2020 PCAARRD ANNUAL REPORT

Bringing

HOPE AND SECURITY

Through S&T

DEPARTMENT OF SCIENCE AND TECHNOLOGY (DOST)
PHILIPPINE COUNCIL FOR AGRICULTURE, AQUATIC AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT (PCAARRD)

About DOST-PCAARRD

The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) is one of the sectoral councils under the Department of Science and Technology (DOST). It was formed through the consolidation of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and the Philippine Council for Aquatic and Marine Research and Development (PCAMRD) on June 22, 2011 pursuant to Executive Order No. 366.

Originally established in November 10, 1972 as the Philippine Council for Agricultural Research (PCAR), it became the Philippine Council for Agriculture and Resources Research (PCARR) to include mines research in 1975. Affirming the role of science and technology (S&T) in development, PCARR changed its name to Philippine Council for Agriculture and Resources Research and Development (PCARRD) in 1982. The Council was tasked to provide a unified and focused direction for the country's agricultural research. It then became an apex organization that supports and manages the national network of government and higher education institutions involved in crops, livestock, forestry, fisheries, soil and water, mineral resources, and socio-economic research and development (R&D). In 1987, the Council was renamed the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development but retained the acronym PCARRD. On January 30 of the same year, the Philippine Council for Aquatic and Marine Research and Development (PCAMRD) was created from the Fisheries Research Division of PCARRD with functions focused on aquatic and marine sectors.

With expanded coverage, functions, and responsibilities, the Council formulates policies, plans, and programs for S&T-based R&D in the different sectors under its concern. It coordinates, evaluates, and monitors national R&D efforts in the agriculture, aquatic, and natural resources (AANR) sector. It also allocates government and external funds for R&D and generates resources to support its program.

As the apex Council of the AANR sector, PCAARRD is engaged in active partnerships with international, regional, and national organizations and funding institutions for joint R&D, human resource development and training, technical assistance, and exchange of scientists, information, and technologies. The Council is implementing its program primarily through its regional consortia, which are located all over the country.

It also supports the National Agriculture, Aquatic and Natural Resources Research and Development Network (NAARRDN) composed of national multi- and single-commodity and regional R&D centers, cooperating stations, and specialized agencies.

Being an ISO 9001:2015-certified agency for its quality management system, PCAARRD is committed to achieving a sustained dynamic leadership in science and technology (S&T) innovation in the AANR sector by providing strategic leadership in promoting S&T as a platform for AANR products innovation and environment resiliency. Guided by its core values of relevance, excellence, and cooperation, PCAARRD will remain steadfast in catalyzing the Philippine AANR sector toward self-sufficiency and global competitiveness.

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MESSAGE FROM THE SECRETARY

HON. FORTUNATO T. DE LA PEÑA
Secretary
DOST

The year 2020 witnessed the Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development's (DOST-PCAARRD) strong commitment in providing science and technology (S&T)-based solutions in the agriculture, aquatic, and natural resources (AANR) sector. DOST-PCAARRD, through the years, has been a strong advocate in sustaining the productivity and competitiveness of the AANR sector in the midst of climate change, natural disasters, and environmental degradation. The Council has been relentless in addressing various persistent issues and for the year that passed it showed its persistence and dedication in the face of the pandemic.

The coronavirus disease 2019 (COVID-19) pandemic has threatened and challenged all sectors of the country. Everyone was concerned about health, safety, source of livelihood, and most especially, food availability. Pressure was most felt not only in the health sector but also in the agriculture sector being the main producer of food for the Philippines.

As a response to the food and livelihood needs of the Filipinos, DOST-PCAARRD launched the "GALING-PCAARRD Kontra COVID-19 Program." It involves technology and information sharing, food product distribution, and food production and livelihood opportunities derived from various R&D projects funded and monitored by DOST-PCAARRD. It is supportive of Republic Act (RA) No. 11469 (Bayanihan to Heal as One Act) that was passed in March 2020 to address issues and concerns due to COVID-19.

This initiative was not only in compliance with the national call for reprioritized utilization of government resources, but also a clear manifestation of the generosity and compassion of the men and women of DOST-PCAARRD and its network partners to those affected by the pandemic.

The accomplishments described in this year's DOST-PCAARRD Annual Report are in support of various industry sectors, such as coconut, fruits, vegetables, root crops, sugarcane, poultry, livestock, dairy, aquaculture/fisheries, and forestry as well as biodiversity conservation, through the Council's Industry Strategic S&T Programs (ISPs).

The Department is proud of DOST-PCAARRD's performance towards attaining its vision of "sustained dynamic leadership in S&T innovation in the AANR sector." The succeeding years will still be challenging, but the country will recover and rise through continued dedication and commitment of everyone.

Congratulations DOST-PCAARRD for a productive year amidst the pandemic!

MESSAGE FROM THE UNDERSECRETARY FOR R&D

ROWENA CRISTINA L. GUEVARA, PhD
Undersecretary for Research
and Development
DOST

The COVID-19 pandemic of 2020 disrupted many processes including the R&D mechanism. Several adjustments had to be made to comply with the protocols recommended by the national government to ensure the safety and health stability of all concerned.

Throughout such challenging times, especially during the "lockdown" period, DOST-PCAARRD did not falter in its commitment to uplift the AANR sector. The "GALING-PCAARRD Kontra COVID-19 Program" served as a venue for the Council to serve not only its primary customers but the ultimate beneficiaries of its R&D projects.

Faced with a difficult situation, the DOST-PCAARRD maximized the use of information and communications technology (ICT) in the performance of its mandates, meticulously packaging, reviewing, and evaluating R&D proposals to ensure that relevant programs and projects will be pursued in support of the eight DOST Outcomes and the Harmonized National Research and Development Agenda (HNRDA). Monitoring of projects under the DOST-PCAARRD ISPs has shown significant results, which are highlighted in this year's Annual Report of the Council. Through various virtual platforms, DOST-PCAARRD was able to establish new partnerships with local and international organizations, while strengthening existing ones.

DOST-PCAARRD has again delivered more than what it has committed as the apex Council for the AANR sector. The DOST commends the Council's unwavering commitment in enabling agricultural research and innovation to serve the Filipino farmers and fisherfolk.

