenge assay was conducted using crude extract from *Talisay* leaves, and it was observed that for shrimp infected with reference *V. parahaemolyticus* and shrimp infected with AHPND isolate *V. parahaemolyticus* R-1 fed with *Talisay*-supplemented feed, survival rates were higher than infected shrimp that were not given *Talisay*-supplemented feeds. No negative effects on the shrimp growth and survival were observed, making *Talisay* a good candidate for feed supplement. Shrimp farmers and *Talisay* farmers will benefit greatly from the results of this project.

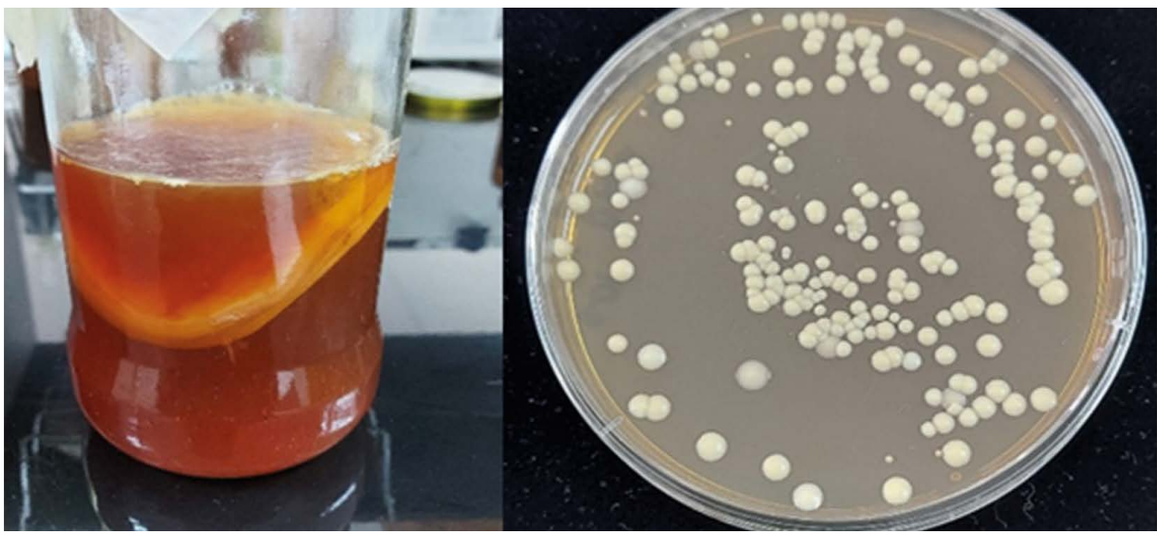
Phase 2: Immunomodulatory effects of Talisay-supplemented feed on Vibrio-challenged whiteleg shrimp (Penaeus vannamei)



Further studies based on the results of project Phase I determined the effects of Talisay-supplemented feed on the immune factors of *P. vannamei* challenged with *Vibrio sp.,* and observed the effects of Talisay-supplemented feed to the expression of genes related to immune response.

Primers for the target shrimp immunity and shrimp housekeeping genes, *V. parahaemolyticus* QS genes and housekeeping genes were designed. Shrimp were acclimatized in a simulated pondwater set-up. RNA was extracted from the shrimp, quantification for the RNA and cDNA synthesis of total RNA was conducted. A feed supplemented with *Talisay* was also developed.

Microbial and Chemical Profile of Kombucha Tea made from Different Symbiotic Colonies of Bacteria and Yeasts (SCOBYs) in the Philippines



Kombucha tea is having a booming market in the country however, there is little to no information regarding its fermentation process, including safety and commercialization. Thus, this study shed light on the safety, microbial community, chemical composition and antioxidant activity of kombucha currently sold in the market.

Four kombucha SCOBY set-ups were prepared; and microbial succession and sampling was conducted. Microorganisms were isolated and plated in order to obtain pure colonies. Isolates were Gram-stained. Observation of zones of inhibition for both filtered and unfiltered kombucha against 3 microorganisms for every 3 days until 15 days was conducted.

Design, Modeling, and Simulation of an Improved In-vessel Composting System

Composting is a controlled decomposition of organic matter by microorganisms, such as bacteria and fungi, into a humus-like product (R.A. 9003). Effectiveness of composting process can be maximized under controlled conditions, in which, it requires right amount of oxygen, temperature, moisture, proper mixture of wet and dry organic matter, and sufficient microbial degraders. Considering that more than 50% of Philippine solid waste is composed of biodegradable waste, composting will greatly reduce the volume of wastes that go into landfills or recovery plants. At the same time, it supports the reduction of the consumption of commercial chemical fertilizers.

DOST-ITDI conducted flow simulation for the composting machine in order to obtain pressure within the vessel. A small-scale version of the composting machine was prepared in order to fit a 3D printed paddle and observe its performance. As software simulation of flow posed problems for the project team, manual flow simulation was instead conducted using two different paddles. Based from this, the final scaled-down design was 3D printed.

Development of Air Biofilters for the Control of Ammonia

In order to address the dangers of ammonia to humans, animals and environment, air biofilters were developed using materials abundant in the Philippines such as water lily fibers and abaca fibers, plastics like HDPE and PS (from waste), and activate carbon as filter media. The biofilter can convert ammonia into nitrate or further convert the nitrate to nitrogen (N2) gas which can be released into atmospheric air.

The team conducted field testing at the poultry farm of the identified partner for the project. The pumps of the biofilter were repaired and reinstalled. New culture media was circulated so that the microbes could attach to the solid media of the biofilter. Ammonia levels were measured at both inlet and outlet vents of the biofilter, and it was found out that the ammonia level at the outlet decreased, indicating that the biofilter passed its field-test.

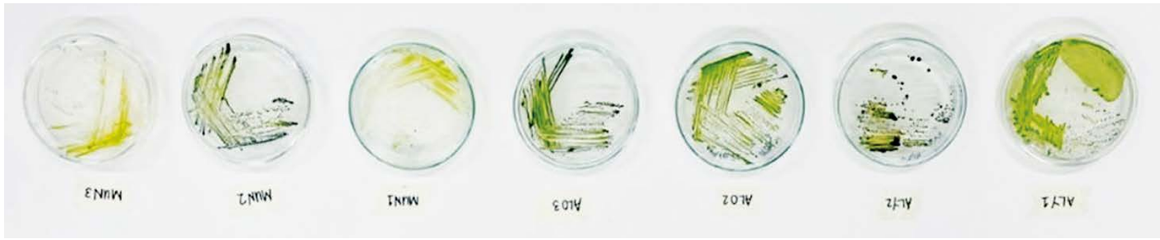
Upgrading of the Emergency Water Disinfection System

The Upgraded Emergency Water Disinfection System (UpEDS) is an onsite water treatment and disinfection system that can produce potable water that is compliant with the Philippine National Standard for Drinking Water. The said system has a small footprint and can treat 170L water/ tank/cycle, which is equivalent to 2,000 L/day for an 8-hr operation. The facility is also energy independent since it features a solar panel power system. Although the system was initially developed for use during disasters, it can also be utilized by communities that have no ready source of potable water.

The UpEDS has been deployed and installed for performance testing at Sitio Bakal, Quezon City. Sitio Bakal was chosen as the site for pilot testing as it is one of the most marginalized urban communities within Metro Manila. The LGU also lacks equitable access to clean and safe water, as their primary source is a privately-owned single hand pump located at the center of the community.

The project team has also conducted training for operators at the said LGU, for the proper handling and operation of the system.

Development of an Algal-Bacterial (ALBA) Wastewater Treatment System



Rapidly growing pig farming industry worldwide has led to an increase in environmental degradation and pollution resulting from piggery waste which contains a considerable amount of unstabilized organic matter, and high ammonia-nitrogen concentration. To answer this, DOST-ITDI developed a treatment set-up for swine wastewater in order to help industries comply with DENR standards. An integrated microalgae-bacteria (ALBA) system was developed that can be used as inoculum for the current wastewater treatment (WWT) set-up of ITDI in the treatment of wastewater from the swine industry to improve its performance.

Various isolates were purified and identified. ALBA was then cultivated and batch experimentation was conducted with variation in the percentage of sludge and sterile swine wastewater media. Nutrient removal was determined through analysis of chemical oxygen demand, total nitrogen, and total phosphorus. Growth of microalgae and cultivation were also observed.

Pilot-Scale Treatment of Fruit Waste for Biogas Production using Trichoderma harzianum

Food processing industries typically generate large volume of solid waste and effluents, with organic materials such as fruit and vegetable peels or trimmings as main solid wastes. Poor management of these solid wastes result to odor with poor management of these solid wastes.

Biomethanation, or anaerobic digestion of fruit and vegetable waste is an attractive strategy for these kinds of wastes, as it not only provides a proper solution to the disposal of biodegradable waste, but it can also be used for the production of methane, which has a high demand as an alternative energy source.

A 200-L portable biogas digester developed by DOST-ITDI was refurbished and leak tested. Start-up operation was conducted using manure collected from a materials recovery facility. Operations using mango peels and calamansi peels produced biogas averaging to 190 L/kg and 41 L/kg, respectively.

Detection of Enteroviruses (EnV) in Wastewater System using Polymerase Chain Reaction (PCR)

Currently, microbiological water quality is primarily assessed using bacterial indicators, however; these frequently fail to detect the presence of dangerous viruses. This is a major concern because viral pathogens present in effluent can endanger public safety by polluting environmental waters. Furthermore, the bacterial indicators may naturally grow in tropical environments, resulting in an inaccurate assessment of water pollution levels. As a result, alternative or additional monitoring systems can be required to improve wastewater surveillance and ensure public protection from waterborne disease. DOST-ITDI developed an alternative monitoring system of detecting enteroviruses (EnV) in wastewater systems using the Polymerase Chain Reaction (PCR).

In-silico analysis of different primer candidates for EnV members and possible indicator organisms was conducted. Primer candidates were synthesized, and RNA extraction, PCR, and gel electrophoresis were conducted to various wastewater samples.

Preliminary Consumer Safety Studies on PFAS (Per- and Poly-Fluoroalkyl Substances) in Paper-Based Packaging of Most Common Takeout and Delivery Food Products During the COVID-19 Pandemic

This project is an initial study leading to more complex research on PFAS relative to consumer safety studies. PFAS concentrations in packaging of selected takeout and delivery foods in Metro Manila were determined. Detection of several PFAS compounds suggests the need for capability enhancement at the local setting, development and validation of methods, expansion of baseline studies, and public awareness, all of which will be addressed in the succeeding phase of the project.

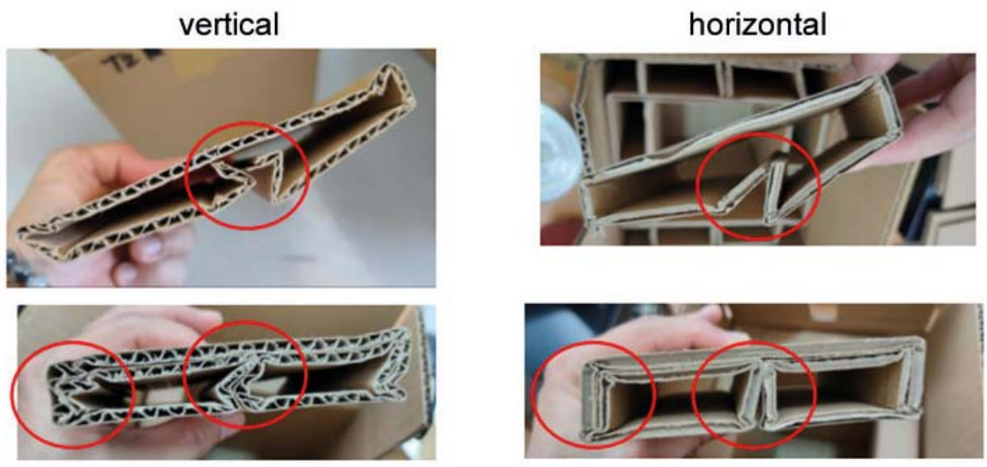
Quality and Safety Monitoring of Chilled Ready-to-Heat/Eat Foods Using Intelligent Packaging with Time Temperature Indicators

Use of intelligent packaging such as time-temperature indicators introduces an effective packaging system for monitoring the quality of ready-to-heat/eat meal preparations along the distribution chain giving information on the products' shelf life. The reliability of using intelligent packaging (time-temperature indicators) in monitoring the quality and safety of chilled ready-to-heat (RTH) meals such as *tocilog* and lasagna simulating the actual conditions in the supply chain.

For the initial evaluation, lasagna and *tocilog* were evaluated in terms of sensory, physico-chemical and microbiological properties. Samples of RTH meals were evaluated based on different sensory attributes (appearance, odor, texture and overall acceptability). Initial microbiological tests showed that the samples are within the FDA food standards. Meanwhile, two brands of time-temperature indicator were tested at abusive temperatures of 13°C and 16°C to assess the reliability of TTI performance in terms of threshold temperature and dye movement. Based on the evaluation, the TTI samples provided by the local distributor performed within the stated specifications.

Development of Generic Designs of Internal Packaging Made from Corrugated Boards for Non-Food Product Protection

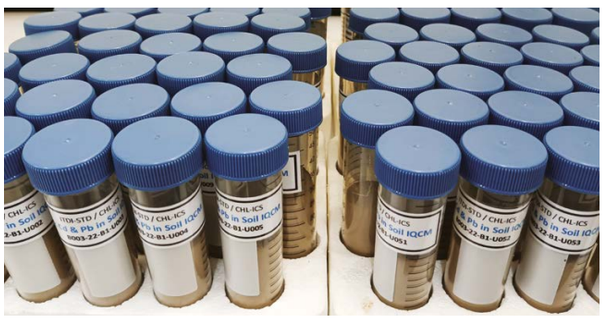
Generic cushion or internal packaging designs were developed by cut and fold techniques similar to making corrugated boxes to ensure products are well-protected from damage due to shocks occurring while in transit. These internal packaging materials were also used for functions other than cushioning, such as immobilizing the products in the box and locking them in place, or filling a void. Generically designed, these packaging materials are flexible enough to adjust to different shapes and product characteristics (fragility) as well.



Development and Validation of HPLC for Food Samples

Test methods for Vitamin A, Vitamin D3, and Folate and Folic Acid analysis in food were developed and validated using High Performance Liquid Chromatography (HPLC) for phase-in as new test services of the Standards and Testing Division. A training manual was also crafted for Vitamin A analysis using HPLC.

Development of Internal Quality Control Material (IQCM) for As, Cd, Hg, and Pb in Soil



Soil Internal Quality Control Material (IQCM) for trace metals Arsenic (As), Cadmium (Cd), and Lead (Pb) were produced that will be used to establish quality control in routine analyses. Homogeneity and stability tests of the produced IQCM were conducted and resulting concentrations of the trace metals in bulk of the IQCM were also checked.

Enhancement of Fuel Testing Capability on Self-Heating, Proximate and Ultimate Analyses in Coconut Shell-based Charcoal Briquettes and Activated Carbon

Through this project, the institute aimed at enhancing its capability for proximate, ultimate and self-heating test of coconut shell-based charcoal briquettes and activated carbon through method validation. Method validation of moisture, volatile combustible matter, ash, carbon, hydrogen, nitrogen, and sulfur were completed for the following performance characteristics: Detection limit (LOD and LOQ), Precision, and Trueness. Self-heating test will also be added as a new technical service to cater the needs particularly of the activated carbon industry.

Also, to further assist industries in their fuel testing requirement, a survey was conducted to determine the capability and needs of fuel testing in the Philippines. Data generated were used as baseline information on the conduct of training/ capacity building to the different testing laboratories in the country.

Development of Internal Quality Control Material (IQCM) for Anions in Aqueous Solution from Laboratory Chemical Wastes

Internal quality control material (IQCM) that will be used to establish quality control in routine analyses of anions in aqueous solution samples.

All expired and wastes of anions (Bromide, Chloride, Fluoride, Nitrate, Nitrite, Phosphate and Sulfate) stock, intermediate, and working standards were collected and homogenized. Concentrations of the anions in the mixed chemical wastes were determined and prioritized anions for the IQCM characterization were already identified. On the other hand, homogeneity test was conducted and the produced IQCMs were determined to be sufficiently and adequately homogenous.

Validation of Test Method for the Determination of Arsenic in Fish

The metalloid Arsenic may be present in fish and will pose harm to consumers if undetected. Test method for the quantification of Total Arsenic (As) in the edible parts of fish samples using the hydride vapor generation - atomic absorption spectrophotometric method (HVG-AAS) was conducted. The validation included the method detection and quantitation limits, method precision (repeatability and intermediate precision), and method trueness through recovery. This validated test method will be phased-in as new testing service to ensure food safety.

Thermal Process Validation of Traditional and Ethnic Bottled Products- Acidified-Pasteurized Vegetables (Ubod, Ampalaya and Mixed Vegetables)

The project focused on assessing the safety and quality of acidified-pasteurized vegetables packed in laminated plastic pouches by conducting heat penetration and heat distribution tests using a laboratory set-up heating vessel that processed the acidified vegetables using mild heat pasteurization treatment (55°C).

The project also aims to modify and improve the existing formulations and processes of ITDI developed pickled products which can be used in the development of training module for vegetable processing.

Accomplishments:

- Validated processing schedule of two (2) acidified vegetables packed in glass bottles and laminated pouches using mild pasteurization treatment
- Developed shelf stable acidified vegetables packed in laminated pouch (pickled kangkong stalks, radish and cucumber)
- Developed training module for the production of acidified (pickled) vegetables

PICKLED KANGKONG IN POUCH

PICKLED RADISH IN POUCH

PICKLED CUCUMBER IN POUCH

Establishment of Used Palm Olein's Shelf life through Physicochemical Characterization Derived from Vacuum Frying of FIC-Developed Products: Okra, Carrots and Jackfruit

From year 2017 to 2020, several adopters of the vacuum frying technologies were able to undergo trainings from DOST ITDI's FIC-Main. From the adopters of the vacuum frying technologies, a small percentage continued in the commercialization stage due to investment constraints in acquiring vacuum fryer equipment and the high cost of raw materials, especially oils. Since there is limited information on oil quality assessment for frying vegetables under vacuum conditions, this study aimed to determine the maximum number of frying cycles for okra and carrot chips production using the DOST-Developed vacuum fryer with the following frying oil types: coconut oil and palm olein.

The project has partnered with upstream partners from St. Isidore "The Farmer" Learning Center Inc. and Mthiraya Food Corporation, located respectively from Bulacan and Benguet, to supply sustainable raw materials resulting to production of standardized products from defined raw material varieties.

Pilot scale production operations for vacuum frying okra and carrot chips were performed; subjected oil samples collected for physico-chemical analyses and gathered market test responses from project cooperators as to the market acceptance of produced vegetable chips from varying frying cycles. Results or information gathered from this study are also vital to DOST rFICs and technology adopters such as on the use of oil during vacuum frying; while researchers may be guided in their R&D, doing financial projections, and designing training mechanisms for technology adoption. mechanisms for technology adoption.

Development of Potential Natural Antimicrobial from Local Food Ingredients and Food Application

Preliminary trial of product application in *Macaroons: Control, and levels of incorporation is 0.15%, 0.1%, and 0.05%*

Kaffir lime (Citrus hystrix DC.) is an essential ingredient commonly used in Southeast Asian cuisine. The kaffir lime leaves are unique because of its hourglass-shaped double leaves appearance and distinctive intense citrusy aroma. In this study, the potential of kaffir lime leaf extracts and its essential oil as a natural antimicrobial was determined. The water (65.6-72.7%) and ethanol (5.06-6.45g) leaf extract and the essential oil was obtained through solvent extraction and hydro distillation (0.4-0.8%), respectively. The susceptibility of common food spoilage microorganisms (Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, and Salmonella typhi), yeast (Candida albicans), and mold for yeast (Aspergillus brasiliensis) towards the leaf extracts and essential oil were determined using disk diffusion assay. Results of the assay show that the yeast and mold were more susceptible to ethanol leaf extract and kaffir lime leave essential oil (KLLEO). In terms of antioxidant activity using the DPPH assay, the water leaf extract showed the highest radical scavenging activity as compared to the ethanol leaf extract.

Application of KLLEO to food commodities that commonly deteriorate due to yeast and mold was conducted. Varying levels of KLLEO were applied to bakery products like pandesal (0.1%, 0.2%, and 0.3%); macaroons (0.15%, 0.10%, and 0.05%); lemon bars (0.01%, 0.005%, and 0.003%); mango juice (0.01%, 0.005%, and 0.003%), while for pastillas, an edible film was used as carrier of various levels of essential oil (0.01%, 0.005%, and 0.003%) to test its feasibility as a natural antimicrobial. Based on the results of this study, there is a potential extension of shelf-life in mango juice (0.01% and 0.005%) and pastillas (0.01%, 0.005%, and 0.003%). However, it is recommended to consider the use the lowest possible concentration ranges since essential oils from Kaffir lime leaves are concentrated which may affect the taste and flavor of food. Further studies can be conducted to validate these results.

Results of the study were presented to PhilAAS (poster presentation) and AhEDMRI (paper presentation).

Development and Assessment of Gender-Responsive Food Technologies Appropriate for Business Enterprises Development (Phase 3)

Aiming to increase interest for technology adoption, researchers, through this project, attempted to look into the target markets' perceptions (as to market acceptability) of developed technologies and gathered their responses.

The resulting information (e.g., market size, requirements) can be useful as reference or guide to potential adopters; as well as in process iterations or reformulations, and even for profitability analysis. The respondents composed of raw material suppliers, SMEs/manufacturers and toll processors, including distributors, all components of the identified supply chain.

Also conducted were thermal validation tests for all the identified products, pilot-scale production, and market tests per product sector. As well, the products went through the standard product development stages such as formulation, process standardization, sensory evaluation studies, microbial and physico-chemical analyses; and shelf life studies.

With all the shared inputs from the market tests, sets of focus group discussions (FGDs) and key informant interviews (KIIs) and validated product's process and formulations, the developed technologies such as the RTE Chicken Egg, mungbean coconut milk beverage, rice drink and ready-to-eat beef-filled suman were adopted by the following: Batangas Egg Producers Multi-Purpose Cooperative (BEPCO) and SwissPharma Research Laboratories, Inc.

Porous Inorganic Nanocarriers In Drug Delivery System - Year 2

Porous inorganic nanocarriers from indigenous nanomaterials in drug delivery system, particularly for anti-inflammatory drug were developed. The researchers aimed to develop a localized drug delivery system to widen the application of developed nanomaterials from indigenous mineral deposits. This involved the characterization of drug loaded nanocarriers, optimization of parameters for producing drug loaded nanocarriers, and performance testing of drug delivery system.

3D Printed Carbon-based Flexible Piezoresistive Wearable Sensor for Smart Device Gesture to Speech Applications - Phase 2

Flexible sensors have substantial potential for smart device gesture to speech applications. This technology alleviates psychological and social impacts on blind and deaf persons that experience impaired ability to properly communicate with another person. In the Philippines, innovative technology of this type is scarce or yet to be developed. Through this project, a 3D printed carbon-based flexible piezoresistive wearable sensor for smart device gesture to speech applications was optimized.

The parameters for the prototyping of flexible sensors dispersed carbon nanotubes in water using sodium cholate as dispersing agent were enhanced. Multi-walled carbon nanotubes were effectively dispersed in water through probe sonication. Sodium cholate was used to stabilize the nanoparticles in water. Meanwhile, multiple geometrical configurations of the prototype using MS Lattice were prepared. Cubic and rectangular configurations for Gyroid, Diamond and Scharz unit cells were made. The STL generated from MS Lattice was imported to the SLS 3D printing software, Sinterit Studio, for 3D printing of the prototype wearable sensors.

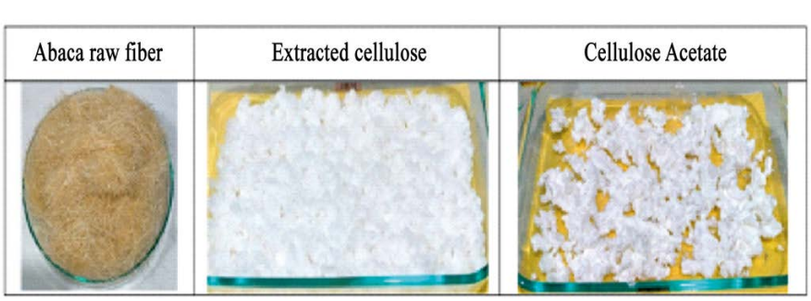
Development of an Antimicrobial Wound Dressing from Bacterial Cellulose-Nanoclay Composite - Phase 2

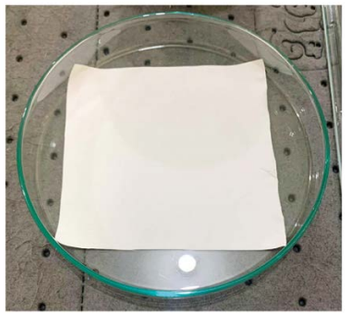
One strategy to improve the properties of bacterial cellulose as an antimicrobial wound dressing is through the incorporation of nanomaterials that exhibit antimicrobial activities. In the first phase of this project, bacterial cellulose-nanoclay composite was developed as a wound dressing material. Phase 2 of this project involved the addition of another antimicrobial agent, silver, as a means to further improve the antimicrobial activity of the developed wound dressing, which inhibited even viruses. This modification gave the composite enhanced antimicrobial property, which was attributed to the synergistic effect between nanoclay and silver. The wound healing property of the developed composites was also studied. Bacterial cellulose developed from this study showed similar properties with the commercial wound dressing, based on tensile strength and exudate absorption.

Cellulose Nanocrystals (CNC) Derived from Ananas comosus Leaves for Industrial Applications and Biomedical Applications

Cellulose nanocrystal (CNC) were prepared from pineapple leaf agro-waste by different chemical treatments namely, mercerization, bleaching, and acid-hydrolysis at a lower concentration. The CNC was characterized in terms of functional group analysis, crystallinity, percentage yield, and morphology. High quality CNC was successfully isolated from agro-waste pineapple crown leaf at a more economical approach. Properties of the CNC could be used as reinforcement in high-performance nanocomposites, functional nanocoating, drug delivery system.

Development of Bioinspired Composite Membrane Separators for Advanced Rechargeable Lithium-ion Batteries - Phase 2: Evaluation and Testing of the Bioinspired Membrane Separators in Rechargeable Lithium-ion Batteries

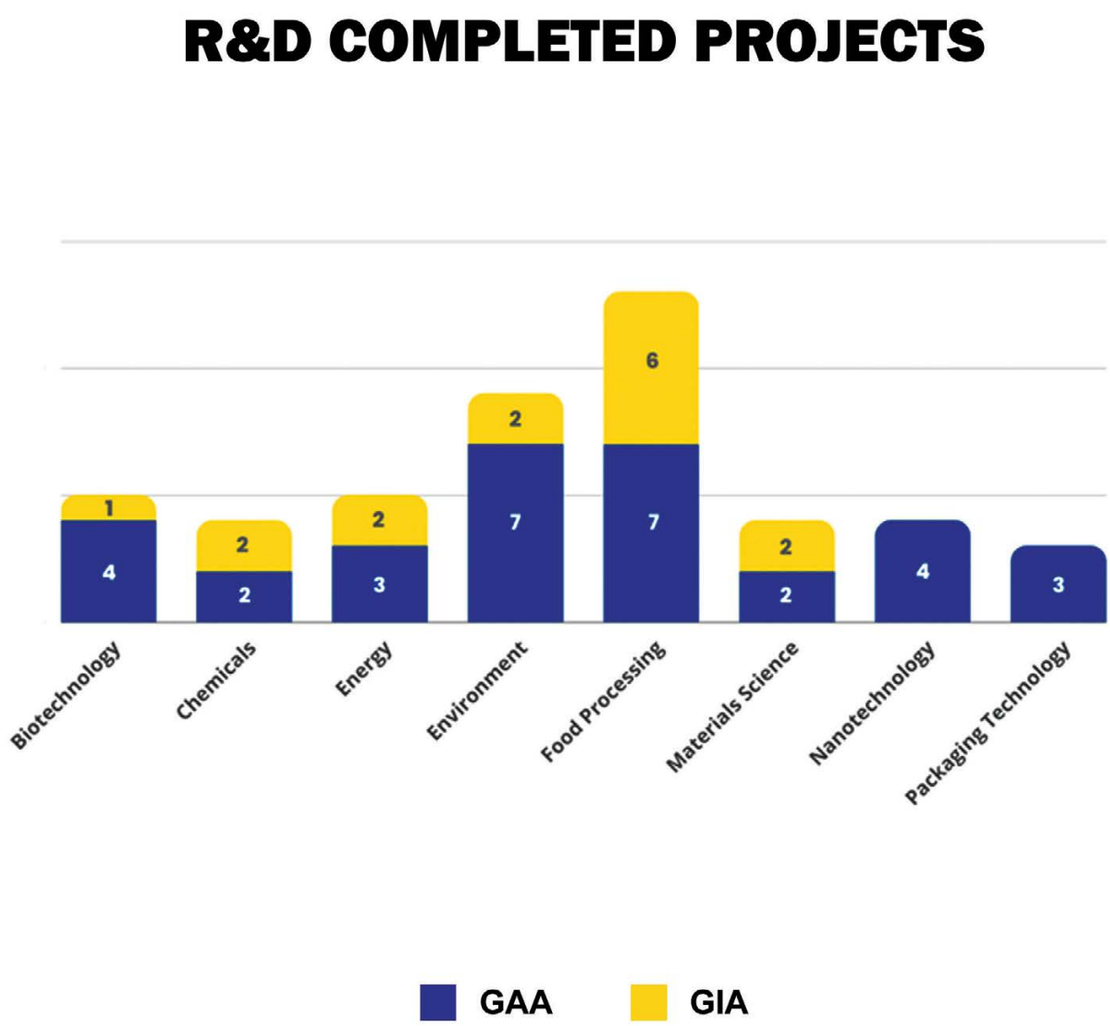




This study utilized bioinspiration in the fabrication of smart polymeric membrane separators for advanced rechargeable lithium-ion battery applications. Abaca-derived cellulose acetate composite membrane separators were fabricated using non-solvent induced phase separation (NIPS). Dopamine was then coated to the fabricated membrane separators increasing their surface energy with an increase in hydrophilicity. Physico-chemical and electrochemical properties of the fabricated membrane separators were also analyzed. These membrane separators can be used in rechargeable lithium-ion battery and similar technology.

List of Completed Projects

A total of **47 projects were completed** this year, **32** of which were funded by the **GAA** budget of the Institute while the other **15** projects were funded under **GIA** of DOST and other funding agencies. Below is the number of completed projects classified in terms of various technical fields engaged in by DOST-ITDI including Biotechnology, Chemicals, Energy, Environment, Food Processing, Materials Science, Nanotechnology, and Packaging Technology:



INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE
GAA 2022 Completed Projects

No.	Project Title	Lead
1	***RDR-CED-2021-03*** Development of Microcontroller & Minicomputer Applications for Selected Equipment Units of the MMIC and a Bench-Scale Hydrothermal Carbonization Equipment of the CED Laboratory	JL Herrera
2	***RDR-CED-2021-04*** Sensory and Physicochemical Refinements in Some Personal Healthcare Products Using Calamansi Essential Oils	EG Panerio
3	***RDR-CED-2022-01*** Development of Copper-Based Nanomaterial as Additional Layer for Masks	CG Mendoza
4	***RDR-CED-2022-02*** Design of Energy Material from Biomass-derived Starting Material as Nanofiller for Fabrication of Hybrid Composite for Fuel Cell Application	RP Parreño Jr.
5	***RDR-EBD-2020-04*** Design, Modeling, and Simulation of an Improved In-vessel Composting System	DL Herrera / JT Tuazon
6	***RDR-EBD-2020-05*** Development of Air Biofilters for the Control of Ammonia	CS Valdecanas / BJ Gutierrez
7	***RDR-EBD-2020-07*** Upgrading of the Emergency Water Disinfection System	DC Vergara
8	***RDR-EBD-2021-03*** Biofilm Inhibitory Activity of Talisay *(Terminalia catappa L.)* Leaf Extract Against Shrimp Pathogen *Vibrio sp.* and its Potential as Feed Supplement Phase 1	JPMD Guzman
9	***RDR-EBD-2022-01*** Pilot-Scale Anaerobic Digestion of Fruit and Vegetable Waste for Biogas Production CENMACO, Inc.	DL Herrera

No.	Project Title	Lead
10	***RDR-EBD-2022-02*** Biofilm Inhibitory Activity of Talisay *(Terminalia catappa L.)* Leaf Extract Against Shrimp Pathogen *Vibrio sp.* and its Potential as Feed Supplement Phase 2: Immunomodulatory effects of Talisay-supplemented Feed on Vibrio-challenged Whiteleg Shrimp *(Penaeus vannamei)*	JPMD Guzman / SDA Mantaring
11	***RDR-EBD-2022-03*** Microbial and Chemical Profile of Kombucha Tea Made from Different Symbiotic Colonies of Bacteria and Yeasts (SCOBYs) in the Philippines Phase 1. Phenotypic and Genotypic Characterization of Microorganisms Responsible for Kombucha Fermentation (Year 1)	IJL Castro
12	***RDR-EBD-2022-04*** Detection of Enteroviruses (EnV) in Wastewater System Using Polymerase Chain Reaction (PCR)	JPG Jose
13	***RDR-EBD-2021-01*** Development of an Algal-Bacterial (ALBA) Wastewater Treatment System	PJF Margarito
14	***RDR-FPD-2021-01*** Modified Texturization Procedures of Restructured Fruits for Thermal Processing Applications	JC Ocasla
15	***RDR-FPD-2021-02*** Thermal Process Validation of Traditional and Ethnic Bottled Products- Acidified-Pasterurized Vegatables (Ubod, Ampalaya and Mixed Vegatables)	ME Evaristo
16	***RDR-FPD-2021-04*** Improvement of Functional Components of Existing Horizontal Water Spray Retort	RT Barcala, Jr.

No.	Project Title	Lead
17	***RDR-FPD-2021-03*** Development of Potential Natural Antimicrobial from Local Food Ingredients and Food Application	RM Gomez
18	***RDR-FPD-2022-02*** Physicochemical Characterization of Used Palm Olein and Coconut Oil from Vacuum Frying of Okra and Carrots as Affected by the Frying Cycle	MB Macaraeg
19	***RDR-FPD-2022-04*** Pilot Scale Production and Market Testing of GAD-Developed Shelf Stable Food Products	MB Macaraeg
20	***RDR-MSD-2022-01*** Porous Inorganic Nanocarriers In Drug Delivery System - Year 2	JR Celorico / AK Collera
21	***RDR-MSD-2022-02*** 3D Printed Carbon-based Flexible Piezoresistive Wearable Sensor for Smart Device Gesture to Speech Applications - Phase 2	MCO Que / JR Celorico
22	***RDR-MSD-2022-03*** Development of an Antimicrobial Wound Dressing from Bacterial Cellulose-Nanoclay Composite - Phase 2	CS Emolaga / MA Paglicawan
23	***RDR-MSD-2022-04*** Cellulose Nanocrystals (CNC) Derived from *Ananas comosus* Leaves for Industrial Applications and Biomedical Applications - Phase 1	MA Paglicawan / PAN de Yro
24	***RDR-MSD-2022-05*** Development of Bioinspired Composite Membrane Separators for Advanced Rechargeable Lithium-ion Batteries - Phase 2: Evaluation and Testing of the Bioinspired Membrane Separators in Rechargeable Lithium-ion Batteries	MT Margarito

No.	Project Title	Lead
25	***RDR-PTD-2021-03*** Quality and Safety Monitoring of Chilled Ready-to-Heat/Eat Foods Using Intelligent Packaging with Time Temperature Indicators	CM Bihis
26	***RDR-PTD-2022-03*** Development of Four Generic Cushion Designs Made from Corrugated Boards for Non-Food Product Protection	FS Victoria
27	***RDR-PTD-2022-05*** Preliminary Consumer Safety Studies on PFAS (Per- and Poly-Fluoroalkyl Substances) in Paper-Based Packaging of Most Common Takeout and Delivery Food Products During the COVID-19 Pandemic	EKP Encarnacion
28	***RDR-STD-2021-01*** Development and Validation of HPLC Methods for Food Samples	CC Ramil
29	***RDR-STD-2022-01*** Program: Enhancement of ITDI-STD Fuel Testing Services Phase 1: Validation of Test Methods for Self-heating, Proximate and Ultimate Analyses in Coconut Shell-based Charcoal Briquettes and Activated Carbon	JCO Alfaro
30	***RDR-STD-2022-02*** Development of Internal Quality Control Material (IQCM) for Anions in Aqueous Solution from Laboratory Chemical Wastes	RL Damian
31	***RDR-STD-2022-04*** Validation of Test Method for the Determination of Arsenic in Fish	ARC Dablio
32	***RDR-STD-2021-02*** Development of Soil Internal Quality Control Material (IQCM) for As, Cd and Pb	ARC Dablio

INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE
GIA 2022 Completed Projects

No.	Project Title	Lead
1	***RDA-CED-2020-02*** Design and Prototyping of Salt Harvesting Machine	OC Evangelista
2	***RDA-CED-2020-03*** Nanostructured Herbal Extract of *Momordica charantia* (Bitter melon/Ampalaya), *Allium sativum* (Garlic) and *Curmuma longa L.* (Turmeric) as Antidiabetic Agents	EA Ongo
3	***RDA-CED-2021-01*** Deployment of Energy Monitoring Application and Network at DOST (DEMAND) as Demonstration Sites	AVO Bawagan
4	***RDA-CED-2021-03*** Government Energy Management Program (GEMP) Compliance Assessment of Local Government Units (LGUs)	AVO Bawagan
5	***RDA-EBD-2020-02*** Cataloging Possible Philippine Strains of Zika and African Swine Fever Viruses and Coconut Cadang-Cadang Viroid through Genome Sequencing	GJM Sikat
6	***RDA-EBD-2022-03*** Waste Analysis and Characterization Study (WACS) in Public Markets: Support to Effective Solid Waste Management of Selected Public Markets in Manila	ML Tansengco
7	***RDA-EBD-2022-04*** Economic and Life Cycle Analysis of Single-use Plastic in the Philippines	DC Pangayao
8	***RDA-FPD-2020-11*** Plant Protein Products from Local Sources	AC Flores

No.	Project Title	Lead
9	***RDA-FPD-2021-01*** Development of Halal Compliant Dehydrated Food Products from Selected Food Materials (Fruits, Vegetables and Rootcrops)	MEM Falco
10	***RDA-FPD-2021-02*** Establishment of Halal Assurance System For Selected Food Ingredients (Dried and Powdered Onions, Garlic, BlackPepper and Chili)	MEM Falco
11	***RDA-FPD-2021-03*** Development of Draft Standards and Recommended Code of Practice for Processing of Peanut Butter	MC Manabat
12	***RDA-MSD-2019-01*** Program: Advanced Additive Manufacturing R & D Project 1: Development of Multiple Materials Platform for Additive Manufacturing (MATDEV)	MT Margarito
13	***RDA-MSD-2021-01*** ADMATEL Expansion Towards Long Term Competitiveness and Sustainability- Phase 2: ADMATEL geared for PHL Industry 4.0	AM Monsada
14	***RDA-PMISD-2021-01*** Development of FIC Competency in Moving New Products from Concept to Market Launch	ZV Ang
15	***RDA-STD-2021-02*** Towards Leveling-up OneLab for Research, Development and Innovation	AV Briones
16	***RDA-STD-2022-??*** Scale-up Production, Stability and Application of Natural Colorants for Cosmetics	MRV Parcon

Highlights of ITDI's 6Ps

Places reached and facilities established

DOST-ITDI was able to reach a total of 101 places in terms of consultancy, trainings, technology transfer, and product launches, among others. This year, DOST-ITDI unveiled its Simulation Packaging and Testing Laboratory and Green Packaging Laboratory as the final facility to be established under the Big 21 in 2021 program of the DOST. Here are the highlights of these activities:

Unveiling SPTL and GPL

The 'Unveiling of simulation packaging testing laboratory (STPL) and green packaging laboratory (GPL)' was held last June 20 at the SPTL/GPL site inside the DOST Compound, Bicutan, Taguig. The event was led by DOST Secretary Fortunato De La Peña, DOST Undersecretary for R&D, Dr. Rowena Cristina Guevara, DOST-ITDI Director, Dr. Annabelle V. Briones, and other officials of DOST and ITDI. It was attended by key players from the industry such as the Packaging Institute of the Philippines (PIP), Unilever Philippines, Healthy Options, Grab Philippines and Kerry Philippines among others. JICA Philippines also conveyed its support to the establishment of the two laboratories. The theme of 'Creating Globally Competitive Packaging Innovations for the Filipino' is a testament of DOST's continuous commitment to elevate the level of packaging research in the country. This project which is the last of the DOST's Big 21 in 2021 state of the art facilities to be made available to the public starting August 2022 is being implemented by the DOST-ITDI Packaging Technology Division or PTD. Establishing the SPTL provides a venue to simulate the actual hazards that packaged products will undergo during distribution while GPL provides option and alternative packaging materials and technologies that are green and sustainable.

STD in RSTL Central Visayas

The Standards and Testing Division's Admer Rey Dablio, RCh, CCPQM and Isaiah U. Sta. Ana, RCh, trained the technical staff of the Regional Standards and Testing Laboratories (RSTL) of DOST Region VII (Central Visayas) at Cebu City on the Computation of Uncertainty of Measurement, Root Cause Analysis, and Effective Corrective Action on September 15-16.

Energy Assessment

The representatives of the DOST-ITDI and the Department of Energy (DOE) conducted a one-day energy assessment of the City Hall Building last August 24 to evaluate power consumption. Local office's usages have been randomly evaluated by checking their consumption rates, electronic devices and other equipment. Certain documents were also checked relating to said procedures.

Salt Technology Equipment Deployment in Occidental Mindoro

The salt processors in Occidental Mindoro got a technology boost as DOST-ITDI turned over its salt technologies at a ceremony held on June 22at the Processing Plant of the Tamaraw Salt Producers Cooperative (TAMACO) in San Jose, Occidental Mindoro.

Products/Processes

InnovEats

With the emerging consumer need for healthier and tastier food products, the Department of Science and Technology (DOST) thru the Industrial Technology Development Institute in partnership with Food Innovation Centers (FICs) in the Philippines officially launched 32 qualified food product prototypes from various FIC clusters through the InnovEats last June 25.

ProdukTo Merkado

With the aim to help entrepreneurs and institution researchers in conceptualization of product development to market opportunities, DOST-ITDI participated in DOST Region V's "ProdukTo Merkado: Stage-gate Process of Innovative Product Development and Marketing" last December 5 at The Pepperland Legazpi City and via Zoom, where ITDI's Deputy Director for ATS Dr. Zorayda V. Ang delivered a talk on the stage gate process for innovative product development and marketing.

Partnerships

Committed to being a reliable and relevant partner of Philippine industries, the institute consistently forged partnerships with a total of 62 for the year, on diverse areas as R&D collaboration, technical trainings, and systems development and deployment. Highlights of these activities are as follows:

SwissPharma

Swiss-Filipino pharmaceuticals manufacturer Swisspharma Research Laboratories, Inc., has partnered with DOST-ITDI to do contract research in support of ITDI's various R&D and technical services. Signing the Memorandum of Understanding at the Almanzor Hall on October 24 were ITDI Deputy Director for R&D Dr. Christine Marie C. Montesa and Deputy Director for ATS Dr. Zorayda V. Ang, while Swisspharma was represented by its President Mr. Benjamin G. Tantiansu and Business Consultant Ms. Natalie Gerundio.

BEPCO

Batangas Egg Producers Multipurpose Cooperative (BEPCO), an agricultural cooperative, inked a Memorandum of Agreement (MOA) to adopt DOST-ITDI Food Processing Division's product, the Ready-to-Eat (RTE) Chicken Egg, an all-natural product with no added preservatives, has a five-month shelf life, and packed in retort pouch for easy distribution. The signing was held at BEPCO, San Jose, Batangas last October 14 as part of the World Egg Day Celebration, with the theme "Eggs for Better Life." Present were DOST-ITDI Deputy Director for R&D Dr. Christine Marie C. Montesa, DOST-ITDI Senior SRS Ms. Michelle E. Evaristo, together with BEPCO's Chairperson Mr. Victorino Michael I. Lescano, BEPCO's Cooperative Secretary Ms. Sheila Marie C. Chavez, BEPCO's Managing Director Ms. Cecille A. Virtucio, Cong. Nicanor Briones, Batangas Vice Governor Jose Antonio "Mark" Leviste II, and San Jose, Batangas Mayor Valentino "Ben" Patrol.