Congratulations and more power!

PREFACE

REYNALDO V. EBORA, PhD
Executive Director
DOST-PCAARRD

It is with great pride that I am presenting the 2020 DOST-PCAARRD Annual Report outlining the Council's initiaves to support our farmers and fisherfolk amidst the COVID-19 pandemic.

The challenges posed by the COVID-19 pandemic did not break the Council's momentum in helping find S&T-based solutions to problems besetting the AANR sector. Indeed, the pandemic has altered people's lives; but in response, the Council also adapted its operations to continue serving and supporting its partners and customers while ensuring the safety of its people by consciously following prescribed safety protocols under the "new normal."

In cooperation with our partners in the R&D community, as well as national and local government agencies, we have successfully launched relevant projects and activities under the "GALING-PCAARRD Kontra COVID-19 Program," simultaneously implementing equally productive and beneficial programs under the DOST-PCAARRD ISPs. All of our endeavors have contributed to the achievement of the Council's identified targets for the year and have addressed all 48 priority areas under the HNRDA 2017–2022 aligned with the DOST's Eleven-Point Agenda.

Highly motivated by the trust and confidence of the DOST on the Council's capabilities to help uplift the living conditions of people highly dependent on the AANR sector, we have also challenged ourselves to continually improve the way we perform and fulfill our mandates.

The accomplishments of this year will not be possible without the hardworking and talented men and women of DOST-PCAARRD.

Allow me to express my gratitude to all the staff for their commitment, hard work, and dedication, which enabled us to deliver and even exceed our targets. Equally deserving of our sincere appreciation are our partners, the DOST-PCAARRD in the regions, for their unceasing support and cooperation to the Council. We assure our stakeholders that we will never stop generating AANR technologies/innovations and products for the Filipinos.

Congratulations for a job well done! Let us continue to give our best and work with a greater passion for a productive and sustainable AANR sector.

I hope that all the information in this report will provide better awareness on what DOST-PCAARRD is and what we are doing to bring hope and security through S&T.

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Executive Summary

PCAARRD had addressed all 48 priorities indicated in the Harmonized National Research and Development Agenda (HNRDA) for the agriculture, aquatic, and natural resources (AANR) sector. A total of 501 projects were funded during the year with financial support from the DOST and PCAARRD Grants-in-Aid (GIA) Program. There were 761 projects monitored during the year, which include newly supported and COVID-related projects, ongoing projects approved for renewal, projects approved for extension, and completed projects, which have not yet submitted terminal and financial reports as of the end of 2020. Despite the coronavirus disease 2019 (COVID-19) pandemic, monitoring activities were continuously done in 698 different programs/projects of partner agencies through virtual meetings and other forms of communication. During the year, a total of 165 local and international partner agencies were established and/or maintained. From the 102 completed R&D projects, 97 were reported by the implementers/researchers to have either been presented in various symposia, filed Intellectual Property (IP) protection, and/or published information, education, and communication (IEC) materials during the year.

GALING-PCAARRD

Good Agri-Aqua Livelihood Initiatives towards National Goals (GALING) PCAARRD is the Council's quick response to the government-led efforts against the COVID-19 pandemic. For the program, a total of 61 projects and 12 activities and initiatives had been approved and being implemented with an estimated total investment of P160 million (M) in collaboration with over 57 partner institutions. As of December 2020, there were 29 ongoing projects across the Philippines divided into 16 projects under crops, 5 under aquatic, 2 under livestock, 1 under forestry, and 5 under cross-cutting.

The Council disseminated IEC materials through different platforms. In April 2020, it launched the eLibrary and had total downloads of 7,597 AANR publications and 3,618 clients/patrons for the year. The DOST-PCAARRD Facebook (FB) page was followed by 74,554 and liked by 68,355 FB users. Other videos were also made available via the Council's Youtube channel which now features 110 videos and 752 subscribers including videos on ItikPINAS (IP), Tilapia Production Technologies, and Enriched Potting Preparation (EPP) Technology for Urban Gardening.

Relief assistance activities were launched to immediately extend assistance to 13,599 households, 7,843 frontliners, 800 farmers and fisherfolk, 707 students, and 46 groups and organizations affected by the community quarantine. The food products distributed included 3,500 kilograms (kg) of rice; 2,546 bags of mushroom; 6,220 bottles of 'calamansi' juice; 1,107 food passes; 346 pieces of tea, turmeric, and coffee products; 200 bottled seafood; 300 kg papaya; and 167 packs of 'kangkong' and 'sitao.' On the other hand, non-food products distributed included 3,275 pieces of alcohol, disinfectants, sanitizers, soaps, face shields, and face masks; 2,760 transportation permits; 810 kg of vegetable seeds and seedlings; and 230 liters (L) of organic inputs.

The program also offered livelihood projects, such as 'Gulayan sa Pamayanan,' 'Tilapia para sa Pamayanan,' and 'Manok at Itlog para sa Pamayanan.' Other components include projects on 'lapnis'-framed face shields, bamboo soap products, bamboo-abaca hands-free disinfectant dispenser, and foot bath prototypes; promoting Darag native chicken as livelihood option; field testing of laboratory-reared seaweeds cultivars; production of smoked 'tilapia' and 'tilanggit;' and development of Giant Swamp Taro chipping machine, geographic information system (GIS)-based system, and coconut ethyl alcohol. It included offshoot projects of the previously mentioned Gulayan sa Pamayanan on urban agriculture technologies, such as EPP and Simple Nutrient Addition Program (SNAP) Hydroponics in the National Capital Region (NCR) and Regions 3 and 4A through the collaboration among DOST-PCAARRD, Caritas, and DOST regional offices. Projects on the enhancement of the food value chain for selected commodities in identified regions were also included.

DOST ELEVEN-POINT AGENDA

Agenda 1: Pursue R&D to Address Pressing National Problems. The Council supported research on managing fall armyworm. To augment seaweed farmers' livelihood, laboratory-reared cultivars were propagated in established seaweed nurseries of Palawan and were dispersed to target beneficiaries. The Council also supported research geared towards guaranteeing the production and ensuring the sustainability of quality hybrids for the production of selected high-value products of coconut.