KFRI

DOST-ITDI strengthened R&D ties with Korea Food Research Institute (KFRI) through an MOU signing ceremony last September 22 led by DOST-ITDI Director Dr. Annabelle V. Briones and KFRI President Dr. Hyunghee Baek. DOST-ITDI and KFRI have an ongoing collaboration through the Technology Advice and Solutions from Korea (TASK) Program of Korea Institute for Advancement of Technology (KIAT), currently in its 2nd Phase (2021-2023). The MOU covers other possible collaborations between the two institutions.

TUP Taguig

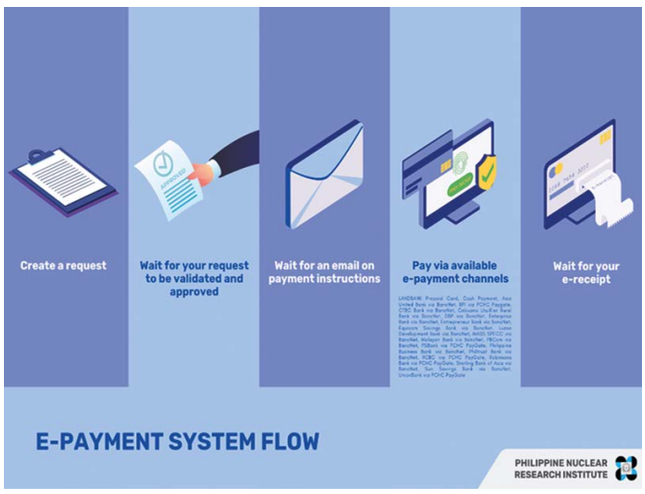
DOST-ITDI through ADMATEL, led by Director Annabelle V. Briones, and and the Technological University of the Philippines (TUP)-Taguig represented by Director Selfa J. Briones, signed an MOU last September 13, as witnessed by other officials from both parties.

This collaboration involves training and immersion program (covering the theory, basic operations, applications, data analysis and interpretation of data) using applicable state-of-the-art equipment for TUP-Taguig faculty and students involved in the conduct of collaborative R&D on identified priority areas.

PNRI

Clients of the Department of Science and Technology-Philippine Nuclear Research Institute (DOST-PNRI) will now have quicker and easier transaction when paying for PNRI's services, including permits and licenses. Through the ePayment system, clients will no longer have to travel to DOST-PNRI but will just have to log in to the online portal for their payment transactions.

Developed by the DOST-ITDI, the ePayment System framework is composed of various interconnected information sub-systems which include modules on technical services, accounting, cashier, ePayment Portal. Commission on Audit, and Bureau of Treasury Remittance. The modules are integrated to the in-house developed enterprise information system of the DOST-PNRI through a Memorandum of Understanding signed last January 27 by representatives of the two institutes.



Zamcor

ZAMCOR Soap and Detergent Manufacturing, which produces various home care products as dishwashing liquids, liquid soaps, and others, has teamed up with DOST-ITDI for the contract research project, "Development of Pet Shampoo and Pet Deodorizer and Analysis of Existing Detergent, Soap, and Cleaning Formulations". Led by its President, Ms. Mellany Zambrano, ZAMCOR signed the Memorandum of Agreement with DOST-ITDI Director Dr. Annabelle Briones, along with ITDI Deputy Director for R&D Dr. Christine Marie Montesa and ZAMCOR's Administrative Supervisor Ms. Jessica Garado. Also present at the event were Special Guest Dr. Diana Ignacio, Assistant Secretary for Administration and Legal Affairs, as well as ITDI DD for ATS Dr. Zorayda Ang, Chemicals and Energy Division (CED) OIC Engr. Apollo Victor Bawagan, CED-Pharmaceuticals Section Head Dr. Elizabeth Panerio, and other staff from ITDI and ZAMCOR.

FGD with DSWD and DND of Developed EFR

To develop accessible and nutritious food rations for deployment during calamities, DOST-ITDI invited government partners for a Focus Group Discussion (FGD) and sensory evaluation of the ready-to-eat chicken egg and beef-filled suman; as well as the ready-to-drink rice milk and coconut mungbean milk last April 19. The event was headed by Dr. Annabelle Briones, DOST-ITDI Director; together with Dr. Zorayda Ang, Deputy Director for Administrative and Technical Services; and Dr. Christine Marie C. Montesa, Deputy Director for Research and Development. They were joined by TSD Chief Ms. Nelia Elisa Florendo, and OIC-FPD Chief, Ms. Ma. Dolor Villaseñor.

Participants from the Department of Social Welfare and Development were comprised of Asst. Secretary Rodolfo M. Encabo, Ms. Ma. Hazel Joy A. Ladera of DSWD's Disaster Response Management Group, and Mr. Rommel Aguilar from DSWD's Bangsamoro Umpungan sa Nutrisyon (BangUn) Program. Also present were Ms. Karen Kaye Caballero of the Department of National Defense - Philippines and Ms. Christine Buenvenida from Department of Education.

NRCP and UPD Institute of Chemistry

DOST-ITDI, National Research Council of the Philippines (NRCP), and UP Diliman's Institute of Chemistry inked a partnership to develop DOST's Pharmaceutical Research Center last April 12, 2022 through the project, "Reactivation of Pharmaceutical Section as a Tuklas Lunas Center for Pharmaceutical Development" that aims to facilitate advancement into the early drug development phase.

Having the expertise, the Pharmaceutical Section of DOST-ITDI can address bottlenecks in the early development pipeline. An important component is the upscaling of bench-scale formulation studies to pilot scales to be able to proceed to pre-clinical studies. ITDI Pharmaceutical Section has the capability to develop standardized formulations of herbals and/or the active extracts and/or drug candidates to a dosage form that is designed and prepared in compliance with the Philippine FDA current requirements and standards.

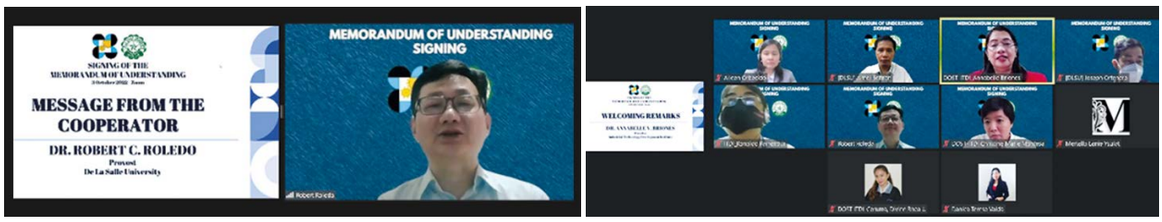
Colegio de Muntinlupa

The city-run Colegio de Muntinlupa and DOST-ITDI signed an agreement last March 22, for the promotion of 3D printing technology in the academe. Muntinlupa Mayor Jaime Fresnedi, CDM College President and former DOST-National Capital Region Director Dr. Teresita Fortuna, and DOST-ITDI Director Dr. Annabelle Briones signed a memorandum of understanding at the CDM Main Building in Barangay Sucat, Muntinlupa. Vice Mayor Artemio Simundac also joined the signing ceremony.

Davao Food Terminal

Envisioning to establish Davao Food Terminal Complex (DFTC) as the first hub of packaging technology transfer for fresh and semi-processed agricultural produce in Mindanao, the DOST-ITDI Packaging Technology Division and DOST Region XI, signed a Memorandum of Agreement with the Local Government Unit (LGU) of Davao City for the implementation of the DOST-DFTC Project last January 18 via Zoom platform.

De La Salle University



DOST-ITDI signed a Memorandum-of-Understanding (MOU) with De La Salle University last October 3 to formalize cooperation on the development and testing of energy materials and fuel cell components. This is a pioneering partnership of the institute with DLSU involving the establishment of its Fuel Cell Research and Development and Testing Facility, which will operate and welcome researchers by the first quarter of 2023.

People Services

Training on Operation, Maintenance, and Troubleshooting of DOST- developed Food Processing Equipment

DOST-ITDI organized the Training on Operation, Maintenance, and Troubleshooting of DOST- developed Food Processing Equipment. It was attended by BRFICC, Region I, Region XII, Region XIII, and BARMM from September 5 to 9. Participants were trained on the operation, maintenance and troubleshooting of the freeze dryer, water retort, vacuum fryer, spray dryer, cabinet dryer, can seamer, and vacuum packaging machine.

FEA Training Graduation

The training course on Finite Element Analysis was among the outputs of the partnership between Finite Element Institute of the Philippines (FEIP), DOST, National University, and FEATI University. Finishing the training course were 27 participants, 13 of whom were present at the awarding ceremony held at the Almanzor Conference Room of DOST-ITDI last August 25. After the awarding of certificates of completion to the graduating trainees, they toured the Materials Development Laboratory, housed at DOST-ITDI's Materials Science Division.

Waste Analysis and Characterization Studies

Trainings on Waste Analysis and Characterization Study or WACS have been conducted in different LGUs around the country to help capacitate them conduct their own WACS. WACS is an integral part in the preparation and updating of an LGU's 10-Year Solid Waste Management Plan. It is an important tool in determining the amount and composition of wastes generated by LGUs from different sources.

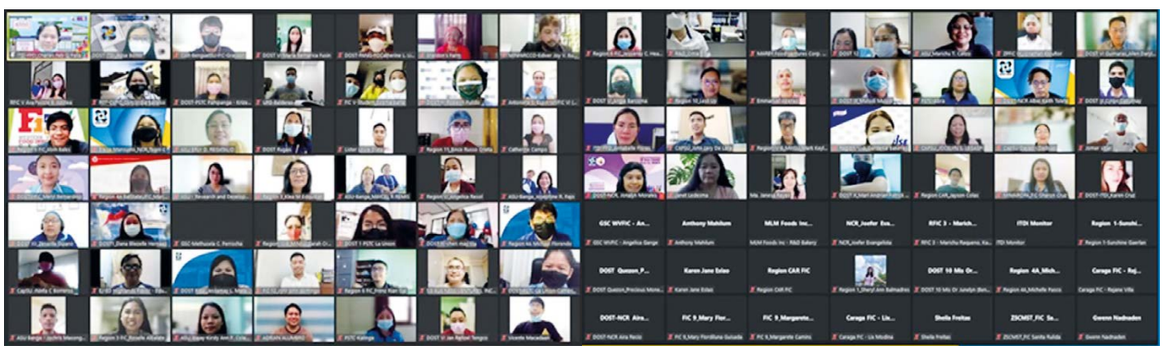
Bioreactor Operation Training in Palawan

DOST-ITDI, L. Angeles Machineries Corporation and PSTO Palawan conducted the *"Training on Operation of Bioreactor Equipment for the Operationalization of the Bioreactor Project"* held at the Aborlan Municipal Compound, Aborlan, Palawan last August 24.

A Closer Look into HHXRF

A hybrid seminar “A Closer Look into HHXRF Industry Applications” was presented Chemisphere Lab Sciences, in collaboration with ADMATEL last April 27. The handheld XRF is one of the newly added services under Nondestructive Testing (NDT). This state-of-the-art equipment meets the requirements of ISO 17025, an international standard for testing laboratories, with accredited scopes in linear and dimensional measurement and elemental analysis.

Online Training on Product Applications Using *Sagip* Nutriflour and Other Non-wheat Flour Industry Applications



The Food Processing Division, conducted a training on using Non-wheat Flour from Local Crops. A total of 140 participants from DOST Regional Offices, PSTCs, FICs, MSMEs, and the academe made butter cake using cassava flour, pandesal using banana flour, and brownies using sweet potato flour. Procedure for choco/nutri bar using *Sagip* Nutriflour was also presented.

Papers published and presented

DOST-ITDI published a total of **16 technical papers** in refereed journals coupled with a total of **42 paper and poster presentations** in various platforms both locally and abroad.

PUBLICATIONS

Development of Power Back-up System Using Motor Control for Large Equipment

FE. Del Pozo Jr., AVO Bawagan, and DRJ Ceruma; International Journal of Advanced Engineering Research and Science (IJAERS), 2022, https://dx.doi.org/10.22161/ijaers.98.35

ABSTRACT

Uninterruptible power supply became a vital technology in the modern era. Through the advancement of technology, the development of this kind of technology has been advancing as well in terms of size, efficiency, and the delivery of purpose and functionality. However, the compatibility of the device to a certain load remains to be the problem. With this, the researchers developed a power back-up system that can deliver the same purpose for any load including large and critical equipment. The storage system capacity was also modified, integrating the use of other energy sources such as new and renewable. The technology used motor control devices for the same purpose. To validate the effectiveness of the technology, the researchers used factorial design and compared its performance with a commercially available uninterruptible power supply. Results showed that there was no significant difference indicating that the power back-up system is efficient and equally reliable as the commercially available devices. Therefore, the power back-up system is highly adaptable, can substitute commercially available uninterruptible power supply, and can be an effective back-up system for large and critical equipment.

Screening for Production of Amylase and Protease by Locally-isolated *Bacillus spp.* from Soil Collected in Taguig City and Clark Freeport Zone, Philippines

JPMD Guzman, SDA Mantaring, and EGPanerio; Pharm Sci Asia 2022; 49(2), 202-209; DOI:10.29090/psa.2022.02.21.156

ABSTRACT

Amylase and protease are two of the most commonly used enzymes in the pharmaceutical industry. Particularly, *Bacillus spp.* is widely regarded as a “factory” of these enzymes. In this study, a total of 40 isolates were collected from four soil samples from different metropolitan sites namely, near Chemicals and Energy Division (CED), and National Metrology Laboratory (NML) oil tankers parking lot inside the Department of Science and Technology (DOST) Compound in Taguig City, and two metropolitan-volcanic sites in Clark Freeport Zone,

Pampanga (CRK1, CRK2). Of these, 33 isolates were deemed putative *Bacillus spp.* via phenotypic assays and were screened for the production of amylase and protease. Results showed that 26 of the screened isolates were able to produce protease and 12 were positive for amylase production. Molecular identification revealed that the enzyme-producing isolates were *Bacillus spp., B. cereus, B. aryabhattai, B. amyloliquefaciens, B. firmus, B. velezensis, and Fictibacillus sp.* No isolate was able to produce amylase alone. These results show the potential of *Bacillus spp.* from metropolitan soil as source of pharmaceutically-important enzymes.

Targeting Quorum Sensing and Biofilm Formation in the Control of *Vibrio harveyi* Infections in *Penaeus vannamei*

JPMD Guzman, P Yatip, C Soowannayan, and MBB Maningas; Aquaculture Research Volume 53, Issue 14;
https://doi.org/10.1111/are.15995

ABSTRACT

Vibriosis, a disease caused by *Vibrio spp.,* including *V. harveyi,* contributes to enormous economic loss to the shrimp aquaculture industry. With the worsening incidences of antimicrobial resistance in aquaculture, novel strategies for combating this bacterial infection are urgently needed. One of these is by targeting the bacterial communication system, called quorum sensing (QS), which is responsible for the expression of genes necessary for bacterial pathogenesis. Recently, bioactive compounds capable of inhibiting QS were identified. This review focuses on the discovery of bioactive substances from animal, plant, and microbial origins with the capability of inhibiting QS and biofilm formation, a mechanism important in the pathogenesis of vibriosis. Furthermore, recent developments in the use of these QS inhibitors (QSIs) as feed supplement for *Penaeus vannamei* shrimp were also discussed. These findings will provide the necessary information for the discovery, development, and eventual commercialization of these QSIs as tools in mitigating vibriosis in the shrimp industry.

What Happened Over the Last 10 years (2012 to >2021): A Bibliometric Analysis of Acute Hepatopancreatic Necrosis Disease (AHPND) Research in Southeast Asia

JPMDGuzman; Journal of Agriculture and Environment for International Development (JAEID), 116(2), 51-68.
https://doi.org/10.36253/jaeid-12852

ABSTRACT

This paper described the research landscape in Southeast Asia over the last 10 years (2012 to 2021) in terms of Acute Hepatopancreatic Necrosis Disease (AHPND), a shrimp disease prevalent in the region. Three hundred and ninety-six (396) records from Scopus database were screened for duplication and eligibility, to come up with a total of 155 papers used in the bibliometric analysis. Among all countries, Thailand produced the most publications, total citations, and the highest h-index. No papers from Brunei, Cambodia, Lao PDR, Myanmar, and Timor Leste on AHPND were obtained. Southeast Asian countries had strong linkages within the region and beyond. Overlay visualization of keywords used in publications over the last 10 years showed that there was a shift in focus from the diagnosis and characterization of the disease to treatments. Interestingly, there were no significant correlations between a country's research investments and productivity, possibly because of issues on allocation. However, there was a positive correlation between the region's research outputs and crustacean production. Limitations of the study include the use of a single database and the exclusion of non-peer reviewed papers. Nonetheless, these results may serve as basis on policymaking on AHPND research investments, prioritization, and allocation in Southeast Asia.

Immobilization of Dredge Material as Partial Substitute for the Production of Mortar

DC Pangayao , A Premacio, and C Borromeo; Journal of Applied Science and Engineering, 21 October 2022;
https://doi.org/10.6180/jase.202307_26(7).0014

ABSTRACT

Dredged material is composed of soil or sediment that may contain inorganic or organic pollutants such as heavy metals, volatile organic compounds, and persistent organic pollutants. This material is an environmental concern due to the considerable amount of contaminants it may carry. This contaminated dredged material can be used as a partial substitute for sand in mortar mix. Based on the characterization of the dredged material, it contains organic and inorganic compounds and heavy metals such as cadmium, chromium, and lead. Moreover, XRF and XRD analyses indicate the presence of quartz, iron, and silicon dioxide. Toxicity Characterization Leaching Procedure (TCLP) test shows that heavy metals from the dredged material can leach out into the environment if not treated or disposed of properly. Furthermore, particle size distribution showed that the material is in the range of clay to sandy making it a good substitute for sand. Through the immobilization technique, an optimized mortar mixture was determined. After 28 days of curing time, the optimum mortar mix was 10% dredge material and 90% sand by weight with a compressive strength of 17.6 MPa. Likewise, after immobilization, TCLP results show that the leachability of the mortar mix is below the standard limit set.

The Need for Wastewater Surveillance of Enteroviruses in the Philippines

JPG Jose 1, SDA Mantaring 1, and JPMD Guzman 2; Lancet Microbe, 22 June 2022;
https://doi.org/10.1016/S2666-5247(22)00178-1

ABSTRACT

Nguyen-Tran and colleagues in a 2022 paper in The Lancet Microbe, emphasised that both pathogen surveillance and immunological surveillance are important in addressing emerging pathogens, such as enteroviruses, and preparing for future epidemics and pandemics. The ongoing COVID-19 pandemic showed the urgent need for a comprehensive surveillance system to rapidly address threats of pathogens which can potentially cause health crises.

Influence of Abaca Fiber on the Performance of Abaca-Glass Reinforced Polymer Composite: IOP Conference Series; Materials Science and Engineering

MA Paglicawan, CS Emolaga, JMB Sudayon, and CL Custodio; 2022 IOP Conf. Ser.: Mater. Sci. Eng. 1250 012004;
DOI 10.1088/1757-899X/1250/1/012004

ABSTRACT

Woven abaca fiber also known as *"Sinamay"* is usually used in textile and handicraft industries. In this paper, the use of woven abaca fiber was utilized as a potential component in a fiber-reinforced polymer (FRP) composite material. The effects of increasing abaca fiber layer on the mechanical and water absorption properties of the copmposite was also studied. The composite laminates having 1, 3, 5, and 7 layers of woven abaca stacked in between of glass

fiber mats: plain-woven fabric and chopped strand and polyester resin as binder were fabricated by hand lay-up technique. These abaca-glass-fiber-reinforced polyester composite specimens were characterized using tensile test, flexural test, izod impact test, and water absorption test. Upon introducing and increasing the amount of abaca layers in the composite, the results showed that its properties were significantly changed. The mechanical strength was decreased while water absorbed was increased as the amount of abaca layer increases.

Mechanical Properties and Water Absorption of Glass-Fiber-Reinforced Composite Laminates Made by Varying Stacking Sequence: IOP Conference Series; Materials Science and Engineering

MA Paglicawan, CS Emolaga, CL Custodio, JM Sudayon, and RJL de Lara; October 2022, Materials Science Forum 1073:143-148; DOI:10.4028/p-58oc1n

ABSTRACT

The current pandemic brought to our attention the need for continuous research and development on the fight against pathogens. The use of derivatives of starch nanocrystals (SNC) with antimicrobial activities offers a good alternative to conventional antimicrobial agents since they can be sourced from readily available, biodegradable, and biocompatible raw materials. In this study, starch nanocrystals were prepared by acid hydrolysis and oxidized using hydrogen peroxide. The resulting oxidized starch nanocrystals showed inhibitory effect against *E. coli.* FTIR analysis showed that the antimicrobial activity could be due to the introduction of carbonyl groups in the starch chain. Due to the versatility of starch nanocrystals, other derivatives with improved antimicrobial activity or other tailored properties could also be developed.

Aquatic Toxicity Studies of Titanium Dioxide and Silver Nanoparticles Using *Artemia Franciscana Naupili* and *Daphnia Magna*

JP Reyes, JDP Lagdameo, JR Celorico, RA Almeda, MM Peralta, and BA Basilia; Journal of Materials Science and Engineering A 11 (10-12) (2021) 107-113; doi: 10.17265/2161-6213/2021.10-12.001

ABSTRACT

Manufactured nanomaterials are expected to enter the environment due to the increasing number of productions which result in anthropological discharges coming from different effluents and seepages. This event poses a potential threat to the environment, especially in the aquatic systems. TiO2 (titanium dioxide) and AgNPs (silver nanoparticles) have significant potential in antibacterial and antiparasitic applications, but despite their significant potential, the toxicity of metal oxide nanoparticles such as TiO2 and AgNPs restricts their use especially in humans due to their toxicity. In this study, the behavior and toxicity of TiO2 and AgNPs were investigated in aquatic systems using *Artemia franciscana nauplii* and *Daphnia magna. Nauplii* and *Daphnia* were exposed to TiO2 and AgNP dispersions at different concentrations. The mortality rates of the *nauplii* and *daphnia* were monitored at 6, 24, and 48 h after its exposure. Saltwater results showed that AgNP is highly toxic to the test organisms while TiO2 was non-toxic after 48 h of exposure. For freshwater, 100% mortality rate on neonates was obtained from the AgNPs dispersion during the first 6 h of exposure while the mortality rate in TiO2 dispersion was 85% at 100 ppm after 48 h of exposure.

Printable and Warpage Evaluation of Polypropylene /Nano Precipitated Calcium Carbonate Composite Prepared by Extrusion Based 3D Printing

MJ Comadre, JAC Sy, J Celorico, AK Collera; July 2022, Materials Science Forum 1066:99-104;
DOI:10.4028/p-h2j0v3

ABSTRACT

Polypropylene (PP) is a promising material for extrusion-based additive manufacturing due to its low cost, chemical resistance, good mechanical properties, versatile, and can be applied in various industrial applications. Recent research has focused on addressing the warpage issue in 3D printing of PP filaments. The effect of environmental conditions and loading of nanoprecipitated calcium carbonate (NPCC) in the pristine polypropylene to decrease warpage using the Fused Deposition Modelling (FDM) printing technology was studied. PP-NPCC composite filaments containing 5, 10, and 15 NPCC (wt%) were prepared using the twin-screw extruder. The printability, physicochemical, and mechanical properties of the PP-NPCC blends were determined. Based on the results, the incorporation of NPCC has contributed to the improvement of 3D printability and warpage in the PP-NPCC composite. At controlled environmental conditions, the filament was printable and the warpage was decreased by 44% at 10% NPCC loading. At the same concentration, there was a 30% increase in compressive strength and 43% increase in elastic modulus of the 3D printed parts.

Synthesis and Characterization of PSF-CQD Nanocomposite Membrane via Non-solvent Induced Phase Separation Technique

PA de Yro , DY Amor, SMG Navarro, GMO Quiachon & SR Cayabyab; Conference paper | First Online: 22 March 2022;
DOI: 10.1007/978-981-16-9632-9_4

ABSTRACT

Membranes have been widely used in separation and purification technologies. With a broad range of polymers for membrane applications, polysulfone (PSf) has been a research interest due to its high thermal strength, solubility in a variety of aprotic polar solvents, and chemical durability over a wide pH range. However, PSf is hydrophobic in nature. Thus, researchers are incorporating fillers that enhance the hydrophilicity of PSf for the desired applications in filtration and sensing. Carbon quantum dots (CQD) are highly hydrophilic. Hence, CQDs are potential fillers in PSf. PSf membranes with varying concentrations of CQD (0.50, 1.0, and 2.0 wt%) were successfully fabricated via NIPS and characterized. PSf pellets (15 wt% and 18 wt%) were dissolved in N-methyl pyrrolidone (NMP) and casted onto a glass substrate. Membranes were formed by coagulating the dope solution in distilled water. FTIR and SEM results showed that CQD was incorporated into the PSf polymer matrix. At 15% PSf concentration, pore sizes of the membranes have almost the same magnitude as membranes with CQD loading up to 2.0%. At 18% PSf concentration, the pore sizes significantly increased at 2.0% CQD loading. For both 15 wt% and 18 wt% PSf, addition of CQDs improved the hydrophilicity of the membranes. Furthermore, there was an increase in stiffness of the 15% PSf membrane with CQD loading of 2.0% and an increase in stiffness of the 18% PSf membrane at 1.0% CQD loading. The results show that PSf/CQD membrane may be useful in filtration or sterilization applications.

Development of Polyamide/Polysulfone Thin Film Composites with Copper-treated Zeolites as Additives for Enhanced Hydrophilicity

SR Cayabyab, J de Guzman & PA de Yro ; Conference paper | First Online: 22 March 2022;
DOI: 10.1007/978-981-16-9632-9_10

ABSTRACT

Membrane filtration is the most extensively used technology for water treatment and purification. The purpose of this study is to create a novel type of thin film composite (TFC) membrane incorporating copper-treated zeolite into polyamide (PA)–polysulfone (PSf) matrix. Philippine natural zeolite was modified with copper via cationic exchange using CuSO4•5/2H2O then calcined at 300 °C for 6 h to obtain the CuZ sample. The TFC membrane was fabricated by interfacial polymerization of m-phenylenediamine (MPD) and trimesoyl chloride (TMC) onto a PSf substrate backed with nonwoven polyester sheet. CuZ was incorporated in the organic solution of TMC in hexane with varying concentrations of 0.1, 0.2, and 0.5 wt%. XRD results showed that copper, in the form of CuO, were successfully loaded onto the surfaces of zeolite. SEM images of the TFCs showed spots and wrinkling. It was observed that as the CuZ loading in the TFC increases, the spot size and intensity of wrinkling also increased due to presence of CuZ affecting diffusion of MPD and miscibility of the aqueous and organic solutions. AFM analysis showed that the average surface roughness has a decreasing trend as a function of increasing CuZ loading which could affect the wetting and anti-fouling properties of the TFCs. Additionally, CuZ imparted a significant degree of hydrophilicity onto the TFCs with increased contact angles. The average contact angle decreased in magnitude by 90.9% with 0.5 wt% CuZ loading. Thus, this could play a critical role in the performance of the membrane.

Acute Toxicity and 28 days Repeated Dose Studies of Multi-Walled Carbon Nanotubes

J. Reyes, J. Celorico, B. Basilia, et.al; Materials Today Proceedings, 5 July 2022, Version of Record 15 September 2022; https://doi.org/10.1016/j.matpr.2022.06.400

ABSTRACT

In the light of the increased production and use of multi-walled carbon nanotube (MWCNT) in consumer products, there is a need for screening the potential toxicity of this nanomaterial. In the present study, the researchers have investigated the acute dermal and acute eye irritation in rabbits and acute oral irritation and 28-day repeated administration of MWCNT in rats. A single dose of 5000 mg/kg was used to test Albino Rabbits for acute dermal and eye irritation test. Similar dose was given to Sprague Dawley Rats for the acute oral and 28-day repeated dose test. Clinical signs/manifestations were closely observed for the first four (4) hours post sample administration and was continued for 1,2,3,7 and 14-day observation period. In acute toxicity study, no treatment-related death or toxic signs were observed with MWCNT. In the 28-day repeated dose study, no significant differences in hematology and clinical biochemistry were detected between control and MWCNT. However, histopathology results revealed mild periarteriolar lymphoid cell depletion in the spleen and mild tubular cell degeneration on the cortex and medulla of both kidneys of the rats while no remarkable lesions were seen on the other organs of both female and male rats.

Antioxidant Activity and Phytochemical Constituents of Philippine *Clitoria ternatea* Flowers as a Potential Therapeutic Agent Against Infectious Diseases

RCTorres, MRVParcon, CCRamil, DCPCanillo, and HJEsmundo; Issues in Biological Sciences and Pharmaceutical Research, 10(2), pp. 12-18. https://doi.org/10.15739/ibspr.22.003
Published: May 3, 2022

ABSTRACT

Infectious diseases have always been present throughout human history, in which numerous emerging and re-emerging pathogens have been documented. Various strategies have been established to combat these pathogens: from vaccinations, to optimized drug delivery routes, to natural products such as antioxidants and flavonoids. This study evaluated the antioxidant activity of the ethanolic extract of the anthocyanin-rich *Clitoria ternatea* flowers, from the Philippines, by analyzing its total phenolic content and DPPH radical scavenging activity. The raw materials used in this study were collected from Victoria, Tarlac, Philippines, which are tvhen macerated and soaked in 95% ethanol for 24 hours before extraction. The extract was then filtered using coarse filter paper and concentrated using a rotary evaporator. The samples were subjected to heavy metals analysis, total phenolic content and IC50 from DPPH radical scavenging activity of the *C. ternatea* extract were found to be 3.9519 ± 0.1 mg GAE / 100 g and 53.6913 mg/kg, respectively. Phytochemical screening of the ethanolic extract of *C. ternatea* revealed the presence of triterpenes, saponins, reducing sugars, tannins, sterols, flavonoids, and alkaloids. Results showed the potent antioxidant properties and the abundance of flavonoids of *C. ternatea* extract which may encourage further studies to evaluate its possible applications as plant-derived antioxidants for the therapeutic management of various infectious diseases.

Efficient Delivery of Metrological Services by Institutes through Accuracy-based Proficiency Testing Programme on Additives in Food Sauce for Laboratories in the Southeast Asian region

Pui Sze Cheow, Tang Lin Teo, Thippaya Junvee Fortune, Benilda Sacop Ebarvia, Siti Nur Nazathul Shima Hashim, Dyah Styarini, Juan Wang, Ee Mei Gui, Ting Lu, Thanarak Mungmeechai, Pradthana Tangtrirat, Aaron Dacuya, April Rose Veranga, Grace Amandy, Hui Ling Li, Yosi Aristiawan, Christine Elishian and Ayu Hindayani; Springer Link July 16, 2022; https://link.springer.com/article/10.1007/s00769-022-01504-z

ABSTRACT

This paper describes a collaborative effort by five metrology institutes to organise a proficiency testing (PT) programme which aims to evaluate the performance and improve the measurement capabilities of food testing laboratories on additives in food sauce in the Association of Southeast Asian Nations (ASEAN). It was the first joint PT programme organised by the metrology institutes under the auspice of the ASEAN Reference Material Network (ARMN). Five common additives, namely: benzoic acid, sorbic acid, methyl paraben, n-propyl paraben and saccharin in tomato sauce, were chosen as the measurands of the PT programme. Thirty-nine laboratories from five economies participated in this PT programme through the

ARMN network. Metrologically traceable assigned values used for performance evaluation of the additives were jointly determined by three metrology institutes using isotope dilution mass spectrometry (IDMS). Issues discussed in the paper include determination of assigned values, performance evaluation, participating laboratories' analytical methods and evaluation of measurement uncertainties. The overall performance of participating laboratories was considered to be satisfactory as 88 % of the participating laboratories achieved satisfactory z-scores (or z'-scores). The joint ARMN accuracy-based PT programme enables a broader understanding of the comparability of measurement capabilities of the food testing laboratories, which play an important role in supporting trade-related industries among the close trading economies in the Southeast Asian region.

Method Development and Validation of Gas Chromatography Methods Using Nitrogen Phosphorus Detector (GC-NPD) and Isotope Dilution Triple Quadrupole Mass Spectrometry (GC-IDMS/MS) for the Determination of Chloropyrifos in Mango

JAC Valdueza, JC Sta Ana, AT Junsay, AC Dacuya, and BS Ebarvia; KIMIKA https://www.kimika.pfcs.org.ph/index.php/kimika/article/view/350; Published: 2022-03-22

ABSTRACT

Pesticides residue determination in fruits like chlorpyrifos is important due to its health effects on humans. Thus, there is a need for sensitive and accurate methods for better quantification. In this study, the performance of two gas chromatographic detection methods, nitrogen phosphorus detector (GC-NPD) and isotope dilution triple quadrupole mass spectrometer (GC-IDMS/MS), for the determination of chlorpyrifos in mango was evaluated to be used for the development of candidate reference material. Other than liquid-liquid extraction (LLE), Quick, Easy, Cheap, Efficient, Rugged and Safe (QuEChERS) sample extraction and dispersive solid phase extraction (dSPE) clean-up procedures were optimized to extract chlorpyrifos from the sample matrix. Comprehensive method validations were performed in GC-NPD and GC-IDMS/MS with HP-5 capillary column to establish linearity, the limit of detection (LOD), the limit of quantification (LOQ), accuracy, repeatability, and intermediate precision using freeze-dried mango samples. The LOD and LOQ were 2.35 and 3.47 µg kg-1 for GC-NPD, and 1.23 and 1.85 µg kg-1 for GC-IDMS/MS, respectively. Matrix-matched calibration curves showed excellent linearity of r2=0.999 for both GC-NPD and GC-IDMS/MS protocols. Acceptable repeatability was obtained for three spike concentrations of 10, 30, and 60 µg kg-1 (n=10) and intermediate precision for 0.5-, 1- and 3-months in the same three-spike concentrations (n=3) expressed as relative standard deviation (RSD) ranging from 0.34-5.61 % for GC-NPD and 0.46-4.22 % for GC-IDMS/MS. Satisfactory mean recoveries (n=10) were achieved: 88.48-109.81% in GC-NPD and 97.61-108.40% in GC-IDMS/MS. GC-IDMS/MS and GC-NPD methods were fit for the purpose of quantifying chlorpyrifos in Philippine mango accurately with the use of isotope dilution technique and traceability to international standards by the application of gravimetric sample preparation.

Paper and Poster Presentations

Date presented	Title	Event	Author/s
Mar 28-29	Development and Validation of Vitamin A in Infant Formula	OneLab R&D Forum	C. C. Ramil et al
Mar 30	Printability and Warpage Evaluation of Polypropylene/Nano Precipitated Calcium Carbonate Composite Prepared by Extrusion-based 3D Printing.	2022 11th International Conference on Advanced Materials and Engineering Materials (ICAMEM 2022	M. Comadre
Apr 7	"Finding Your One True Lab"	UST College of Science Week	J. P. M. D. Guzman
	Post Treatment of Food Processing Wastewater Effluent for Nutrient Removal	The 2nd Wave of Action: Water S&T Tools and Technologies	R. L. Esguerra
	Development of a Compact Wastewater Treatment System for Restaurants Discharging to Manila Bay Area	Innovate Pinas	R. L. Esguerra
	Antimicrobial Activity of Kaffir Lime *(Citrus hystrix D.C.)* Leaves Extract Against Common Food	PHILASST 71st Annual Convention	Product Development Section
Apr 7-10	ABS/AgZrP Nanocomposite Additive Manufacturing Filament for Antibacterial Applications	9th International Conference Mechanics, Materials and Manufacturing	P. A. N. de Yro

Date presented	Title	Event	Author/s
Apr 7-10	Influence of Styrene-ethylene-butylene-styrene and Stearic Acid on Poly (lactic) Acid/Alumina Filament Composite for Fused Deposition Modeling Application	7th ICMEM (International Conference for Materials Engineering and Manufacturing)	M. Tolentino
	Mechanical Behavior of Functionally Graded ABS Gyroid Lattice Structure Using Fused Deposition Modeling	7th ICMEM (International Conference for Materials Engineering and Manufacturing)	S. A. C. Arañez
	Effect of Line Width and Wall Count on the Compressive Strength of Single and Functionally Graded Additively Manufactured ABS Gyroid Structure	9th International Conference Mechanics, Materials and Manufacturing	S. A. C. Arañez
Apr 21	Power Back-Up System	NEDA Innovation Day *Filipinovation:* Unlocked	F. E. Del Pozo Jr.
May 17	Benzoic Acid in Food for Regulatory Compliance	MMHRC-ITDI Forum: Pagkain, Nutrisyon, Kalusugan at Kaligtasan – Pagharap sa Hamon ng Makabagong Panahon	M. R. V. Parcon
	Webinar on Food Security Halal Spa Skincare Products for the Halal Tourism Industry	PCIEERD SIBOL 2022	M. R. V. Parcon, et al
	Boosting Health with Nutraceuticals and Functional Ingredients	MMHRDC Forum *"PAGKAIN, NUTRISYON, KALUSUGAN AT KALIGTASAN: Pagharap sa Hamon ng Makabagong Panahon"*	R. Z. M. L. Walde

Date presented	Title	Event	Author/s
May 20	"The Philippines'Experience in the conduct of Remote Assessments for accredited laboratories under ISO/IEC 17025:2017"	IMEKO World Metrology Day Celebration, Dubrovnik, Croatia, Online via MS Teams	A. R. C. Dablio
June 13	Application of Biodegradable Film as Modified Atmosphere Packaging for Red chili	23rd IAPRI World Packaging Conference	D. A. Balanon
	Anti-microbial Activity of Biodegradable Lignin Nanoparticles in Polyvinyl Acetate Based Film Against Major Spoilage Microorganisms in Mango Fruit	23rd IAPRI World Packaging Conference	A. Basbasan, Jr.
	Development of Transport Packaging System and Establishment of Vase Life of Chrysanthemum Harvested at Bud and Half Bloom Stage	23rd IAPRI World Packaging Conference	M. J. Paico
June 12-16	Exposure Assessment of Filipino Consumers to Benzophenone Migrated from Paper and Paperboard Used as Packaging for Foods & Beverages	23rd IAPRI World Packaging Conference	D. Alcarde, Jr.
July 13	Reference Material Production and Characterization of lead, cadmium, copper, and iron in Drinking Water for Us on Proficiency Testing Studies	NAST 44th Annual Scientific Meeting (ASM) - Online via Zoom	T.F. Aviles, C.S. Daniel, C.D. Laurio, J.C. Guerrero, E.K.P. Encarnacion, B.S. Ebarvia

Date presented	Title	Event	Author/s
July 13	Development of a Matrix Reference Material for Salbutamol in Lyophilized Meat	NAST 44th Annual Scientific Meeting (ASM) - Online via Zoom	A.T. Junsay, A.G.H. Bion, P.A. Quiton, A.C. Dacuya, B.S. Ebarvia
Aug 11	Application of Intelligent Data Analysis System (IDAS) of Methamphetamine HCl-FTIR Spectra	19th Asian Pacific Confederation of Chemical Engineering (APCChE) Congress	A. M. Monsada
Aug 28	PLA/MWCNT Nanocomposite: Improved Electrical, Thermal and Antibacterial Properties for Fused Deposition Modelling Additive Manufacturing Applications	9th International Conference Mechanics, Materials and Manufacturing	P. A. N. de Yro
Sept 8-9	Data Profiling and Partial Characterization of Locally-Produced Sustainable Alternative and bio-based Packaging Materials	71st PhilAAST Annual Convention 2022 - Online	E.K.P. Encarnacion, A.C. Alcantara, H.E. Armario, and W.P. Alejandro
Sept 09	Improved Properties of Microencapsulated Betalain from Philippine Beta vulgaris using Scale-up Spray Drying Technology (Poster)	71st PhilAAST National Convention	M. R.V. Parcon, et al
	Evaluation of Selected Agricultural and Commercial Wastes as Potential Source of Renewable Energy (Poster)	71st PhilAAST National Convention	I. U. Sta Ana, et al

Date presented	Title	Event	Author/s
Sept 09	Development and Validation of Method for Folic Acid in Liquid Milk Using HPLC (Poster)	71st PhilAAST National Convention	J. C. O. Alfaro, et al
	Reduction of Chemical Laboratory Waste Through Small-scale Sample Preparation Method for Vitamin A Analysis in Food (Poster)	71st PhilAAST National Convention	A. C. Bidol, et al
	Local Natural Fibers as Scaffolds for Tissue Engineering	71st PhilAAST National Convention	S. Cayabyab
	Development of a Colorimetric Total Volatile Base-Nitrogen Sensor for Potential Real-Time Freshness Monitoring of Pre-packaged Food	23rd IAPRI World Packaging Conference	D. J. Ortiz
	Magnesium Candidate Certified Reference Material Production, Homogeneity and Stability Evaluation Using Automatic Photometric Titration (Poster)	PhilAAST - Online	J.E.C. Guerrero, C.S. Daniel, E.K.P. Encarnacion, S.T. Lucas, B.S. Ebarvia
	'Fitness-for-Purpose' of Gravimetric External Calibration method via ICP-MS and DMA for PT Material Characterization of Mercury in Drinking water (Poster)	36th Philippine Chemistry Congress - Online-Whova	J.D. Maniego, E.K.P. Encarnacion, C.S. Daniel, A.T. Junsay, B.S. Ebarvia

Date presented	Title	Event	Author/s
Sept 9	Provision of PT Schemes for Qualitative and Quantitative Food Microbiological Measurements	71st PhilAAST Annual Convention 2022 - Online	MSA, APA, NMDC, SME
Sept 14-16	Preparation of Cross-linked Partially Neutralized Poly (Acrylic Acid) Copolymer Incorporated with Nanosized Silica	83rd PIChE National Convention : ChE Unlocked: Exploring Specializations in Addressing Global Challenges	A. M. Monsada
Sept 21	Essential Oils: ITDI Initiatives	Investing on the Science, Economics and Sustainability for the Inclusive Growth of the Philippine Essential Oils Industry	E. G. Panerio
Sep 29-Oct 01	"Development of Internal Quality Control Material (IQCM) for Anions in Aqueous Solution from Laboratory Chemical Wastes"	36th Philippine Chemistry Congress, Philippines, Online via Whova	A. R. C. Dablio
	"Microencapsulation of Anthocyanin Pigments from Philippine Clitoria ternatea Flowers through Spray Drying Technology"	36th Philippine Chemistry Congress, Philippines, Online via Whova	D. C. P. Canillo
	Candidate Reference Material Production and Assessment of Homogeneity and Stability of Co, Mn, Ni in Drinking water Using ICP-OES (oral)	36th Philippine Chemistry Congress - Online-Whova	C.J. Gatchalian, C.D. Laurio, C.S. Daniel, E. K. P. Encarnacion, A.T. Junsay, B.S. Ebarvia

Date presented	Title	Event	Author/s
Sept 29-Oct 1	Data Profiling of Total Chemical Migrations from Food Contact Materials (FCMs) as Support for Drafting National Policies on Food Safety	36th Philippine Chemistry Congress - Online-Whova	A.C.Alcantara, E.K.P. Encarnacion, H.E. Armario, W.P. Alejandro, and D.J. Alcarde Jr.
	Assessment of Homogeneity and Stability of Candidate Matrix Reference Material for Ethoxyquin in Chicken Using Validated Ultra High Performance Liquid Chromatography– Fluorescence Detection (UHPLC-FLD) Method (oral)	36th Philippine Chemistry Congress - Online-Whova	A.H. Bion, A.T. Junsay, A.C. Dacuya, B.S. Ebarvia
Oct 17-20	"Development of Internal Quality Control Material (IQCM) for Arsenic, Cadmium, and Lead in Soil"	IMEKO TC11 and TC 24 Joint Hybrid Conference, Dubrovnik, Croatia, Online via MS Teams	A. R. C. Dablio
Oct 24-26	"The Importance of Quality Control in Microscopic Analytical Test Methods"	2022 International Conference on Microscopy and Microanalysis, De La Salle University, Laguna Campus, Philippines	A. R. C. Dablio
Oct 27-28	Comparative Study of the Total Chemical Migration and Barrier Performance of Polyethylene Composites and Monolayers, and Bioplastic Packaging	Kapisanan ng mga Kimika ng Pilipinas-Southern Tagalog Annual Convention	H. E. Amario