For cost-competitive aquafeed from 'lab-lab,' an automated machine vision-based capable of harvesting the algal mat (lab-lab) was developed. For the Philippine component of the project, "Development of Area Wide Management Approaches for Fruit Flies in Mango for Indonesia, Philippines, Australia, and the Asia-Pacific Region," research on identifying the most suitable and affordable male annihilation block is being undertaken.

The dry Reverse Transcription-Loop Mediated Isothermal Amplification (RT-LAMP) test kit was developed to promptly and more conveniently detect classical swine fever (CSF) or hog cholera and porcine reproductive and respiratory syndrome (PRRS) in swine.

For the breeding protocol of *Penaeus vannamei*, three families of *P. vannamei* (Kona, SIS, and Philippine local) were obtained from different commercial broodstock producers to establish the base population with high genetic diversity. Two deoxyribonucleic acid (DNA)-based detection kits for *Aeromonas hydrophila* and *Enterococcus faecalis* were developed and produced for freshwater tilapia. A mangrove crab crabifier application was also developed. Crabifier is a free and accurate Android-based mobile application that can identify the species of juvenile crablets of the genus *Scylla*.

Furthermore, a technology on extending the shelf life of salted duck eggs was also studied. The process extends the shelf life of the eggs stored at ambient temperature from 5 to 12 weeks. In fresh milk storage, the traditional method using salt and ice was optimized in the absence of cooling facilities at the farm. The processing of salted duck eggs into powder was completed, unlocking a new flavor and another product innovation for the market.

Agenda 2: Conduct R&D to Enhance Productivity and Improve Management of Resources. To improve management of resources, the following initiatives were conducted: Eggplant Fruit and Shoot Borer (EFSB) Motion Tracking Software; Aeroponics for Quality Plant Material Production of Purple Yam; Optimized Production and Use of Fertigroe N, P, and K Nanofertilizers; Nutrio® Biofertilizer for Improved Production of Sugarcane; and Automated Furrow Irrigation System for Sugarcane Block Farms.

In terms of environment and natural resources management, the following initiatives were undertaken: Multilocation Trial of 10 Promising Varieties of Cacao in Different Agro-climatic Zones in the Philippines; Utilizing Young-aged Falcata and Yemane for Veneer, Plywood, and Construction Material; Cellulosic Quality Planting Materials of Indigenous Tree Species; and Nanocrystals from Wood and Processing Wastes of Industrial Tree Plantation Species (ITPS); Mussels, Sea Cucumbers, and Seaweeds as Biofilters in an Integrated Multi-Trophic Aquaculture (IMTA) Systems; and Biodiversity S&T Initiatives.

Furthermore, the Council provided support to Niche Centers in the Regions (NICER) for better productivity and resource management.

In terms of policy initiatives for a more conducive S&T policy environment, the Council provided significant inputs to bills on the National Land Use Act, Cacao and Coffee Industry Development Acts, Agriculture Information System Act, and Single-use Plastic Products Regulation Act.

Agenda 3: Engage in R&D to Generate and Apply New Knowledge and Technologies Across Sectors. The Council supported a study on producing hydrolysates from marine fisheries species.

Agenda 4: Strengthen and Utilize Regional R&D Capabilities. Despite the threat of the worldwide pandemic experienced in 2020, the Council together with its 15 regional consortia continue strengthening its partnership in addressing regional development and concerns and creating a greater impact on the advancement in the AANR sector. The prestigious 'Ugnay' Award was also revived. Likewise, four NICER were established on biodiversity, native pig, halal goat, and seaweed.

Agenda 5: Maximize Utilization of R&D Results through Technology Transfer and Commercialization. For technology transfer and commercialization, the Council implemented a program to address and minimize the effects of disaster and calamities and initiated social

protection programs through successful collaborations between researchers across different research institutions to address not only the needs of the poor but to prioritize disadvantaged communities and social groups across the nation.

In 2020, the Intellectual Property and Technology Business Management (IP-TBM) program welcomed the year by officiating 25 new partnerships under "Support to the University's Strategies in Technology Acceleration Initiatives by Nurturing (SUSTAIN) the IP-TBM Offices of the Consortia Member Agencies." To date, seven Science for the Convergence of Agriculture and Tourism (SciCAT) farms have been established, in which 15 package of technologies (POTs) are being implemented and six technologies were commercialized in 2020. Likewise, Agri-Aqua Business Hub was established and institutionalized.

Agenda 6: Develop Science, Technology, and Innovation (STI) Human Resources and Build a Strong STI Culture. For 2020, the Council generated P35.2 M from DOST to support human resources development, particularly the Balik Scientist Program (BSP) and the Graduate Research and Education Assistantship for Technology (GREAT) Program. The Council likewise provided P36.2 M for the continuation of its capacity-building activities and programs—the GREAT Program, Thesis/Dissertation Assistance, Re-entry Grant for Returning Scholars, Publication Incentives, and Non-Degree Training Programs to improve its reach and ensure continued relevance in the sector.

To continue providing enhancement courses to the members of the National Agriculture, Aquatic and Natural Resources Research and Development Network (NAARRDN), the DOST-PCAARRD Online Learning Management System (LMS) was developed. It also held its S&T Awards Program composed of Best Research and Development (R&D) Paper Awards, Dr. Elvira O. Tan Awards, Ulat SIPAG Awards, and Ugnay Award.

Agenda 7: Upgrade STI Facilities and Capacities to Advance R&D Activities and Expand S&T Services. Five projects were supported for the facilities development in Isabela State University (ISU), Visayas State University (VSU), University of the Philippines Los Baños-Dairy Training and Research Institute (UPLB-DTRI), Northwest Samar State University (NwSSU), and University of Southern Mindanao (USM).