Date presented	Title	Event	Author/s
Nov 18-19	Development of Alternative Techniques for Okra *(Abelmoschus Esculentus)* Flakes/Sheets Spoilage and Pathogenic Microorganisms	Research and Education Congress 2022	B. B. Flores, Jr.
	Effects of Cassava Starch Modifications on the Rheological Properties of Heat-Treated Food System	Research and Education Congress 2022	K. A. S. Dela Cruz
	Development of Halal Compliant Dehydrated Mango	Research and Education Congress 2022	R. M. Gomez
	Optimization of Process Parameters on Vacuum Fried Okra Slices Using a Response Surface Method	Research and Education Congress 2022	M. B. Macaraeg
	Application of Essential Oil from Kaffir Lime *(Citrus hystrix)* Leaves as a Potential Natural Antimicrobial Agent for Juice and Candy	Research and Education Congress 2022	M. R. Manalo
	Food Standards Development: The Science Behind It	Research and Education Congress 2022	M. C. M. Manabat
	The Production and Distribution of Emergency Food Reserve (EFR) from Selected Crops: Government-Private Sector Cooperation	WAITRO Summit 2022	L. S. Montevirgen, C. F. Q. Palla, A. C. Flores

Date presented	Title	Event	Author/s
Nov 23	Fuel Cell Technology: Powering the Future with ITDI	NSTW Techno-Forum	R. P. Parreño, Jr.
	Bacteriophages from Hospital Wastewater Against Clinical Bacterial Isolates in the Philippines	Bacteriophage Therapy Summit	U. G. Bigol
	The Role of Chemical Engineers in National Industrialization to Bring about National Development	7th PIChE Northern Luzon Symposium	R. L. Esguerra
Nov 23-26	*Penaeus vannamei postlarvae fed with Terminalia catappa L.*-supplemented feed differentially express immune-related genes	49th Philippine Society of Biochemistry and Molecular Biology (PSBMB) Annual Convention	J.P.M.D. Guzman, J.R.K.A. Delos Santos, R.R. Estrella, J.P.G. Jose, I.J.L. Castro, M.R. Razon, U.G. Bigol, S.D.A. Mantaring
Nov 26-28	Full Factorial Design Analysis of the Facile Synthesis of Organo-conjugated Carbon Quantum Dots from Glycerol	11th International Conference on Material Science and Engineering Technology (ICMSET 2022) – Tokyo, Japan	R.A.T. Cruz
Dec 1-2	Talisay *(Terminalia catappa L.)* leaf extract as feed additive against Vibrio parahaemolyticus infection in Litopenaeus vannamei shrimp postlarvae	27th Philippine Society for Microbiology (PSM)-Mindanao Annual Convention and Scientific Meeting	S.D.A. Mantaring, J.R.K.A. Delos Santos, R.R. Estrella, J.P.G. Jose, I.J.L. Castro, M.R. Razon, U.G. Bigol, J.P.M.D. Guzman

Date presented	Title	Event	Author/s
Dec 1-2	Development of Partition Board from Agricultural Waste for Transport Packaging Application	Waste No More 2022 6th Philippine Solid & Hazardous Waste Management Conference-with the 3rd International Conference on Circular Economy-based Waste Management	M.J. Paico
	Solid waste generated by public markets shows high potential for diversion	Waste No More 2022 6th Philippine Solid & Hazardous Waste Management Conference-with the 3rd International Conference on Circular Economy-based Waste Management	J.R. Barcelo, M.L. Tansengco, D.L. Herrera, M.J.V. Capule, M.T.C. Artuz, R.L. Esguerra, J.R.E. Beraye, M.P. Prudencio, Jr.
	Preliminary Study on Chemical Contaminants of Water Reservoirs by Paper Packaging Wastes	Waste No More 2022 6th Philippine Solid & Hazardous Waste Management Conference-with the 3rd International Conference on Circular Economy-based Waste Management	W.P. Alejandro, E.K.P. Encarnacion, A.C.Alcantara, and H.E.Armario
	Development and Validation of QuEChERS with EMR-Lipid Method for the Analysis of Ethoxyquin in Chicken by Ultra High Performance Liquid Chromatography-Fluorescence Detection	NAST 44th Annual Scientific Meeting (ASM) - Online via Zoom	A.H. Bion, P.A.M. Quiton, A.T. Junsay, B.S. Ebarvia

Intellectual Properties

A total of **7 intellectual property applications** were processed and **9 IP applications were secured/approved** as trademark and copyrights for this year 2022.

New IP Secured/Approved = 9

Title of IP	Type of IP
Coco Bukayo	Trademark
FIC New Product Development and Marketing Manual	Copyright
Preparation of Mango Dietary Fiber	Copyright
Preparation of Ready to Drink Herbal Milk Tea	Copyright
Preparation of Spray Dried Herbal Tea	Copyright
Good Manufacturing Practice	Copyright
Interlaboratory Comparison Scheme for Microbiology ICSM - 2022-01	Copyright
Guidelines on PPGs; Guidelines on Sphygmomanometers; 2 PT Protocols	Copyright
TekNegoShow	Copyright

New IP Applied = 8

Title of IP	Type of IP
Lotion Formulation with Hydrosol from Plant Hydrolisation	Patent/Utility Model
Protecart	Trademark
Drawings/Plastic Works of a Scientific or Technical Character: Mechanokawa	Copyright
Drawings/Plastic Works of a Scientific or Technical Character: Screw Sorter Machine	Copyright
Drawings/Plastic Works of a Scientific or Technical Character: Transradial Education Casting System	Copyright
Drawings/Plastic Works of a Scientific or Technical Character: Customized Protective Personal Equipment Add-Ons	Copyright
ITDI 100 Technologies (Coffee Table Book)	Copyright
ITDI GAD Logo was applied on November 2022	Trademark

Policies Developed

A total of **69 policies** were developed mainly on the development of PNS of various products where DOST-ITDI personnel are involved as technical experts.

- ITDI Memo on Harmonized Chemical Inventory Harmonized Chemical Inventory including Guidelines for Storage and Inventory of Chemicals (Internal)
- DTI-PAB: LA/GD02 Guidelines on Grading of Non-Conformities; LA/GD08 Classification of Scopes in ISO/IEC 17025 (Testing)
- JMC 01 Series of 2021 Guidelines on the Classification, Certification and Safe Handling/ Transport of Coconut Shell Chips, Coconut Shell Powder, Coconut Shell Raw Charcoal, Coconut Shell Granulated/Powdered Charcoal, Coconut Shell Charcoal Briquettes and Coconut Shell Activated Carbon
- ISO 50001 Energy Policy Statement
- SO 340 Reconstituted the ITDI Energy Efficiency and Conservation Team
- NSWMC Resolutions Approval of 10-year solid waste management plans:
    - Magallanes, Sorsogon
    - Abra Province
    - Balbalan, Kalinga
    - Pontevedra, Negros Occidental
    - Province of Isabela
    - Province of Lanao del Norte
    - Gamu, Isabela
    - Nunungan, Lanao del Norte
    - Titay, Zamboanga Sibugay

- SB 2425/HB 10696 Extended Producers' Responsibility
- RA 11898 Extended Producers' Responsibility Act of 2022
- CODEX Sub-Committee on Food Hygiene
- Revised Guidelines on the Assessment of Microbiological Qualities of Processed Food Products
- PNS Virgin Coconut Oil for Human Consumption
- PNS Coconut Water
- PNS Virgin Coconut Oil for Cosmetic use
- PNS Amendment for Live and Raw Bivalve Mollusk
- PNS Amendment for Fresh Frozen Soft Shelled Crab
- PNS on Abalone Product Standard
- Development of Explanatory Manual and Illustrative Guide for PNS on Fish and Fishery Products
- PNS Processing of Peanut Butter
- RCP Processing of Peanut Butter
- RCP Processing of Peanut Butter

- PNS BPS/TC 87: Nanotechnology - Measurements of Particle Size and Shape Distributions by Scanning Electron Microscopy• PNS BPS/TC 87: Nanotechnology - 3D Image Reconstruction of Rod – Supported Nano Objects Using Transmission Electron Microscopy
- PNS BPS/TC 87: Nanotechnology - A guideline for Ellipsometry Application to Evaluate the Thickness of Nanoscale Films
- PNS BPS/TC 87: Nanotechnology - Consideration for Performing Toxicokinetic Studies with Nanomaterials
- PNS BPS/TC 87: Nanotechnology - Assessment of Nanomaterials Toxicity Using Dechlorinated Zebrafish Embryo
- PNS BPS/TC 87: Nanotechnology - Clay nanomaterials –Part 2: Specifications of Characteristics and Measurements for Clay Nanoplates Used for Gas Barrier Film Applications
- ISO/TS 23303:2021, Nanotechnologies - Requirements and Recommendations for the Identification of Measurands that Characterise Nano-objects and Materials that Contain them
- ISO/TS 21357:2022 - Nanotechnologies- Evaluation of Mean Size Nano-objects in Liquid Dispersion by Static Multiple Light Scattering (SMLS)
- ISO/TS 21633:2021, Nanotechnologies - Label-free Impedance to Assess the Toxicity of Nanomaterials In Vitro
- ISO/TR 22293:2021, Nanotechnologies – Evaluation of Methods for Assessing the Release of Nanomaterials from Commercial Nanomaterials –Containing Polymer Composites
- ISO/TS 23650, Nanotechnologies – Evaluation of Antimicrobial Performance of Textiles Containing Manufactured Nanomaterials
- ISO/TS 13099-2:2021, Colloidal Systems – Methods for Zeta-Potential Determination – Part 2: Optical Methods
- ISO 6330:2021, Textiles – Domestic Washing and Drying Procedures for Textile Testing IEC/TS62607-2-4:2020, Nanomanufacturing – Key Control Characteristics – Part 2-4: Carbon Nanotube Materials- Test methods for Determination of Resistance of Individual Carbon Nanotubes
- ISO/TR 22455:2021, Nanotechnologies – High Throughput Screening Method for Nanoparticle Toxicity Using 3D Model Cells
- ASTM F3529-21 Guide for Additive Manufacturing - Design- Material Extrusion of Polymers
- Nanotechnologies – Nanostructured Porous Alumina as Catalyst Support for Vehicle Exhaust Emission Control – Specification of Characteristics and Measurement Methods
- Nanotechnologies - Vocabulary - 6: Nano-object Characterization
- Nanotechnologies – Particle Size Distribution for Cellulose Nanocrystals
- Position Paper - Proposed Code of Practice on Storage and Distribution of RTH meals Ecolabeling of Packaging - Guidelines/Criteria on Ecolabeling of Packaging
- Position Paper - Guidelines on Internet Sales –CODEX Food Labeling Committee
- PNS ISO 15509:2021: Adhesives - Determination of the Bond Strength of Engineering-plastic Joints

- PNS ISO 17178:2021: Adhesives - Adhesives for Bonding Parquet to Subfloor - Test methods and Minimum Requirements
- PNS ISO 17194:2021: Structural adhesives - A Standard Data-base of Properties
- PNS ISO 19212:2021: Adhesives - Determination of Temperature Dependence of Shear Strength
- PNS ISO 21368:2021: Adhesives - Guidelines for the Fabrication of Adhesively Bonded Structures and Reporting Procedures Suitable for Risk Evaluation of such Structures
- PNS ISO 9653:2021: Adhesives - Test Method for Shear Impact Strength of Adhesive Bonds
- PNS 2161:2021: Halal Cosmetics and Toiletries - General Requirements
- PNS ISO 247-1:2021: Rubber - Determination of ash - Part 1: Combustion Method
- PNS ISO 247-2:2021: Rubber - Determination of Ash - Part 2L Thermogravimetric Analysis
- PNS ISO 248-1:2021: Rubber, raw - Determination of Volatile-matter Content - Part 1: Hot-mill Method and Oven Method
- PNS ISO 1382:2021: Rubber - Vocabulary
- PNS ISO 1853:2021: Conducting and Dissipative Rubbers, Vulcanized or Thermoplastic Measurement of Resistivity
- PNS ISO 2878:2021: Rubber, Vulcanized or Thermoplastic - Antistatic and Conductive Products - Determination of Electrical Resistance
- PNS ISO/TR 21386:2021: Nanotechnologies - Considerations for the Measurement of Nano-objects and their Aggregates and Agglomerates (NOAA) in Environmental Matrices
- PNS ISO/TS 12025:2021: Nanomaterials - Quantification of Nano-object Release from Powders by Generation of Aerosols
- PNS ISO/TS 21356-1:2021: Nanotechnologies - Structural Characterization of Graphene Part 1: Graphene from Powders and Dispersions
- PNS ISO/TS 21361:2021: Nanotechnologies - Method to Quantify air Concentrations of Carbon Black and Amorphous Silica in the Nanoparticle Size Range in a Mixed Dust Manufacturing Environment
- PNS ISO 5667-5:2021: Water Quality - Sampling - Part 5: Guidance on Sampling of Drinking Water from Treatment Works and Piped Distribution Systems
- PNS ISO 5667-10:2021: Water Quality - Sampling - Part 10: Guidance on Sampling of Wastewater
- PNS ISO 5667-20:2021: Water quality - Sampling - Part 20: Guidance on the use of sampling data for decision making - Compliance with thresholds and classification systems
- PNS ISO 5667-22:2021: Water quality - Sampling - Part 22: Guidance on the design and installation of groundwater monitoring points
- PNS ISO 5667-23:2021: Water Quality - Sampling - Part 23: Guidance on Passive Sampling in Surface Waters
- PNS ISO 6107:2021: Water Quality - Vocabulary
- PNS ISO 6107-9:2021: Water Quality - Vocabulary - Part 9: Alphabetical List and Subject Index
- PNS ISO 15839:2021: Water Quality - On-line Sensors/Analysing Equipment for Water Specifications and Performance Tests
- PNS ISO 17381:2021: Water Quality - Selection and Application of Ready-to-use Test Kit Methods in Water Analysis

Knowledge Translation / Technology transfer

As businesses and processes start to transition back to normal operations during the year, the institute likewise observed and instituted more face-to-face transactions while still enhancing its online systems in support of the government's drive for digitalization.

ITDI's knowledge translation (KT or technology transfer) program employing various media was strongly pursued with TSD relentlessly conducting KT initiatives that aimed to enhance stakeholder engagement towards technology adoption or uptake.

These efforts resulted to substantial gains for the institute with a total of 57 technologies transferred in 2022; 17 by commercialization, 14 by extension, and 26 as public good. There were five technology adopters while seven technology transfer agreements were forged from which two products/prototypes were created/developed/produced.

KT initiatives implemented during the year include among others, the use of quad media, consultative meetings or dialogs, innovation conference, trainings, webinars, exhibits, and forums.

Technology/Tech Service promotion

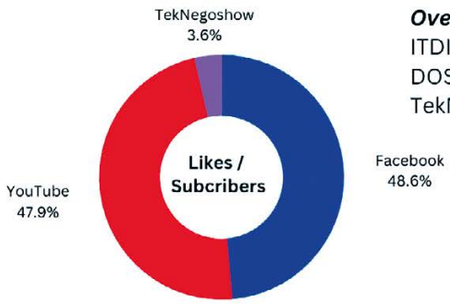
A total of 128 IEC materials were produced and disseminated to some 4,644 users in various promotion activities. Using various media, among those produced and released during the year include:

- 189 syndicated press releases
- 265 published (print and online)
- 217 radio/TV guestings/interviews
- 321 Facebook page posts
- 2 issues Techno Bulletin
- ___Flashnews
- 12 issues Miscellanews

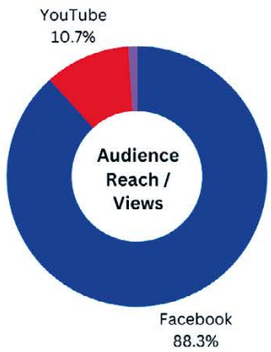
Likewise, 3,076 emails were processed with various requests and inquiries properly attended to for appropriate action. With businesses and processes gradually going back to normal, more face-to-face activities were pursued while online promotion through social media and Youtube continuously engaged the institute's stakeholders.

For the year 2022, overall social media metrics garnered by the institute are tabulated as:

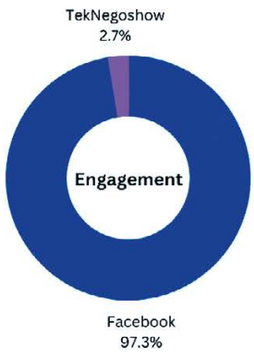
2022 SOCIAL MEDIA METRICS



Over-all Total Likes /Subscribers: 63,987
ITDI Updates FB Page: 32,226
DOST-ITDI YT Channel: 31,761
TekNegoShow Series: 2,356

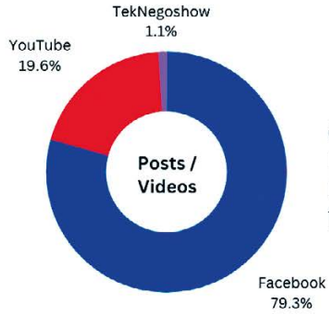


Over-all Total Audience Reach / Views: 1,891,533
ITDI Updates FB Page: 1,670,442
DOST-ITDI YT Channel: 201,544
TekNegoShow Series: 19,547



Over-all Total Engagements: 193,569
ITDI Updates FB Page: 188,364
DOST-ITDI YT Channel: Not Available
TekNegoShow Series: 5,205

Over-all Total Watch Time (Hours): 12,293
ITDI Updates FB Page: Not Available
DOST-ITDI YT Channel: 12,293
TekNegoShow Series: Not Available



Over-all Total Posts / Videos: 552
ITDI Updates FB Page: 438
DOST-ITDI YT Channel: 108
TekNegoShow Series: 6

In 2022, ITDI accommodated 22 study tours/visits (virtual and face-to-face modes) from the academe, industry, LGUs, other agencies and individuals wherein laboratories and facilities were showcased fitted to their specific purpose or objective such as for benchmarking, encouraging the young towards STEM, learning and development plans, industry solutions, and/or for future collaboration or partnerships.

Other KT channels included exhibits and forums where various technologies and services took center stage:

IP protection is also pursued with in-house publications/knowledge products applied for copyright and this year, 28 were registered with IP such as R&D terminal reports, manuals, TNS episodes.

TekNegoShow

DOST-ITDI reprised TekNegoShow in 3rd sequel series shown on November 15, 2022 until December 15 via its Facebook page, TekNegoShow signaling the show's institutionalization.This resulted from the positive review and recommendation of the project evaluation panelalong with its monitoring agency, DOST-PCIEERD (Philipppine Council for Industry, Energy,and Emerging Research and Development). Hence, TNS is now running via GAA funds. TNS airs narratives and insights of technology generators, business people, and theconsuming public on how they perceive a featured technology, all together in one platformfor a more cohesive take or perspective. First initiated in 2020 with a 14-episode season, italso aired a six-episode Special Edition that was shown the following year.TNS aims to widen and heighten engagement of DOST-ITDI's technology generators withthe public and encourage technology uptake or adoption. For its maiden season forinstitutionalization, TNS showcased ITDI's newest technical facilities and services, namely: ADMATEL, HALAL R&D LAB, and SPTL/GPL. Each episode and all earlier episodes of TNSare available and can be viewed anytime on its Facebook page TekNegoShow, and on Youtube, ITDI-DOST.

Training and technical assistance

In 2022, the Institute successfully implemented 155 training programs classified into regular training (RT), customized training (CT), and regional training (RGT) delivered through webinars/online, blended learning, and face-to-face modes to best fit clients' needs.

A total of 3,354 participants coming from MSMEs, LGUs, cooperatives, associations, academe, government offices, and private individuals from different regions of the country participated in these trainings, that generated an income of PHP 1,388,751.57.

These trainings focused on various areas among which include: calibration; livelihood courses (food and non-food processing); food packaging technologies with mandatory labelling requirements; solid waste management technologies and guidelines on facility disinfection and proper waste disposal; internal quality audit for PNS ISO/IEC 17025:2017; introductory course on validation of chemical methods of analysis; fabrication of abaca fiber reinforced composite; HAS or Halal Assurance Management Systems in food industries and Halal awareness; and computation of standardized fees and charges for the use of facility/equipment.

Providing trainings for Filipinos abroad was also continuously explored through a partnership with the Department of Foreign Affairs – Technical Cooperation Council of the Philippines (DFA-TCCP). Via this project, an online Livelihood Training Program on Nata de Coco and Ube Processing for Filipino women residing in Sri lanka was implemented during the year. Ten participants from the Philippine Ladies Association (PLA) in Sri Lanka who are married to Sri Lankan nationals were taught techniques in food processing and preservation, tips on keeping food safe, and bulk food handling or Good Manufacturing Practices (GMP), including product costing. Lecture-demonstrations on processing nata de coco in syrup, ube powder, ube halaya, ube chips (sweetened and salted), and ube butterscotch were conducted for the group.

This DOST-ITDI and DFA-TCCP project aims to provide a new source of revenue right in the comfort of the participants' homes using locally abundant but underutilized resources like coconut and yam. It is envisioned that such livelihood opportunities and benefit extend to the surrounding communities as well.

Aside from providing trainings, a total of 68 interventions in the form of technical assistance were carried out online and onsite, nationwide. These include consultancy, inspection, and assessment on following:

- Food products and processing: cassava flour, coconut products, EFR, dragon fruit, freeze dried fruits and vegetables, calamansi extract, soy sauce, banana catsup andfish sauce, santol juice and malunggay, bottled bagoong, VCO, ube, kangkong, dairyproducts, cacao, salt, turmeric, sugarcane juice, vinegar, wine, condol products, fruitsand nuts, and mushroom;
- Food Processing, Packaging and Labeling, Rebranding, etc.;
- Essential oils, soap, shampoo, and lotion; and
- Waste disposal and management technologies.

Resulting from these interventions could be recommendations for improvement of processes/practices and/or product; systems upgrade; solutions to shop floor concerns or problems/trouble-shooting; and product development, among others. Ultimately, all these serve as instruments that help improve clients' overall productivity and make room for more KT opportunities among stakeholders.

Technology transfer / technical assistance agreements

A total of eighteen agreements for eighteen clients materialized in 2022, all covered with MOA (either for training or technical assistance) and TLA (licensing) as follows: four trainings, seven technical assistance, two technical services and five licensing. From these transactions, the institute generated Php 2.5 M income in the form of licensing fees and royalty fee collections.

Moreover, technology transfer and commercialization support services were conducted through events such as consultative meetings, technology pitchings, IP trainings, webinars, inspections, technology audit, fairness opinion evaluation participation, technology offerings and IP management trainings.

Table 1. 2022 Agreements Forged

	Title of TLA/MOA	Company	Type of Agreement
1	Renewal of Licensing - Kai anya Foods International Inc. for RTE Chicken Arroz Caldo	Kai anya Foods International Inc.	TLA (Licensing)
2	Vacuum Renewal of Licensing - RS Unitech Manufacturing and Trading Corp. for Cacao Roaster, Cacao Desheller/Winnower and Cacao Grinder Designs	RS Unitech Manufacturing and Trading Corp.	TLA (Licensing)
3	MOA on availment of Technical Service for Consumer Care Products Inc. Arroz Caldo	Consumer Care Products Inc.	MOA (Technical Services)
4	MOA on availment of Technical Service for SIP Project of LGU Pasig City	LGU Pasig City	MOA (Training)
5	MOA on Training on EFR with Aklan State University, DOST R6, and Kapatiran para sa Progresong Panlipunan	Kapatiran para sa Progresong Panlipunan	MOA (Training)
6	Renewal of Licensing on Dual Drum Composter of LAMACO	LAMACO	TLA (Licensing)
7	Technology Licensing of RTD Tablea by Argao Guilang Tablea	Argao Guilang Tableya	TLA (Licensing)
8	Technology Assistance for CharTed	Brgy. Tanza, Navotas	MOA (Technical Assistance)

Table 1. 2022 Agreements Forged *(continued)*

	Title of TLA/MOA	Company	Type of Agreement
9	Technical Assistance for St. Isodore "The Farmer" Learning Center, Inc. for VF Okra	St. Isodore "The Farmer" Learning Center, Inc	MOA (Technical Assistance)
10	Technical Assistance on Energy Audit for Tekno Centrix Corp.	Tekno Centrix Corp.	MOA (Technical Assistance)
11	Technical Assistance on Jatropha Methyl Ester for Mr. Dennis Sy	Mr. Dennis Sy	MOA (Technical Assistance)
12	Technical Assistance on Plant Lay-out for Dayton International Corp.	Dayton International Corp.	MOA (Technical Assistance)
13	Technology Adoption of RTE Chicken Egg for Batangas Egg Producer Cooperative (BEPCO)	Batangas Egg Producer Cooperative (BEPCO)	TLA (Licensing)
14	Technology Adoption of VF Technology of Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc.	Sentrong Pamilihan ng Produktong Agrikultura sa Quezon Foundation, Inc.	MOA (Training)
15	Training and Consultancy Services on Basic Thermal Processing to Aling Patring's Sari-Sari Store	Aling Patring's Sari-Sari Store	MOA (Training)
16	Deployment of Upgraded Emergency Disinfection System at Batangas State University (BSU)	Batangas State University (BSU)	MOA (Technical Assistance)
17	Training on Nata de Coco Production to Ms. Anitra Vishnawathan Murugeswari	Anitra Vishnawathan	MOA (Training)
18	Technology Assistance on Thermal Validation Test on Canned Milk concerning USFDA Inspection to Natural Quantum Diversified Products, Inc.	Natural Quantum Diversified Products, Inc.	MOA (Technical Assistance)
19	RTE Chicken Arroz Caldo	Best Friend Goodies Corporation	MOA (Technical Assistance)

Other KT Initiatives

Innovation Conference

An Innovation Conference dubbed as *iCon* with the theme *"Unlocking Possibilities through STI'* was conducted that brought together relevant STI stakeholders. The event was designed to boost creativity both of technology generators and partners and strengthen their engagement and pave the way for crafting new ideas, develop new approaches for designing, or re-designing existing products and services as solutions to challenges in defined areas that support the current socioeconomic agenda of government.

The iCon focused on five areas namely: renewable energy, consumer protection and safety, food security, disaster preparedness, and community livelihood. Invited resource persons presented programs and challenges confronting the five areas, and discussions in the plenary, aimed to find or identify solutions and/or new research/studies that may lead to possible partnerships or collaborations with relevant stakeholders.

Technical Support for DOST Regional Food Innovation Centers (FICs)

The institute, through a project led by TSD has been providing technical support to DOST Food Innovation Centers or rFICs' operation; repair, maintenance, and upscaling of food processing equipment; developing a sustainability mechanism for their continual operation and viability in the regions; while recognizing and promoting the most innovative food products.

With the improving COVID situation and easing up of travel restrictions and health protocols in 2022, several lined-up activities were implemented and by yearend, 15 out of the 17 regional FICs were already visited for proper assessment and rehabilitation of deployed food processing equipment.

The project team also facilitated procurement and delivery of equipment parts and supplies that were not available in the regions. Having undergone comprehensive trainings and guidance on the FIC equipment, majority of repairs that were originally to be outsourced were carried out by the project team themselves, leading to significant cost savings.

With 95 percent of FIC equipment rehabilitated, the project team provided a comprehensive range of trainings for the regional FIC personnel, from equipment operations to various food science and product development topics.

To make the support holistic, a wide range of data from FIC stakeholders were gathered through surveys, interviews, and focus group discussions to better understand the gaps and hurdles and recommend measures to sustain operations of the DOST FICs. From the gathered data, a database or knowledge management system that would link all FICs into one network is now being developed and will soon be operational through one portal that will make knowledge sharing and collaboration easier and seamless.

FPE Repair and Rehabilitation

Recognition of Most Innovative Products

Development of Mobile Modular Food Processing Facility (MMFPF)

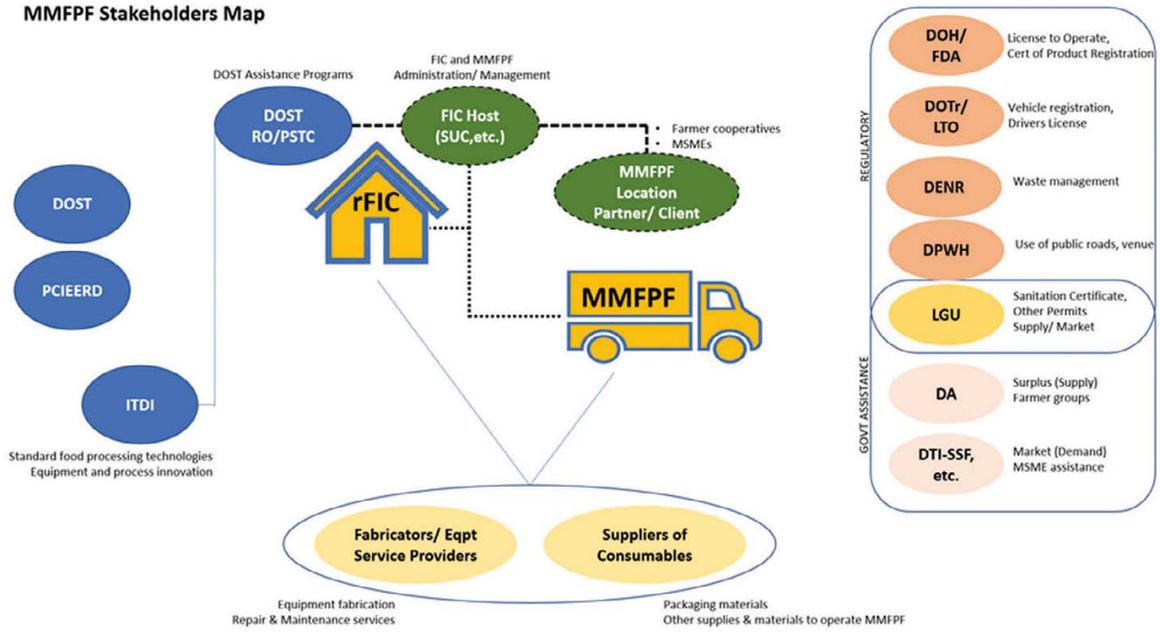
Developing the DOST mobile modular food processing facilities was conceptualized during the COVID pandemic when perishable commodities could not be transported to markets or distribution centers, with tons and tons of produce ending up being wasted. While acknowledging the complexity of design considerations, the project team took on the monumental task.

After careful studies and consultations with experts from relevant fields, design development of the MMFPF Systems for drying, frying, and thermal processing were completed in 2022, allowing the project team to push through with the procurement process. As components begin to arrive, preparation for simulation activities begun.

Around the same time, the project team also worked closely with DOST regional offices IV-B, VI, IX and X for the selection of regional commodities, assessment of proposed sites, and identification of stakeholders who would play vital roles in the operational sustainability of the MMFPFs upon deployment in 2023.

Project team design development and status meetings

Project team visit to fabricators of mobile homes and custom trucks



Upgrading of ITDI Engineering Workshop

To provide a space for collaborative innovation among the institute's engineers, as well as with clients from the academe and industry, the ITDI Engineering Workshop was renovated in 2021 and installed with an ICT system in 2022 to be fully operational. With the newly upgraded Visitor's Lounge, Machine Shop, and Engineering Services Office, the ITDI Engineering Workshop is set-up to be the hub for harmonized and state-of-the-art engineering-related services for both internal and external clients of the institute.

Machine Shop

ESS Office

Corporate Social Responsibility

Amidst its quest for KT initiatives, the institute is also a staunch supporter and implementer of GAD (Gender and Development) advocacies and has been conducting CSR programs especially for the less privileged groups. This year, its CSR through the DOST-ITDI GAD Training/Capability Building Program was conducted for some select parishioners of St. Joseph Parish in Taguig City. Majority of the participants were women aged 51 to 70 years old and are married.

The program featured several livelihood training courses that aimed to provide select stay-at-home housewives and other womenfolk, youth, and other groups of the Taguig City Diocese knowledge and skills to enable them to startup or expand small businesses at home. It is also envisioned that the knowledge and skills gained will empower them to become more productive even at the comfort of their homes, especially for the women participants who have families to also take care of.

Six (6) livelihood training program were conducted consecutively with maximum number of fifteen (15) participants per technology, as follows:

- Hand Sanitizer
- Liquid Hand Soap
- Calamansi Processing
- Ham Making
- Coconut Burger Patty
- Coconut Lumpia

Plans for more support training courses on product costing, valuation, and accounting, among others are eyed for the group, which, when organized into a cooperative as espoused by their parish priest, they may yet evolve into a ‘best practice’ model for social entrepreneurship.

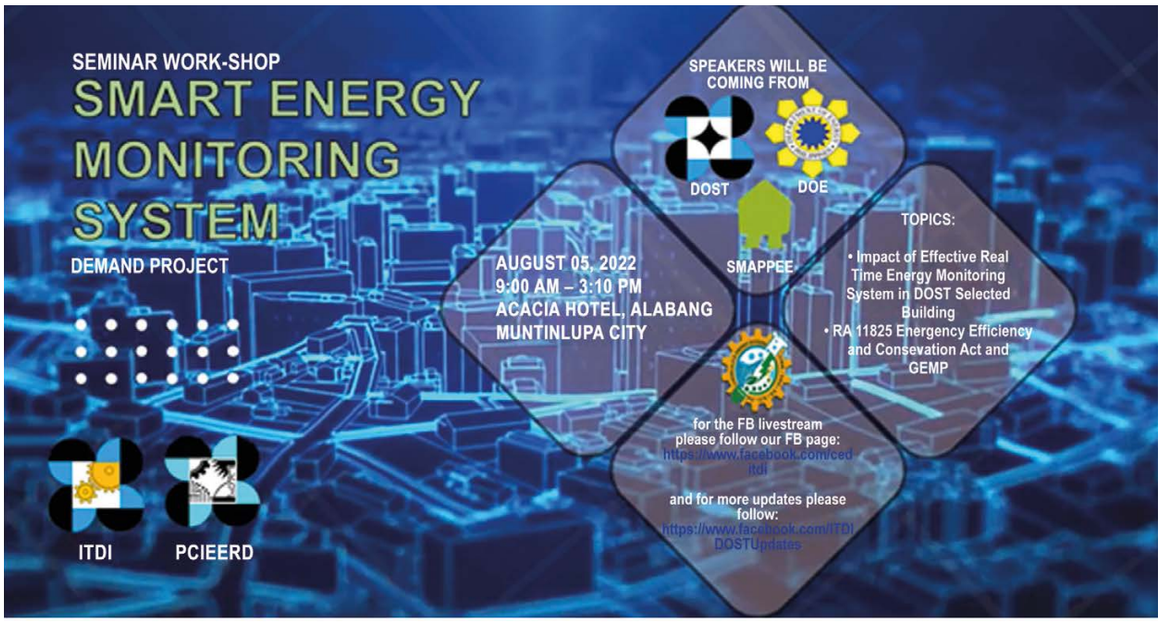
ASEAN – SCMST Training on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries

DOST-ITDI, representing the Philippines, hosted the ASEAN Sub-Committee on Materials Science and Technology (SCMST) *Training on Advanced Materials Characterization Techniques for Young Researchers from ASEAN Member Countries* last October 26-28. Lectures on various topics were conducted with hands-on training on the equipment at DOST-ITDI's Advanced Device and Materials Testing Laboratory (ADMATEL).

PhilCAM

In partnership with DOST's MIRDC and PCIEERD, the 1st Philippine Conference on Additive Manufactruring (PhilCAM 2022) was conducted on September 29-30 with the theme: State and Prospects of Philippine Additive Manufacturing.

Seminar-Workshop on Smart Energy Monitoring System



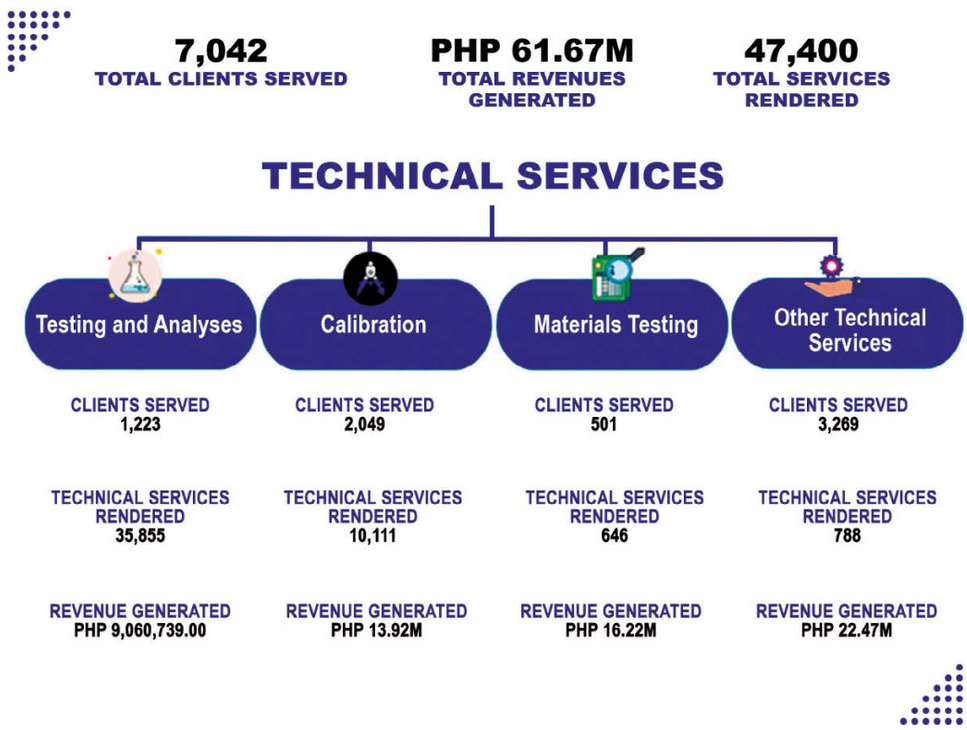
A seminar-workshop on Smart Energy Monitoring Systems was conducted jointly with PCIEERD last August 5 at the Acacia Hotel, Alabang. Various topics that include Impact of Effective Real Time Energy Monitoring System in DOST Selected Building, RA 11825 or Energy Efficiency and Conservation Act, and Government Energy Management Program (GEMP) were discussed.

World Metrology Day

Led by its National Metrology Division, ITDI celebrated **World Metrology Day** on May 24. Themed *"Metrology in the Digital Era",* the event had three highlights: 1. re-dedication and ribbon cutting ceremony of the Almanzor Conference Room, 2. MOU signing between ITDI and PhilMSTQ, and 3. Webinar on Understanding the Philippine Metrology Infrastructure.

Technical Services

The institute has a wide range of technical services being offered that cater to the needs of various sectors such as the industry, government, and academe that contribute in enhancing their productivity. A total of 47,400 technical services involving testing & analyses, calibration, materials testing, and R&D services were rendered to 7,053 customers nationwide which generated a total revenue of PHP 59.74 million. This year's revenue has surpassed last year's Php 29.43 million income by 51%.



New services offered by ADMATEL for this year included the use of onsite Handheld X-ray Fluorescence Spectrometry (hXRF) and 2D X-ray Non-Destructive Testing (NDT). Various reference materials and PT schemes were also developed by the National Metrology Division as follows:

1. Benzoic Acid in Mango Juice
2. Histamine in Canned Tuna
3. Histamine in Dried Fish
4. As and Hg in Drinking Water
5. Pb, Cd, Fe, and Cu in Drinking Water
6. Sulfite in Dried Mango
7. Salbutamol in Meat
8. Ca, Mg, and Zn in Drinking Water
9. Co, Mn, and Ni in Drinking Water
10. Vitamin A (Retinol)
11. Vitamin D3 (Cholecalciferol)
12. Folic Acid/Folate

Governance

Annual Planning Workshop 2022

As part of the planning cycle of the Institute, the ITDI Annual Planning Workshop was conducted last 17-18 November 2022 at the Development Academy of the Philippines, Tagaytay City. This was attended by the ITDI ExeCom and other key personnel from each division. Various points discussed included the overview of the ITDI Performance and Current Situation, Presentation of the R&D and ATS Roadmaps, 2022 Financial Performance, 2023 Budget, and other issues and concerns.

To prepare for this Institute-wide Planning Workshop, all divisions also held their Divisional Planning Workshop wherein they reviewed and validated their programs against the DOST Strategic Plan 2021-2025 and updated their respective program roadmaps to align with the thrust of the current administration.

ITDI Accreditations and Certifications

In 2022, that the Physical and Performance Testing Laboratory also secured renewal of its Laboratory Recognition under the Bureau of Philippine Standards (BPS) of the Department of Trade and Industry (DTI).

It was also in 2022 that the Chemistry Laboratory secured the renewal of its Certificate of Authority to Operate (CATO) as a chemical testing laboratory in compliance to RA 10657, the Chemistry Profession Act. this was granted by the Professional Regulation Commission (PRC) during the 6th National Conference of Chemical Laboratories (NCCL).

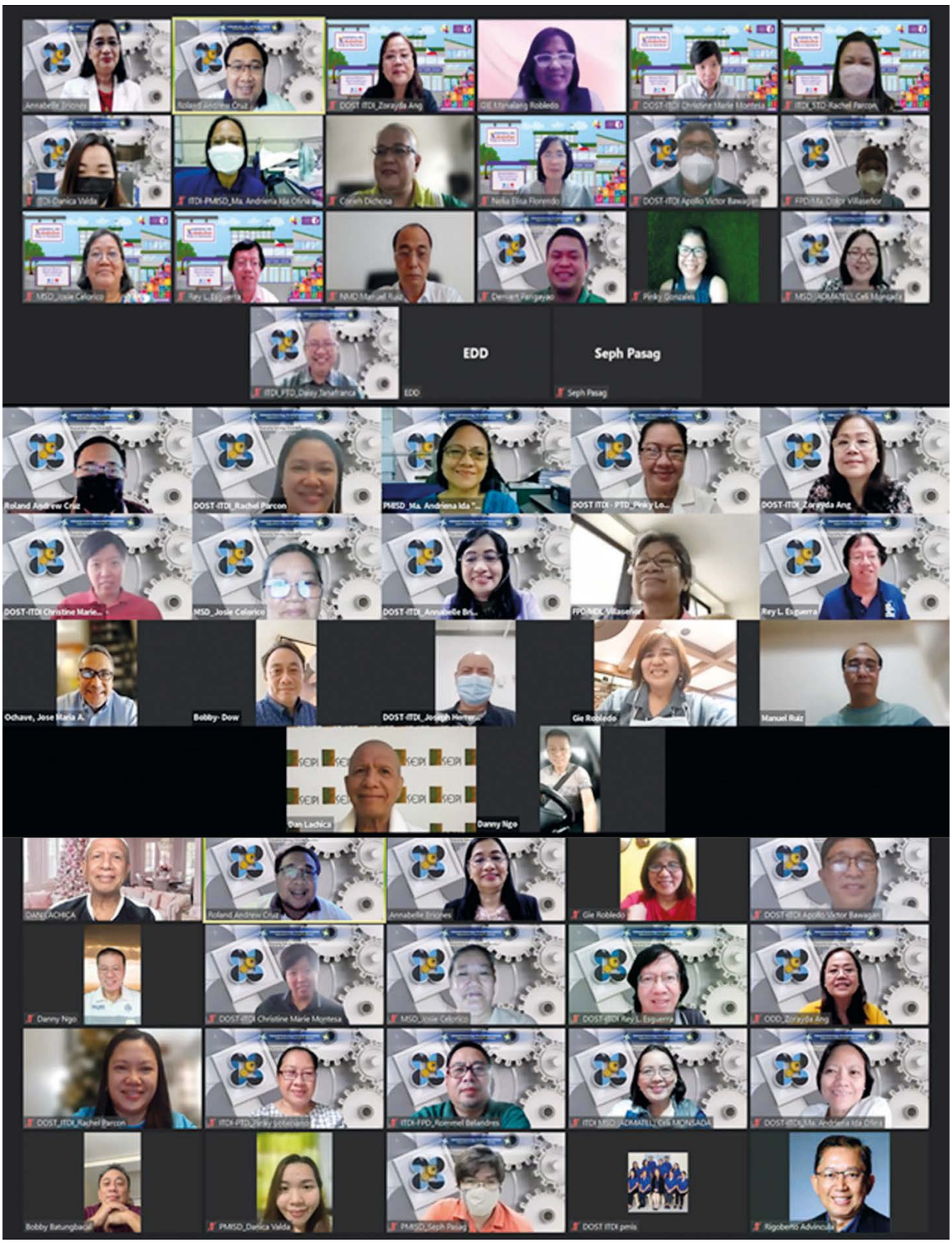
Likewise, the Standards and Testing Division - ITDI was granted continued accreditation by the DTI-Philippine Accreditation Bureau under PNS ISO/IEC 17025:2017 in the fields of Biological (LA-2005-081D), Chemical (LA-2015-284B and LA-2011-190C), and Mechanical Testing (LA-2011-191C) on April 13. Additionally, their Microbiology Section, Biological Laboratory and the Inorganic and Organic Chemistry Sections of the Chemistry Laboratory successfully obtained the renewal of their FDA Laboratory Accreditations.