Agenda 9: Provide STI-based Solutions for Disaster Risks and Climate Change Adaptation and Mitigation. To address climate change and mitigation, "Development of Decision Support System for Enhancing Climate Change Resiliency of Smallholder Upland Farmers in Selected Communities of Cavite, Laguna, Batangas, Rizal, and Quezon (CALABARZON), Philippines" was implemented. Furthermore, Smarter Approaches to Reinvigorate Agriculture as an Industry in the Philippines (SARAI) was implemented by employing the following technologies: SARAI Knowledge Portal, Adaptive Planting Calendar for Rainfed Rice and Corn, Agricultural Drought Monitoring and Forecasting System Using Remote Sensing Technology, Coffee Application Harvest Date Estimator (CAPHE), Optimal Geographic Insurance Units (GIU) for Weather Index-based Crop Insurance (WIBI) in the Philippines, Water Advisory for Irrigation Scheduling System (WAISS), and Enhanced Operation and Connectivity of Automatic Weather Station (AWS) and Unmanned Aerial Vehicle (UAV) Units for Crop-Environment Monitoring and Forecasting.

Projects for disaster risk reduction and mitigation implemented were Coastal Acidification, Iodine-129 as a Tool for Nuclear Activities Detection, and Offshore Coral Reef Stabilization Technology.

Agenda 10: Strengthen Industry-Academe-Government and International STI Collaboration. In support of the Los Baños Science Community, the Council continued to provide technical support to and participated in the virtual celebration of the annual Syensaya: The Los Baños Science Festival. In terms of international S&T collaboration, the Council, through DOST, proposed areas for cooperation with France, Germany, India, Indonesia, Iran, Italy, and the United Kingdom. Moreover, the Memorandum of Understanding (MOU) with the Thailand-based Asian Institute of Technology (AIT) was signed on September 28, 2020. The Council also continued the implementation of projects and activities with its bilateral partners: Australian Centre for International Agricultural Research (ACIAR), International Potato Center (CIP), Food and Fertilizer Technology Center (FFTC); multilateral partners: Asia-Pacific Association of Agricultural Research Institutions (APAARI), Asian Productivity Organization (APO), Council for Partnership on Rice Research in Asia (CORRA); and those under DOST-led partnerships: Japan Society for the Promotion of Science (JSPS), Manila Economic and Cultural Office-Taipei Economic and Cultural Office (MECO-TECO),

Ministry of Science and Technology of the People's Republic of China (MOST-China), Association of Southeast Asian Nations (ASEAN), and e-ASIA.

Agenda 11: Enhance Effectiveness of STI Governance. In 2020, DOST-PCAARRD employed a total of 211 regular employees and 96 contractual staff. Five have completed their graduate studies while six have started pursuing their advanced degrees.

The Program on Awards and Incentives for Service Excellence (PRAISE) Manual has been approved by the Civil Service Commission (CSC) on March 12, 2020, and has been implemented during the year. Fifty staff members received different rewards during the first virtual Rewards and Recognition Ceremony. Four employees were granted the Exemplary Service Award (posthumous), 1 received the Special Creativity Award, 26 were given the Loyalty/Service Award, 16 were rewarded the Outstanding Employees Award, and 3 were bestowed the Management Excellence Award. Furthermore, five contractual staff were also awarded.

DOST-PCAARRD managed a total of P1.349 billion (B) budget in 2020 with P1.134 B for Current Appropriation and P215 M for Continuing Appropriation. The Department of Budget and Management (DBM) allotted to this amount an additional P10.785 M for salary adjustments and authorized employer's share on retirement insurance.

For 2020, DOST-PCAARRD generated about P502 M from external sources, accounting both in cash and in-kind. A total of P478 M was generated from local sources while the remaining P23.89 M was from international sources.

The Council also supported gender and development and knowledge management initiatives.

DOST-PCAARRD's Initiatives Against COVID-19: "GALING-PCAARRD Kontra COVID-19 Program"

Background

With the COVID-19 pandemic affecting much of the whole world in 2020, people had to learn to adapt and continue life amidst the health restrictions and unique challenges of the time. DOST-PCAARRD facing the same challenges had to adapt and continue its work to contribute to addressing the fears, doubts, and insecurity prevailing among the public. The Council learned how to reach out to people who are mostly confined in their own homes while mobility is restricted.

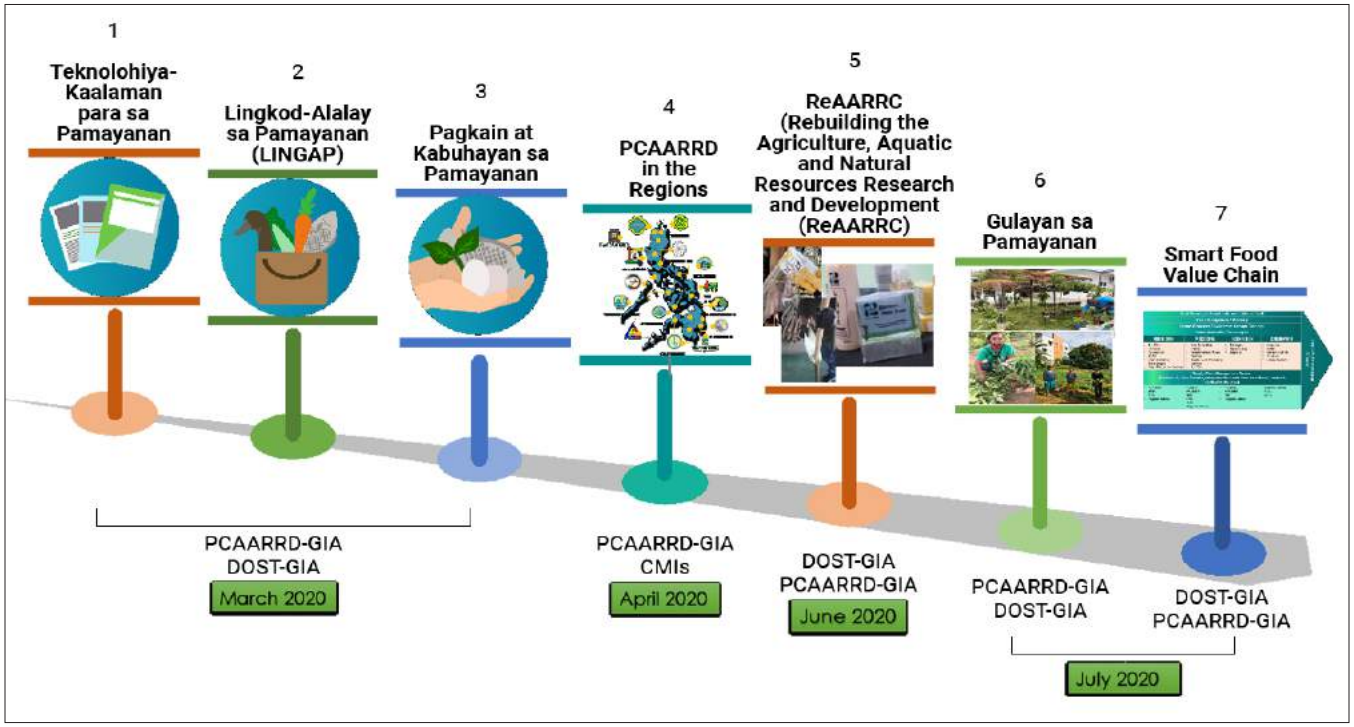
As a quick response to the government-led efforts against the COVID-19 pandemic following the Bayanihan to Heal as One Act, the Council launched the "GALING-PCAARRD Kontra COVID-19 Program." The Council through this program opened up facilities, devised new strategies, and ramped up its traditional and digital promotion initiatives and efforts.