The Freedom of Information - Project Management Office (FOI-PMO) under the Presidential Communications Operations Office (PCOO), recently awarded DOST-ITDI as FULLY COMPLIANT to the enhanced FOI requirements.

Meanwhile, on November 1, 2021, the International Halal Integrity Alliance (IHIA) Ltd., Malaysia, awarded a Certificate of Accreditation to DOST-ITDI's Halal R&D Facility. The official awarding of certificate was held on March 23, 2022.

ITDI Industry Advisory Committee (IAC)

DOST-ITDI's Industry Advisory Committee (IAC) is a group of industry experts and business leaders from both private and public sectors that provides expert advice on R&D, business development, and technology transfer.



Four meetings with the IAC were conducted this year to seek expert advice and possibly, for coaching or guidance particularly in developing ITDI programs and technology roadmaps. This year has also seen the active participation/engagement of ITDI and external IAC members in various international seminars, fora, facility tours, and collaboration meetings in advancing objectives for mutual benefit.

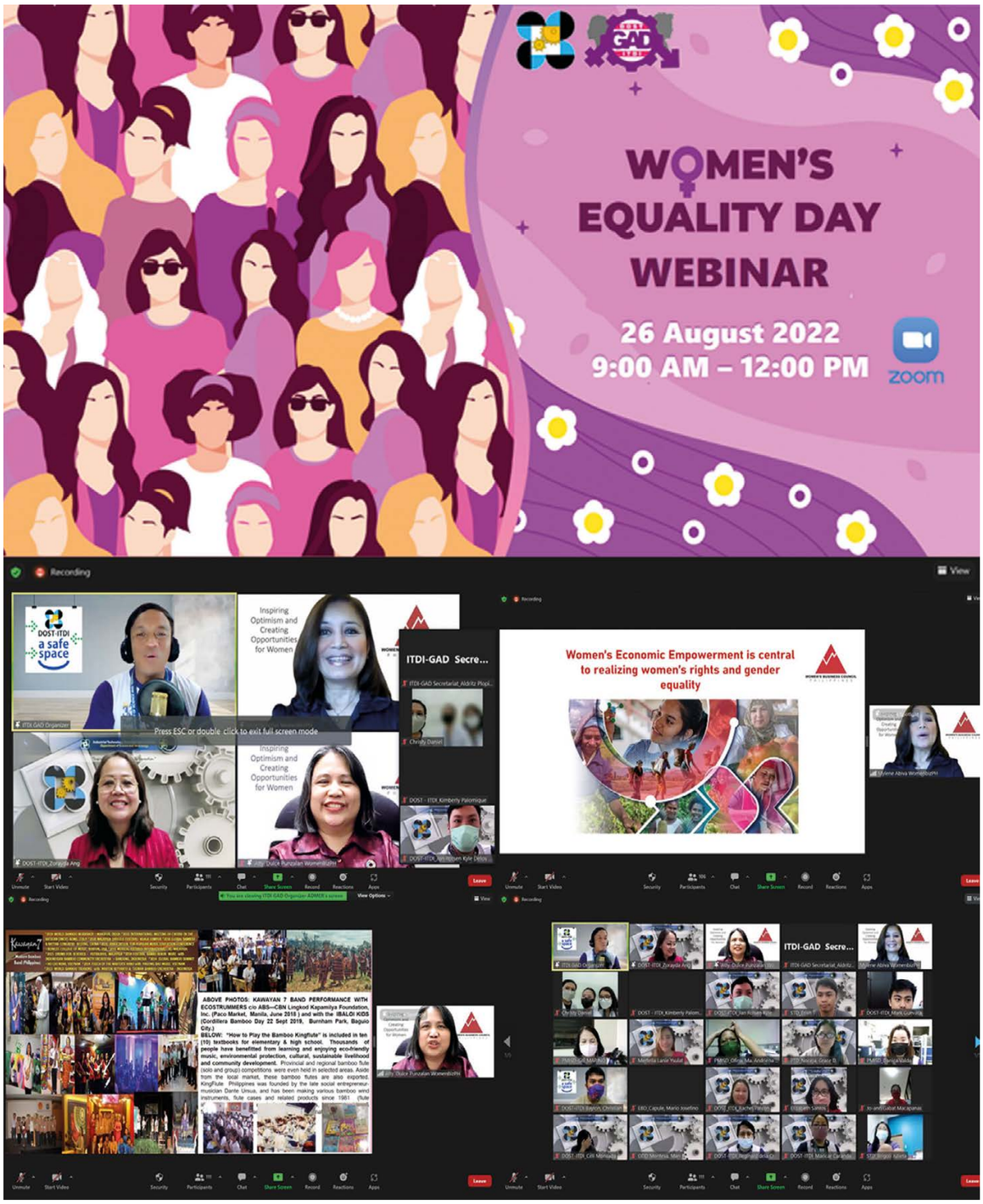
Philippine Industry Association

Gender and Development (GAD)

With the theme “Agenda ng Kababaihan Tungo sa Kaunlaran”, DOST-ITDI kicked-off its annual National Women’s Month Celebration (NWMC) last March 1. As Gender and Development Chair, Deputy Director for ATS Dr. Zorayda V. Ang led the gathering of nearly hundreds of ITDI officers and staff in front of the National Metrology Building, all in various shades of purple tees, as a show of support to the cause. ITDI GAD also provisioned women’s month themed souvenir items (t-shirt, alcohol spray bottle, and face mask) to all ITDI employees regardless of employment status. These items were used throughout the month that signified the Institute’s adherence to the campaign.

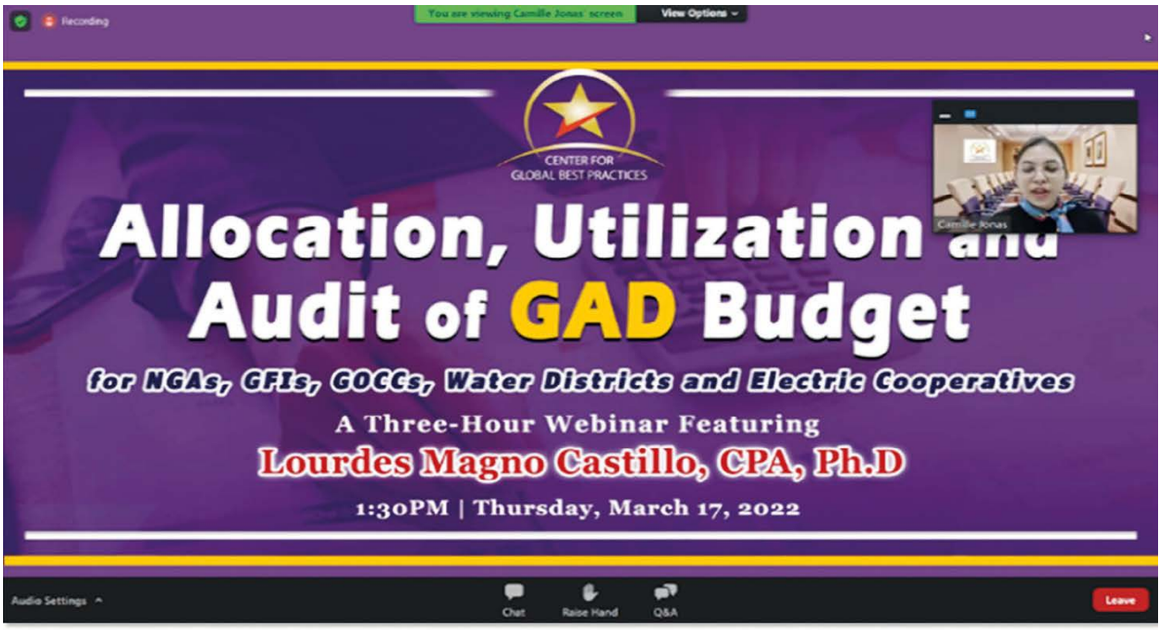
With the theme “#BreakTheBias”, DOST-ITDI staff celebrated the International Women’s Day last 8 March 2022 by doing the #BreakTheBias pose. ITDI Executives, led by Director Annabelle V. Briones, made their pledge video which signifies the Institutes stand to the cause. This year’s campaign is represented by the #BreakTheBias hashtag and calls on people to work towards a world that is equitable, inclusive, and free from bias and discrimination so the playing field is levelled for women moving forward. DOST-ITDI organized the “BreakTheBias Music Video Making Contest”. This contest aims to provide an avenue for all ITDI personnel to showcase a community that is free from bias, stereotypes, and discrimination against women to attain a diverse, equitable, inclusive, and a gender equal world.

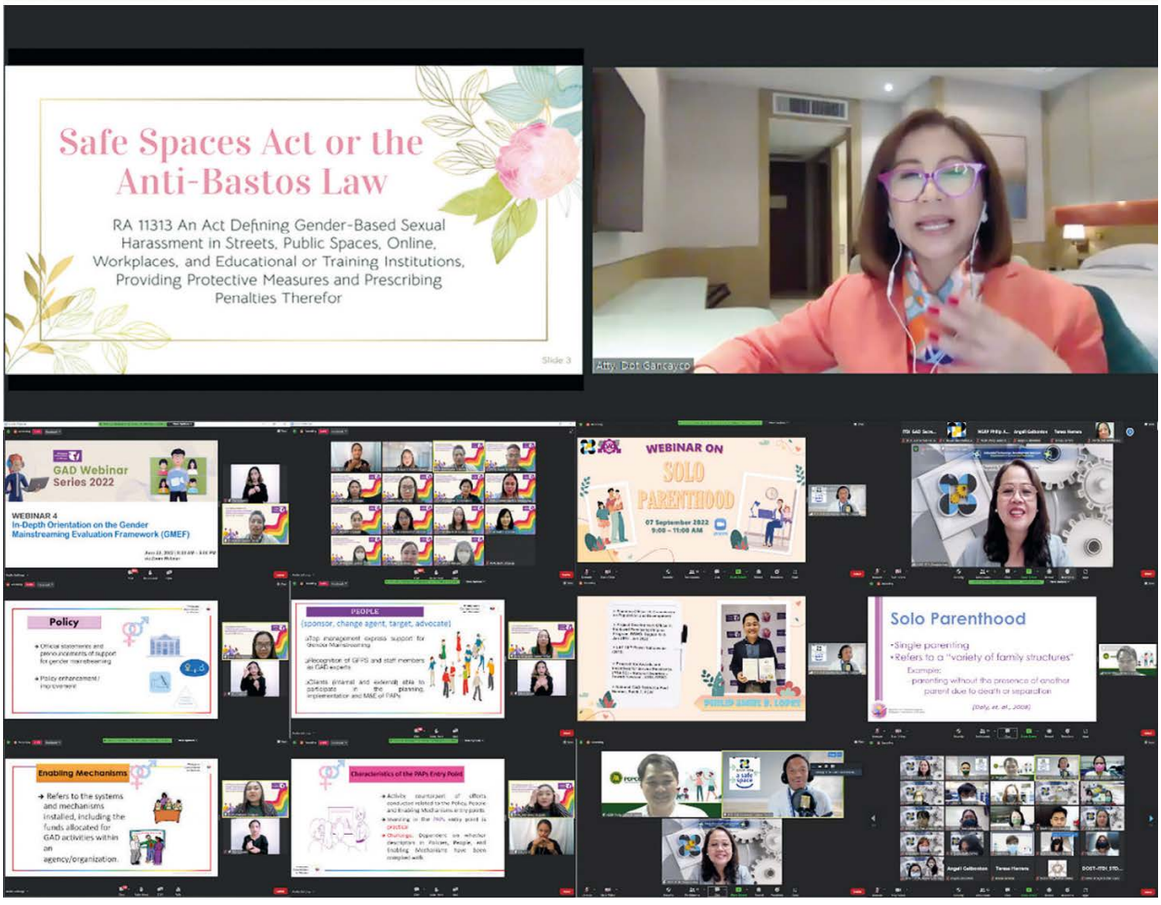
Last March 31, DOST-ITDI ended the women’s month celebration with a mini concert. The ITDI GAD Band composed of in-house singers and band members performed various women empowerment songs to honor the women of science and their remarkable contributions in the field.



As part of the Women's Equality Day celebration, two keynote speakers from the Women Business Council Philippines (WomenBizPH), an advocacy group composed of the country's top women business leaders and entrepreneurs, which seeks to promote women-led and women-owned enterprises through networking and through the use of technology, were invited to deliver the requested topics. Ms. Mylene Abiva, chairperson of WomenBizPH, discussed how Innovation and Market Participation Transform Women's Lives. While Attorney Dulce T. Punzalan, a World Bamboo Ambassador, and also a member of the Women Business Council talked about women's empowerment through innovative and creative industries.

Various online trainings and webinars were also participated by DOST-ITDI as part of its GAD activity such as the following: (1) Allocation, Utilization, and Audit of GAD Budget, (2) The Law and IRR of Safe Spaces Act, (3) In-depth Orientation on the Gender Mainstreaming Evaluation Framework (GMEF), (4) Fatherhood at DOST-ITDI, (5) Gender Sensitization, (5) Honoring Solo Parents of DOST-ITDI, (6) Gender Analysis and Tools Training





The DOST-ITDI GAD Training/Capability Building Program featured several livelihood training courses on food including calamansi processing, coco lumpia and coco lumpia-burger production, ham making, and liquid handwash and hand sanitizer production. It aimed to provide select stay at home housewives and other womenfolk, youth, and other groups of the Taguig City Diocese knowledge and skills to enable them to startup or expand small businesses at home.

Last November 14, DOST-ITDI conducted its Annual Gender and Development Planning Workshop which was held at the Almanzor Hall, National Metrology Division. Various ITDI GAD Focal Point System (FPS) Technical Working Group (TWG) members from different ITDI divisions attended the GAD Planning Workshop. Participants of the GAD Planning Workshop were capacitated on the significance of conducting Gender Analysis and Project Stakeholders Profiling cycle as well as providing comprehensive means of verification when accomplishing the Project Design and Project Implementation, and Management, Monitoring, and Evaluation (PIMME) Checklist.

DOST-ITDI staff gathered at the Metrology Building to commence the observance of the 18-Day Campaign to End Violence Against Women (VAW) this 2022. With the theme *"UNited for a VAW-Free Philippines"*, the campaign aims to highlight the powerful impact of combining individual efforts towards a collaborative and united thrust towards a VAW-free Philippines.

Anti-Red Tape Unit (ARTU)

In compliance with Section 1, Rule III of the Implementing Rules and Regulations of RA 11032 and in accordance with the issued ARTA Memorandum Circular 2020-07 or Guidelines on the Designation of CART, Anti-Red Tape Unit (ARTU) of DOST-ITDI was reorganized to Committee on Anti- Red Tape. DOST-ITDI CART was able to accomplish the following this year:

- New ITDI 2021 Citizen's Charter Handbook was completed and implemented in 2022.
- Revised all Information Bulletins based on the new ITDI Citizen's Charter.
- Prepared and submitted to ARTA the Zero Backlog Report and ITDI Reengineering Report
- Revised template for Customer Satisfaction Survey Quarterly report was issued incorporating recommendation of the ISO Internal Audit Team and compliance to GAD (Gender and Development) gathering of data.

AESE Updates

With its members' proclivity for inclusion, efficiency, and reliability; AESE remains an instrument to foster unity and cooperation with the ITDI management and the 218 employees it represents. AESE will continue to march forward and hopefully, institutionalize more programs for employee welfare and progressive employee-management relations. Below are the AESE Executive Board's accomplishments this year:

Health for all

- Provided medical and bereavement assistance to affected members amounting to Php 22,000.00
- Granted reimbursement of hospitalization services and annual mental, medical-physical examination related expenses incurred for this year in pursuant to DOST Administrative Order No. 019, Series of 2016, amounting to a total of Php 3,408,803.75
- Facilitated negotiation with and enrollment to one health insurance provider (HMO) and organized in-house annual physical examination for ITDI employees. A total of 562 employees and their dependents were enrolled for this year's HMO

Employee representation

- Facilitated Collective Negotiations Agreement (CNA) incentive as the joint effort of the ITDI Management, AESE and its members to implement effective cost-cutting measures and systems improvement this year in pursuant to the Department of Budget and Management Budget Circular No. 2022-3 dated October 19, 2022
- Conducted General Assembly with members.
- Provided monetary contribution to both the 2022 ITDI Anniversary and Year-end Activity
- Actively participated in meetings conducted by various ITDI Committees to represent rank-and-file employees of the Institute
- Distributed Christmas rice package to all members in time for the holiday celebration

Establishment of ITDI Cooperative

To jump-start the ITDI Cooperative, the AESE Board Members attended an orientation with the DTI's Cooperative Development Authority (CDA). Though this cooperative will be a stand-alone entity from AESE, the board is spearheading the election of its Board of Directors together with the review of its legalities.

AESE Office

With the help of the ITDI Management, AESE now has its own office that will also house the future ITDI Cooperative. Improvements are being done to make the place a conducive venue for meetings and other activities.

Rikkamae Zinca Marie L. Walde, RCh, won the best oral presentation during the 24th Anniversary Conference of the National Institutes of Health - University of the Philippines. Her presentation entitled *"Computational molecular docking of Angiopteroside and its derivatives revealed promising SARS-CoV-2 Mpro Inhibitor"* was part of her thesis in her Master's Degree in Chemical Biology in the prestigious Chulabhorn Graduate Institute of the Chulabhorn Royal Academy in Bangkok, Thailand.

2022 International Publication Awards (IPub Awards)

1. **3D printing of metals using biodegradable cellulose hydrogel inks** by Carla Joyce C. Nocheseda, Fred P. Liza, Alvin Kim M. Collera, Eugene B. Caldona, and Rigoberto C. Advincula. **Additive Manufacturing** 48 (102380), 2021.

2. **Occurrence of microplastics in the sediments of Baseco Port area at Manila Bay, Philippines** by Lynne Jerisa A. Castro, Araceli M. Monsada, and K D Cruz. **IOP Conference Series: Earth and Environmental Science** 958 (012009): 1-8, 2022.

3. **Characteristics and performance of PTU-Cu composite membrane fabricated through simultaneous complexation and non-solvent induced phase separation by** Marianito Tiangson Margarito , Arnel Bas Beltran, Aileen Huelgas-Orbecido. **Polymers** 13(11), 1743, 2021.

4. **Characterization of cellulose acetate based scaffolds derived from kapok fiber (Ceiba pentandra (l) gaertn)** by Sharyjel R. Cayabyab, Josefina R. Celorico, Cyron L. Custodio, Blessie A. Basilia. **Materials Science Forum** 891:77-82, 2021.

5. **Effect of fiber loading on the chemical, structural and mechanical properties of 3D printed polylactic acid/abaca microcrystalline cellulose composites** by Cyron L. Custodio, Joel M. Cabañero Jr, Marissa A. Paglicawan and Blessie A. Basilia. **Materials Science Forum** 1041:3-9, 2021.

6. **Mechanical properties of abaca–glass fiber composites fabricated by vacuum-assisted resin transfer method** by Marissa A. Paglicawan, Carlo S. Emolaga, Johanna Marie B. Sudayon, and Kenneth B. Tria. **Polymers** 13(16): 2719, 2021.

7. **Properties of styrene-ethylene-butylene styrene block copolymer/exfoliated graphite nanoplatelets nanocomposites** by Marissa A. Paglicawan and Josefina R Celorico. **Polymers and Polymer Composites** 29(9S):S154–S165, 2021.

8. **Piper betle L. leaf extracts inhibit quorum sensing of shrimp pathogen Vibrio harveyi and protect Penaeus vannamei postlarvae against bacterial infection** by John Paul Matthew D. Guzman, Pattanan Yatip, Chumporn Soowannayan, and Mary Beth B. Maningas. **Aquaculture** 547:737452, 2022.

9. **Screening for production of amylase and protease by locally- isolated Bacillus spp. from soil collected in Taguig City and Clark Freeport Zone, Philippines** by John Paul Matthew Guzman, Sheila Mantaring, and Elizabeth Panerio. **Pharmaceutical Sciences Asia** 49(2): 202-209, 2022.

10. **Effect of modified cassava starch in reduced-fat mayonnaise by correlating emulsion stability with anti-oxidation reaction using gas chromatography–mass spectrometry (GC-MS)** by Ronaldo P. Parreño Jr., and Maricar B. Carandang. **Philippine Journal of Science** 150(4), 2021.

11. **Investigating the mechanical behavior of 3D printed PLA- coco coir composites** by Paul Eric C. Maglalang, Blessie A. Basilia, and Araceli M. Monsada. **Materials Science Forum** 1056, 2021.

12. **Surface design of 3D-printed PEEK by controlling slicing parameters** by Carlo S. Emolaga, Shaun Angelo C. Arañez, Persia Ada N. de Yro, Jocelyn P. Reyes, Brigida A. Visaya, Blessie A. Basilia, and Rigoberto C. Advincula. **International Journal of Mechanical Engineering and Robotics Research** 11(3), 2022.

13. **Synthesis and characterization of PSf-CQD nanocomposite membrane via non-solvent induced phase separation technique** by Persia Ada N. de Yro, Dianne Y. Amor, Sweetheart Meryl G. Navarro, Gerald Mari O. Quiachon, and Sharyjel R. Cayabyab. **Lecture Notes in Mechanical Engineering**, 2022.