'GALING' or Good Agri-Aqua Livelihood Initiatives towards National Goals, is derived from a Filipino term with multiple meaning including "Healing" (from COVID-19) and "Excellence," which resonates with DOST-PCAARRD's tagline, *Excellence in AANR Innovations*. When pronounced with a slow accent, galing also means "from," denoting that the technology, product, and service offerings of the program are from the various R&D initiatives supported by the Council.

Components of the "GALING-PCAARRD Kontra COVID-19 Program"

The program originally started with three components and later on expanded into seven components:

1. **'Teknolohiya-Kaalaman para sa Pamayanan.'** This component focuses on the dissemination of knowledge packaged in different IEC formats and shared through various communication platforms. Through this, the Council brought hope and security to the homes of Filipinos.



Components of the GALING-PCAARRD Program.

Teknolohiya-Kaalaman para sa Pamayanan.

Knowledge Sharing through Social Media

At the start of the enhanced community quarantine (ECQ) in March 2020, social media engagement, most especially on FB, was high. Through these engagements, it was evident that interests in agriculture and fishery as an immediate source of food during the quarantine were increasing.

The Council tapped on this opportunity to create awareness about the outputs of the agency's R&D initiatives in the agriculture and aquatic sectors. Available knowledge products were laymanized to provide information for the public's consumption.

Since April 2020, the Council has been producing publication materials for FB on how to produce food and inspire future entrepreneurs with livelihood ideas. Moreover, virtual press conferences were held and streamed via FB Live that engaged both the media and the general public. This initiative increased the Council's FB likes by 35,897 likes, recording a total of 68,455 likes and reached 6,433,476 people as of December 2020.

Quick how-to's and videos available via DOST-PCAARRD's social media accounts.

Reaching the Public through Virtual Press Conferences and Webinars

The Council has also conducted four virtual press conferences using Zoom and Streamyard. The virtual press conferences were participated by 1,200 people and generated a total of 73 published articles from 34 media outlets and 13 broadcast coverages from 8 radio/teleradyo programs.

Each virtual press conference included an interactive open forum, wherein questions from the FB Live participants, media or non-media, were entertained. The conduct of the virtual event engaged media personalities and the general public.

Valuing DOST-PCAARRD's Public and Media Relations

Even with restrictions in mobility, the Council produced and disseminated 143 articles in 2020. The Council's media relations activities yielded a total of P31,726,294.83 media value or the amount that the Council would have spent in advertising had it not practice public and media relations.

Engaging the Public through Virtual Exhibits

With restrictions in mass gathering, the Council developed an online exhibit platform for the National Science and Technology Week (NSTW) Celebration in 2020. Through the online exhibit, IEC materials featuring technologies, programs, and services in the AANR were made available and accessible to clients and stakeholders.

In 2020, the Council featured a total of 65 AANR products and technologies from the marine, inland, aquatic, crops, livestock, forestry, and agricultural resources, as well as programs and services on socio-economic research, human resource development, technology transfer and extension, and e-commerce and knowledge management.

Of the 65 AANR technologies, programs, and services, six were featured in the DOST-sponsored virtual exhibits on smart agriculture and rural livelihood technologies. A total of 59 briefers were produced and can be downloaded through the DOST-PCAARRD virtual exhibit platform. Likewise, eLibrary links and 48 explainer videos, were produced and made available to complement the IEC materials. The virtual exhibits also featured interactive games and live chat to encourage interaction with the visitors.

For the duration of the NSTW celebration, the virtual exhibit recorded 2,187 online visitors who visited 5,540 pages with an average viewing time of 20 minutes.

Continuous Access to Technologies and Information through DOST-PCAARRD eLibrary

Amidst the ECQ, when people were confined in their homes, the Council launched the DOST-PCAARRD eLibrary to bring technologies and information within reach of people. The aim was to help people cope with their fears and insecurities and to cultivate the growing interest in agriculture among the people during the pandemic. Since its launching in April 2020, the DOST-PCAARRD eLibrary now has a total of 3,618 registered patrons who have accessed and downloaded a total of 7,597 publications as of December 2020. Downloaded publications were on: agriculture, vegetable production, tilapia culture, various commodities and technologies featured in the Philippines Recommends series, urban gardening, and vegetable planting calendar, among others.

To complete the deployment of the DOST-PCAARRD eLibrary's Science Library Integrated Management System (SLIMS) to the 15 regional consortia, the Council virtually deployed the system in the remaining nine consortia. Such a strategy was devised to respond to the restrictions imposed due to the pandemic. The SLIMS deployment is in line with the project, “Establishing the DOST-PCAARRD Knowledge Network of eLibraries,” a project being implemented by the DOST-Science and Technology Information Institute (STII).