14. **Development of polyamide–polysulfone thin film composites with copper–treated zeolites as additives for enhanced hydrophilicity** by Sharyjel R. Cayabyab, Justine de Guzman, and Persia Ada de Yro. **Lecture Notes in Mechanical Engineering**, 2022.

15. **Superhydrophobic l-pillars via simple and scalable SLA 3D- printing: The stair-case effect and their wetting models** by Jose Bonilla-Cruz, Jo Anne C. Sy, Tania E. Lara-Ceniceros, Julio C. Gaxiola-Lopez, Vincent Garcia Blessie A.Basilia, and Rigoberto C. Advincula. Soft Matter 17:7524–7531, 2021.

16. **Hybrid composite of nafion with surface-modified electrospun polybenzoxazine (PBz) fibers via ozonation as fillers for proton conducting membranes of fuel cells** by Ronaldo P. Parreño Jr. and Arnel B. Beltran. **RSC Advances** 12:9512, 2022.

17. **Absorbency and corrosion inhibition property of polyamide epoxy and superabsorbent polymer composite material** by Ariel V. Melendres, Rolan P. Vera Cruz, Mel Bryan L. Espenilla, Araceli M. Monsada. **Chemical Engineering Transactions** 86, 2021.

Awards and Recognition

The Association of Government Accountants of the Philippines (AGAP) has chosen DOST-ITDI's Finance and Management Division as one of the Outstanding Accounting Offices of 2021. FMD has received the award for three straight years, making the Institute part of the elite Hall of Famer Category of Outstanding Accounting Offices. This achievement is a testament of the quality, timeliness, and accuracy of DOST-ITDI's financial documents.

DARNA

Mr. Christian D. Laurio, RCh of the National Metrology Division, and member of TEAM DARNA (Detection of Anomaly in OFW Recruitment Posts thru ARtificial NeurAl Network) won the Best Use of Data Science in the recently concluded Dataquest 2022: Gender Responsive Labor Migration Hackathon. DARNA studies Facebook Overseas Filipino Workers (OFW) recruitment posts and tags them as low or high risk for illegal recruitment. It also shows the Department of Migrant Workers (DMW) website to link the user to legitimate job postings. A combined NLP and Neural Network was used to develop the model which shows 88% accuracy.

During the 71st Annual Convention of the Philippine Association for the Advancement of Science and Technology (PhilAAST), DOST-ITDI personnel were awarded the following:

- 3rd Prize in the Poster Presentation for the paper Local Natural Fibers as Scaffolds for Tissue Engineering authored by JR Celorico, S Cayabyab, C Custodio, and Dr. BA Basilia

- Gregorio Y. Zara Award for Applied Science Research for Dr. EA Ongo

Amongst the research and development institutes (RDIs) and sectoral councils of DOST, DOST-ITDI emerged the winner for the Gawad SIDHA Award for RDIs and Councils. The award, granted by DOST's Technology Application and Promotion Institute (DOST-TAPI), was conferred during the Launching of the DOST-TAPI Roadmap and Stakeholders' Recognition held last May 13 at the Novotel Manila Araneta City, Quezon City.

Accepting the award from DOST-TAPI Director Atty. Marion Ivy D. Decena was DOST-ITDI Director Dr. Annabelle V. Briones. Aside from the trophy, the Institute also took home a check worth P30,000.

2022 Utility Model Registration Awards (UM Awards)

1. **Method of Bilayer Coating of Fruit**
   by Darylle Jerome I. Ortiz, Ray Anne Grace M. Garalde, Daisy E. Tañafranca, Angel T. Basbasan Jr., and Jonel C. Urbona
   Utility Model Registration Number 2-2020-050394

2. **Method of Manufacturing Natural Fiber-reinforced Composite Structures**
   by Marissa A. Paglicawan, Carlo S. Emolaga, and Blessie A. Basilia
   Utility Model Registration Number 2-2021-050304

3. **Method of Manufacturing Natural Fiber-reinforced Composite Structures**
   by Marissa A. Paglicawan, Carlo S. Emolaga, and Blessie A. Basilia
   Utility Model Registration Number 2-2021-050306

4. **Method of Manufacturing Natural Fiber-reinforced Composite Structures**
   by Marissa A. Paglicawan, Carlo S. Emolaga, and Blessie A. Basilia
   Utility Model Registration Number 2-2021-050307

5. **A Ready-to-Drink Beverage from Mung Beans and Coconut Cream**
   by Rommel M. Belandres, Ma. Dolor L. Villaseñor, and Donah Jane C. Lusanta
   Utility Model Registration Number 2-2019-050108

6. **A Process of Producing Ready to Eat Food Product**
   by Floridel V. Loberiano, Grace D. Noceja, Ermin S. Orendain, Daisy E. Tañafranca, Vicente P. Casas, and Allan B. Quirante
   Utility Model Registration Number 2-2020-000158

7. **A Ready-to-eat Food Product**
   by Floridel V. Loberiano, Grace D. Noceja, Ermin S. Orendain, Daisy E. Tañafranca, Vicente P. Casas, and Allan B. Quirante
   Utility Model Registration Number 2-2020-000159

8. **A Process Employing Retort as a Means to Effect Longer Shelf Life and Stability of Ready-to-eat Food Product**
   by Floridel V. Loberiano, Grace D. Noceja, Ermin S. Orendain, Daisy E. Tañafranca, Vicente P. Casas, and Allan B. Quirante
   Utility Model Registration Number 2-2020-000160

9. **Process of Formulating Moisturizing and Whitening Bath Soap with Halal Ingredients Through Cold Saponification Technique**
   by Rosalinda C. Torres, Chelsea Kate F. Jose, and Dana A. Taladro
   Utility Model Registration Number 2-2020-050671

10. **Standardized Process of Producing a Bar shampoo with Hair-Growth Promoting Properties Using Halal Ingredients**
by Rosalinda C. Torres, Harvy Jay N. Esmundo, and Danille Camille P. Canillo
Utility Model Registration Number 2-2021-050222

11. **Process of Producing Natural Colorant from Beta Vulgaris (Beet root)**
by Rosalinda C. Torres, Rowelain Mae G. Yumang, and Rikkamae Zinca Marie L. Walde
Utility Model Registration Number 2-2019-000542

12. **Process of Formulating Moisturizing Lip balm with Halal Ingredients**
by Rosalinda C. Torres, Ma. Rachel V. Parcon, Chelsea Kate F. Jose, and Dana A. Taladro
Utility Model Registration Number 2-2021-05089

13. **Process of Formulating Liquid Clear Shampoo with Hair Growth Promoting Properties using Halal Ingredients**
by Rosalinda C. Torres, Ma. Rachel V. Parcon, Chelsea Kate F. Jose, and Dana A. Taladro
Utility Model Registration Number 2-2021-050750

14. **Method of Producing Okra (Abelmoschus esculentus) Flakes and Okra Flakes obtainable therefrom**
by Ma. Elsa M. Falco, Rosela M. Gomez, Christopher Andrew G. Bilbao, Kristine Ann S. Dela Cruz, Christian Niamey U. Cortado, Romnick A. Enriquez, and Ronald M. Balderama
Utility Model Registration Number 2-2019-050039

15. **Method of Producing Okra (Abelmoschus esculentus) Sheets and Okra Sheets obtainable therefrom**
by Ma. Elsa M. Falco, Rosela M. Gomez, Christopher Andrew G. Bilbao, Kristine Ann S. Dela Cruz, Christian Niamey U. Cortado, Romnick A. Enriquez, and Ronald M. Balderama
Utility Model Registration Number 2-2019-050040

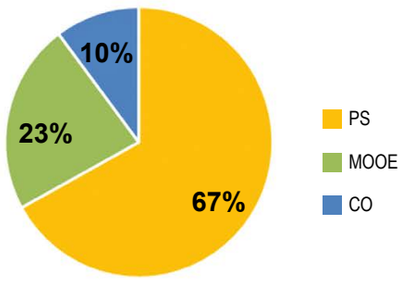
16. **Power Back-up System**
by Apollo Victor O. Bawagan, Federico E. del Pozo Jr., and Divine Rhea J. Ceruma
Utility Model Registration Number 2-2020-050378

17. **Standardized Process of Formulating A clay shampoo with Hair Growth Promoting Properties using Halal Ingredients**
Danielle Camille P. Canillo, and Ruffa Mae R. Cadiz
Utility Model Registration Number 2-2020-050743

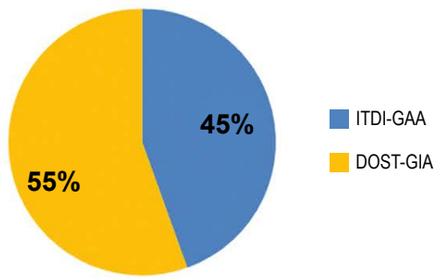
Financial Management Report

The institute received PHP 414.37 million funding from the Department of Budget and Management (DBM) General Appropriations Act (GAA), but was able to generate additional resources from project proposal-based funding of the DOST Grants-In-Aid (DOST – GIA) program in the amount of PHP 516.30 million. From R&D Technical Services, an amount of PHP 0.6 million provided additional funding. Altogether, a total of PHP 522.89 was generated to sustain the operations of DOST – ITDI in 2022.

ITDI 2022 Allotments

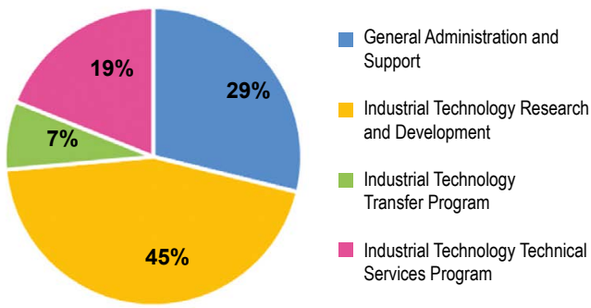


2022 Funding Sources by Percentage



For the 2022 ITDI – GAA, the Personnel Services (PS) component received the largest allotment with PHP 277.52 million; the second largest is Maintenance and Other Operating Expenses (MOOE) with PHP 94.44 million, and the smallest allotment is for Capital Outlay (CO) with PHP 42.4 million. ITDI's allotment for Programs, Projects, and Activities (PPAs) is divided into four, namely, General Administration and Support (GAS), Industrial Technology Research & Development, Industrial Technology Transfer Program, and Industrial Technology Technical Services Program.

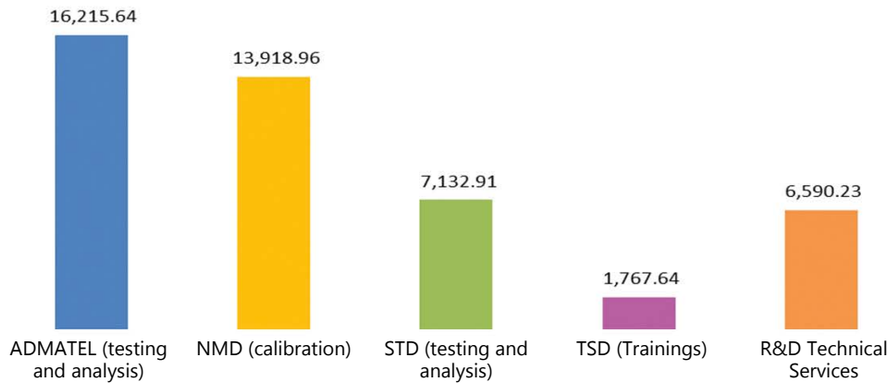
2022 Allotments by PPA



For 2022, the agency's R&D program received the largest budget with PHP 177.93 million, followed by the GAS with PHP 114.46 million, then by the Technical Services program with PHP 75.31 million, and lastly, the Technology Transfer Program with PHP 29.53 million.

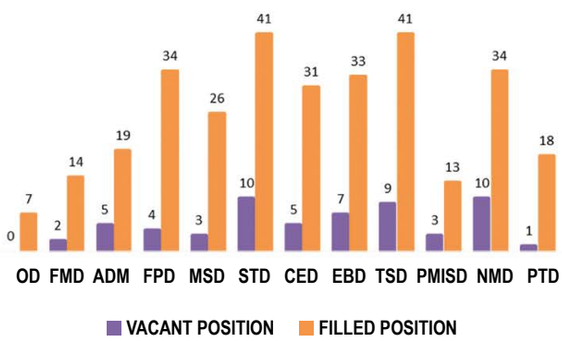
As most businesses and industries have resumed normal operations, ITDI was able to generate an amount of PHP 45.62 million. Of these, the Advanced Device and Materials Testing Laboratory (ADMATEL) technical services contributed the most to the revenue generated, followed by calibration services of the National Metrology Division (NMD), then by testing and analysis from the Standards and Testing Division (STD), followed by R&D technical services, and lastly by the trainings conducted by the Technological Services Division (TSD).

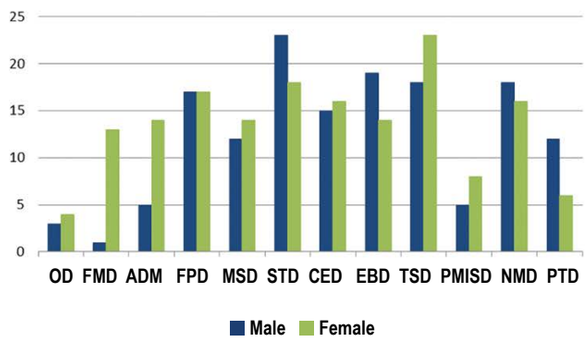
Revenue Generated in 2022 (PHP '000)



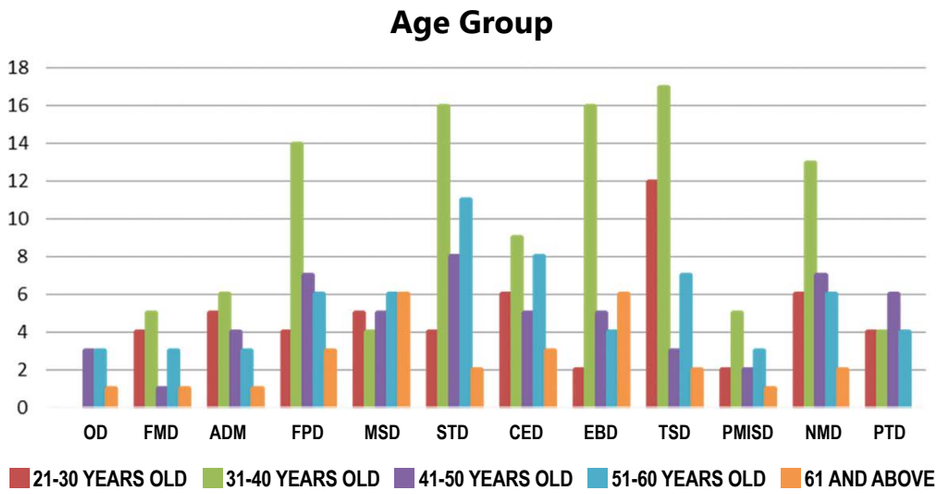
Human Resource Report

As of December 2022, the Institute has a total of 311 employees out of 370 authorized positions. Out of the 59 unfilled positions, the STD and NMD accounts for most of the unfilled positions; with 10 unfilled positions each. In terms of number, there is an almost even split between female employees and male employees; as female employees account for 52% or 163 employees, with TSD accounting for 14% of ITDI's female employees. Meanwhile, the STD is male-dominated and accounts for 15% of the total number of male employees of the institute.

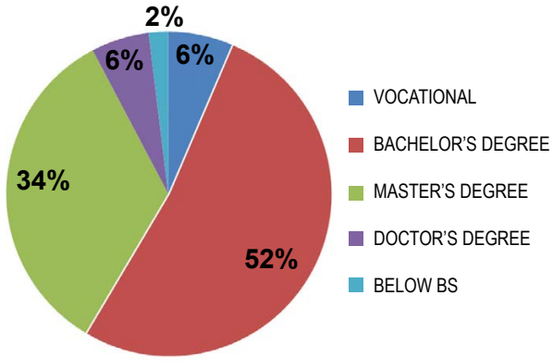




A large portion of the current DOST – ITDI human resource falls within the 31 – 40 age bracket with 109 employees, or 35% of the whole ITDI workforce. This is followed by the 51 – 60 age bracket and 41 – 50 age brackets with 64 and 56 employees, respectively. Majority of the divisions are composed of employees within the 31 – 40 age bracket, with the exception of the Material Science Division (MSD), with an almost equal split among the age brackets.



As part of self-improvement and to uphold excellence and professionalism as an R&D institute, DOST – ITDI pushes its staff to pursue higher learning. To date, 52% comprise those with Bachelor's degrees, 34% have Master's degrees, and 6% with Doctor's degrees; while other DOST – ITDI staff are still actively pursuing their advanced studies.



In 2022, 7 staff finished their graduate degrees, while 2 staff finished their doctorate degrees.

Degree Holder	Field of Specialization
Gerry Boy C. Garinggan	Master of Science (MSc) in Science of Measurement
Ahdrian Camilo C. Gernale	Professional Science Masters (PSM) In
Rikkamae Zinca Marie L. Walde	Master of Science (MSc) in Chemical Biology
Lynne Jerisa V. Castro	Master of Science (MSc) in Chemistry
Athena Dana V. Cortes-Chavez	Master of Science (MSc) in Microbiology
Jacqueline F. Dinglasan	Master of Science (MSc) in Information Technology
Karen S.M Cruz	Master of Science (MSc) in Information Technology
Marianito T. Margarito	Doctor of Philosophy (PhD) in Chemical Engineering
Kim Christopher C. Aganda	Doctor of Philosophy (PhD) in Energy Science and Technology

ITDI Organizational Chart

DR. ANNABELLE V. BRIONES
Director

DR. CHRISTINE MARIE C. MONTESA
Deputy Director for Research & Development (R&D)

DR. ZORAYDA V. ANG
Deputy Director for Administrative & Technical Services (ATS)

R&D

- Chemicals & Energy Division (CED)
- Packaging Technology Division (PTD)
- Materials Science Division (MSD)
- Food Processing Division (FPD)
- Environment & Biotechnology Division (EBD)

ATS

- Technological Services Division (TSD)
- Administrative Division (ADM)
- Standards & Testing Division (STD)
- Finance & Management Division (FMD)
- National Metrology Division (NMD)
- Planning & Management Information Systems Division (PMISD)

Reasearch and Development

ENGR. APOLLO VICTOR O. BAWAGAN
OIC, Chemicals and Energy Division

ENGR. REYNALDO L. ESGUERRA
Chief, Environment and
Biotechnology Division

MS. MA. DOLOR L. VILLASEÑOR
Chief, Food Processing Division

MS. JOSEFINA R. CELORICO
Chief, Materials Science Division

MS. FLORIDEL V. LOBERIANO
OIC, Packaging Technology Division

Administrative and Technical Services

ENGR. MANUEL M. RUIZ
Chief, National Metrology Division

MS. MA. RACHEL V. PARCON
OIC, Standards and Testing Division

MS. NELIA ELISA C. FLORENDO
Chief, Technological Services Division

DR. JANET F. QUIZON
Chief, Finance and Management Division

MS. MERLITA M. REGONDA
OIC, Administrative Division

DR. ZORAYDA V. ANG
OIC, Planning & Management
Information Systems Division

ITDI HISTORY

1901	1st of July - **The Bureau of Government Laboratories (BGL)** came into existence through the Philippine Commission Act. No. 156. It was composed of the biological and chemical laboratories, a science library, and the Serum Laboratory of the Board of Health.
1905	By virtue of the Philippine Commission Act. No. 1407, the BGL was reorganized into the **Bureau of Science (BS)** and expanded its functions to include the Bureau of Mines and the Ethnological Survey Division of Education.
1934	The headship of the BS was passed on for the first time to a Filipino chemist. Dr. Angel S. Arguelles. The present-day Bureau of Soils, Bureau of Mines, Bureau of Fisheries and National Survey Division of Education Museum developed initially as part of the Bureau of Science during the pre-war years.
1947	The BS was transformed into the **Institute of Science (IS)** by virtue of Executive Order No. 94.
1951	The IS was renamed **Institute of Science and Technology (IST)** by virtue of Executive Order No. 392 and for the first time primarily concerned itself to industry-oriented research.
1956	Congress approved RA Number 1606 authorizing the establishment of the National Science Board (NSB). IST was changed to the **National Scientific and Industrial Research Institute (NSIRI)**, and was placed under supervision of NSB.
1958	Under the so-called “Magna Carta of Philippine Science” RA 1067, NSB was reconstituted as the National Science Development Board (NSDB) which was designed to coordinate and supervise all scientific activities in the country. NSIRI became the **National Institute of Science and Technology (NIST)** under the supervision of NSDB.
1973	As part of the overall reorganization of the Executive branch of the government, the NIST was reorganized, but retained the same name. With the merger of the Agriculture Research Center, Biological Research Center and Medical Center, only two (2) technical R&D centers remained, namely Biological Research Center and Industrial Research Center. In addition, these were the Tests and Standards Laboratory and the Scientific Instrumentation Division to provide standardization and technical services.
1982	By virtue of Executive Order Number 784 dated 17 March 1982, the NSDB was reorganized into the National Science and Technology Authority (NSTA). Under the reorganization NIST remained as one the R&D Institutes under the NSTA. As reorganized, research on agriculture was transferred to UPLB while the ceramics center emerged into an independent institute (MSRI).The Biological and Industrial research center were also abolished and in their place, three (3) centers were created namely: the National Research and Development (NRDC), Chemical Research and Development Center (CRDC), and the National Standards and Testing Center (NSTC). Under the NRDC and CRDC are seven(7) programs to undertake R&D activities, while the NSTC provides standardization and technical services.
1987	The NSTA was reorganized into the Department of Science and Technology (DOST) by virtue of Executive Order Number 128 dated 30 January 1987. Under this reorganization, NIST was renamed **Industrial Technology Development Institute (ITDI)** and remained one of the R&D institutes under the DOST. All centers were abolished and ITDI now has ten (10) technical divisions with (MSRI) now absorbed by ITDI. Seven (7) divisions to undertake R&D activities, three (3) to render technical services and two (2) support divisions were created.
2009 to present	26th of August, the ITDI Rationalization Plan was approved and immediately implemented. The new structure consisted of the merger of some divisions / sections while the other divisions remained as separate divisions with minor internal restructuring.

"Inspired by Technology,
Driven by Innovation."

DOST-ITDI

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