Promoting R&D Results through Printed IEC Materials

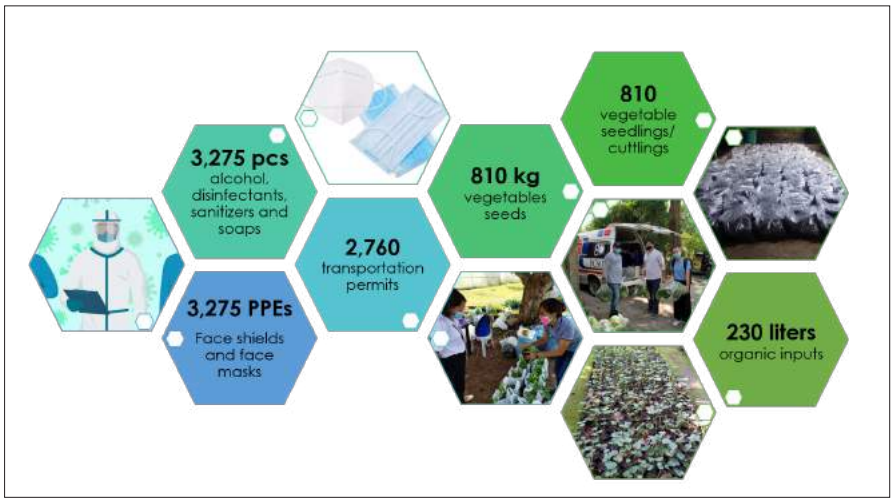
Even with problems on mobility during the ECQ, DOST-PCAARRD published 40 books, leaflets, and brochures on technologies and information in the AANR sector producing a total of 78,700 copies. During the year, the Council also disseminated a total of 24,492 printed copies to about 19,348 clients, mostly included in its regular mailing list.

2. **'Lingkod Alalay sa Pamayanan.'** This component focuses on the distribution of food and non-food products (e.g., disinfectants, alcohol, personal protective equipment [PPEs]) and provision of support services to affected communities and frontliners. This is in response to the call to immediately extend assistance to families and individuals affected by the community quarantine. A total of 11 institutions facilitated the sourcing and distribution of food and non-food products through the 12 activities and initiatives of the Council’s ongoing technology transfer projects.

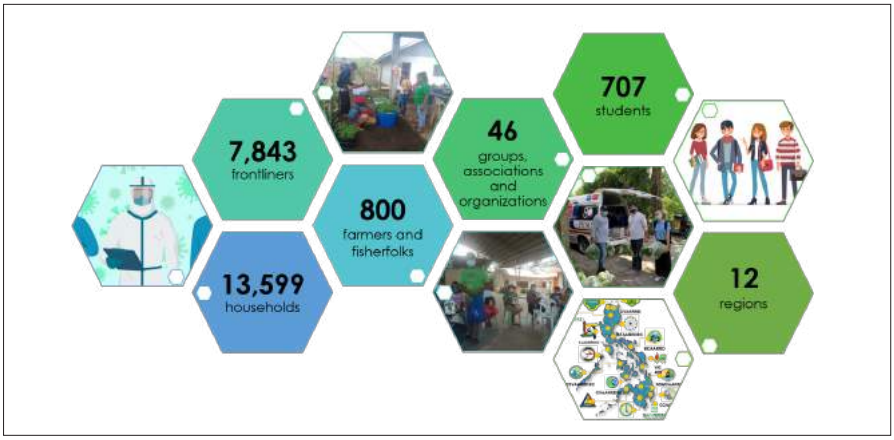
   The established projects of the Council's partner agencies served as strategic locations for the government to help vulnerable communities, frontliners, daily wage workers, and community workers. Relief assistance activities were conducted among various regions in the country through the following agencies: Department of Agriculture-Bureau of Plant Industry (DA-BPI), Benguet State University (BSU), Central Luzon State University (CLSU), Sultan Kudarat State University (SKSU), Capiz State University (CapSU), Central Mindanao University (CMU), Laguna State Polytechnic University (LSPU), Pampanga State Agricultural University (PSAU), DOST-Region 10, Cavite State University (CvSU), and Mariano Marcos State University (MMSU).

   Aside from the food and non-food products, 27,814 copies of IEC materials such as production guides on

Food-related assistance distributed to beneficiaries.



Non-food related assistance distributed to beneficiaries.



Beneficiaries of the 10 technology transfer projects/programs.

growing various vegetables, home and community gardening, SNAP hydroponics, preparation of organic fertilizer, etc. were distributed.

3. **'Pagkain at Kabuhayan sa Pamayanan.'** This component supports food production and livelihood projects. Initially, there were three projects under this component—the Gulayan sa Pamayanan, Manok at Itlog para sa Pamayanan, and Tilapia para sa Pamayanan. Now, there are 18 livelihood projects under the program, with 8 projects already funded including 6 ongoing and 2 new projects.

Gulayan sa Pamayanan

DOST-PCAARRD supported the Gulayan sa Pamayanan project implemented by DOST-National Capital Region (NCR). The project provided S&T-based livelihood and increased vegetable production in metropolitan areas as a means to address food availability during the pandemic. Urban gardens were established in Las Piñas, Paranaque, Valenzuela, Marikina, and Manila.

Six trainings on EPP and seven on SNAP were conducted benefitting around 300 households. These households established communal gardens using the project-distributed EPP kits and SNAP hydroponics. The kits enabled them to produce vegetables, such as lettuce, 'kangkong,' eggplant, pepper, tomatoes, kale, 'saluyot,' onion spring, herbs, and spices. As of December 2020, the project has added 12 community-beneficiaries in Navotas, Muntinlupa, Marikina, Paranaque, Pateros, and Pasay. These communities were

provided with SNAP kits, which helped them start their own hydroponics farm setup.

DOST-PCAARRD extensively disseminated information about the Gulayan sa Pamayanan through virtual presser of the project launch and radio interviews. Similarly, DOST-NCR organized four training-seminar webinars participated in by 671 individuals. Technology information disseminated includes topics on seed propagation and production, vegetable pest and disease management, and vegetable processing.

Manok at Itlog sa Pamayanan

Manok at Itlog sa Pamayanan aims to provide affected communities with livelihood options through raising duck, native chicken, and commercial broilers and layers. The project gave farmers access to the new duck breed known as IP. The farmers were provided with technical assistance to help them venture into duck egg production and marketing to commercialize the new breed of quality IP ducklings and eggs in the market.

A total of 26,940 eggs valued at P5.30–6.10 per piece generated from farmers and institutional flocks in different regions in the country were distributed through the program. Benevolent farmers sold their produce at P1.25–1.50 lower than the prevailing market price. Others gave their eggs for free as support and appreciation to the frontliners.

Tilapia para sa Pamayanan

The Council also initiated the setting up of 20 small-scale backyard tilapia fishponds for marginalized families in Laguna and Batangas. The project was designed to provide food in terms of fish protein to poor households and improve their capacities to develop and implement livelihood activities during the post-lockdown period. Fourteen farmer-cooperators with an area of 2,798 square meters (m^2) benefitted from the project. Aqua-inputs, such as fingerlings, feeds, and technical support to the farmer cooperators were also provided.

The farmer-cooperators from Laguna and Batangas provinces harvested their stocks in December 2020. The Council distributed stocks of five pieces fingerlings per square meter among the farms in Batangas from June to July and September. These were monitored periodically until harvested. The stocks in the three ponds at LSPU were harvested earlier in October to avoid damages from the previous typhoons.

4. **DOST-PCAARRD in the Regions.** The fourth component comprised the Quick Response Project (QRP) proposals from different Consortia based on the assessed and identified ongoing and prospective activities needed to address COVID-19 concerns and impacts in the regions. The regional consortia, as the DOST-PCAARRD in the Regions, is committed to addressing the specific needs in their respective areas. From the time of implementation of the ECQ in March 2020, the

EPP kits turn-over at Barangay (Brgy.) CAA, Las Piñas on July 10, 2020.

One of the recipients of duck eggs distributed by Western Mindanao State University (WMSU).

Mr. Aliña (third from the left), one of the farmer cooperators, with LSPU staff harvests the tilapia in his fishponds.

Tilapia harvesting at LSPU.

regional consortia have already conducted several activities, projects, and initiatives in response to the COVID-19 pandemic.

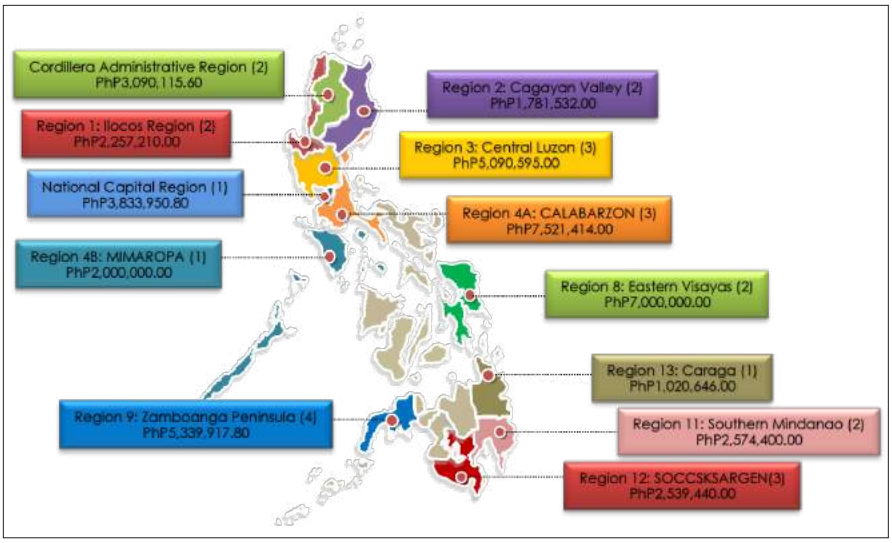
Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development (CorCAARRD) in Cordillera Administrative Region (CAR)

The project titled, "HAGABI (Harnessing Agriculture for A Bountiful Ifugao)," aimed to increase food security and sufficiency of households through vegetable and animal production. Agricultural supplies and materials including seeds, agricultural materials, and livestock such as duck and chicken were distributed to 100 beneficiaries in 10 municipalities. The project conducted 14 capacity and skills training. As output, they produced 80 L of organic herbal nutrient (OHN), 75 L of fermented plant juices, and 75 L of fermented fruit juices.

Ilocos Agriculture, Aquatic and Resources Research and Development Consortium (ILAARRDEC) in Region 1 (Ilocos Region)

The project titled, "Production and Distribution of Ready-to-Eat Hygienically Dried, Vacuum-fried, and Vacuum-packed Fish Products as Quick Response to COVID-19 Pandemic," aimed to assist COVID-19 affected families in selected towns of La Union and Benguet through production and distribution of wholesome and safe ready-to-eat hygienically dried, vacuum-fried, and appropriately packed fish products as a quick response during emergencies. Four hundred packs of hygienically dried, vacuum-dried, and vacuum-packed fish products including milkfish, 'barbasan,' 'sapsap,' shrimps, anchovy, and 'dalag baybay' and 300 packs of value-added, ready-to-eat, dried and vacuum-dried fish products were provided to 30 families in the upland municipalities in Bagulin, La Union.

Also, three sets of fish samples including 'dilis,' barbasan, and milkfish were submitted for microbiological analysis to DOST-Region 1. Sensory evaluation of the vacuum-fried fish products was conducted with descriptive and acceptability tests by the trained sensory panel. Three fish processors were willing to be capacitated.



Twenty-six Quick Response PCAARRD in the Regions projects as of December 2020.

Southern Tagalog Agriculture, Aquatic and Resources Research, Development and Extension Consortium (STAARRDEC) in Region 4A (CALABARZON)

The project titled, "Pagpapayabong ng mga Produktong Agrikultura: Sagot ng STAARRDEC Laban Sa COVID-19," was implemented to empower communities in producing their vegetables through urban gardening during the post-lockdown in Luzon. Five inception meetings were conducted with cooperating agencies via Zoom. Three memorandum of agreements (MOAs) were signed including MOAs with DOST-PCAARRD and two partner cooperating agencies: CvSU and University of Rizal System (URS). A total of 150 beneficiaries were identified with 30 beneficiaries each from Alfonso, Cavite; Siniloan, Laguna; Lobo, Batangas; Tanay, Rizal; and Lucban, Quezon.

Ten IEC materials on container gardening, SNAP hydroponics, organic fertilizer, and 'gabay sa produksiyon ng letsugas,' 'kamatis,' 'ampalaya,' 'pakchoi,' 'talong,' celery, at 'dahon ng sibuyas' were developed. A total of 2,500 copies of each IEC material were reproduced. Training among the beneficiaries in Cavite was conducted on December 15–18, 2020, wherein five farmer-leaders were trained.

Another project in the region titled, "Bangon Batangas: S&T-based Assistance to Taal Volcano's Internally Displaced Population," was implemented. It aimed to contribute to the concerted efforts of the government and other organizations to help individuals/families displaced by the Taal Volcano eruption and rehabilitate the affected areas through interagency collaborative efforts and S&T-based recovery operations. A total of 3,000 families were given relief packages consisting of proprietary foods for disaster relief developed under DOST projects, such as complimentary food blend made from rice, mongo and sesame seeds, crunchies rice, mongo chips, and instant 'lugaw;' medical and hygiene supplies, such as alcohol shampoo, toothbrush, toothpaste, and mini bath soap; and regular food items and groceries, such as corned beef, meatloaf, powdered choco malt drink, powdered milk, and rice.

Visayas Consortium for Agriculture, Aquatic and Natural Resources Program (ViCARP) in Region 8 (Eastern Visayas)

The project harvested a total of 11,227.05 kg of assorted vegetables and successfully distributed these to 5,938 beneficiaries, which included VSU faculty and staff and stranded students; residents of nearby barangays including Brgy. Pangasugan, Guadalupe, Patag, Gabas, and Marcos; 10 line agencies; and 3 state universities and colleges (SUCs).

SOCCSKSARGEN Agriculture, Aquatic and Natural Resources Research and Development Consortium (SOXAARRDEC) in Region 12 (Soccsksargen)

Vegetable seedlings are continuously being produced by SOXAARRDEC for distribution to various barangays in North Cotabato including Brgy. Osias, Kabacan, Brgy. Patadon, Brgy. Pacao, Alamada, among others. A total of 1,295 vegetable seedlings were distributed. Aside from vegetable gardening, farmers in the area also perform vermicomposting. In this regard, the Council, with the assistance of the

agricultural technician of SOXAARRDEC, distributed supplies for vermicomposting facilities, such as worms, hollow blocks, and tarpaulin among project sites. The consortium also provided technical assistance, trainings, and seminar workshops.

Furthermore, the consortium distributed 300 heads of IP to six farmers of Sultan Kudarat, each receiving 50 ducklings. The distribution was held at SKSU Campus in Bagumbayan, Sultan Kudarat. MOU was signed by the farmer-recipients, SOXAARRDEC, and SKSU.

Caraga Consortium for Agriculture, Aquatic, Forestry and Natural Resources Research and Development (CCAARRD) in Region 13 (Caraga)

The project titled, "Strengthening Urban Agriculture: A Strategy for Ensuring Food Availability Amidst the Threat of COVID-19 in the Caraga Region," is to promote production of tomato, okra, eggplant, pechay, and lettuce. A total of 9,344 vegetable seedlings were already produced and 10,000 vegetable seeds for distribution. To provide technical assistance, 210 IEC materials on production guide for tomato, eggplant, and 'pechay' were also distributed.

In addition, PPEs such as facemasks, face shields, and disinfecting and cleaning materials such as alcohol, disinfectants, sanitizers, and soaps were produced and distributed through various regional consortia.

(Center wearing red t-shirt) Project leader Dr. Othello B. Capuno together with his project staff Dr. Moises Neil Sireño and Dr. Rosario Salas distributed the ready-to-plant assorted vegetable seedlings at the lower campus of VSU.

VSU's distribution of vegetables to beneficiaries in Ormoc City through the city's local government unit.

5. **Rebuilding the Agriculture, Aquatic, and Natural Resources in Response to COVID-19 (ReAARRC).** The fifth component is the R&D and innovation component of the program. It intends to create a mechanism that will oversee the coordination, monitoring, implementation, and reporting of all COVID-19 related projects and initiatives across the 15 regions of the country. The ReAARRC activities and projects will focus on non-food/ non-crops initiatives, such as the production of ethyl alcohol, face mask textile, health and wellness products, and so forth. These projects will also give priority to the fisheries, aquaculture, and natural resources sectors.

   Nine projects were already approved for funding, which include production of lapnis-framed face shields, bamboo soap products, bamboo-abaca hands-free disinfectant dispenser, and foot bath prototypes; promotion of Darag native chicken as livelihood; field testing of laboratory-reared seaweeds cultivars; production of smoked tilapia and tilanggit; and development of Giant Swamp Taro chipping machine, GIS-based system for production and utilization, and coconut ethyl alcohol.

6. **Gulayan sa Pamayanan.** Originally part of Pagkain at Kabuhayan sa Pamayanan, the Gulayan sa Pamayanan was expanded and became a separate component. It offers urban agriculture technologies, such as EPP and SNAP Hydroponics in NCR and Regions 3 and 4A through the collaboration among DOST-PCAARRD, Caritas International, and DOST regional offices.

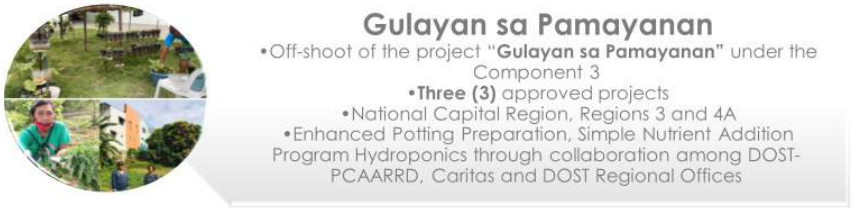
   Three projects were approved under this component with a total investment of P14.5 M. It is a collaborative partnership of DOST and Caritas International to provide sustainable livelihood opportunities.

7. **Smart Food Value Chain Program.** This component is an integration of the initiatives amongst DOST-PCAARRD, Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD), Industrial Technology Development Institute (ITDI), Food and Nutrition Research Institute (FNRI), and DOST regional offices in partnership with the state universities and colleges (SUCs) to enhance food value chains through smart and innovative technologies.

   Ten projects were approved under this component with a total investment of P28,297,907.07. These projects aim to enhance the food value chain for selected commodities in identified regions by implementing key approaches to strengthen the network of stakeholders and processes involved in the production and value-adding activities towards food resiliency in the new normal; to increase production; to improve the quality of selected commodities; and to ensure sustainable food value chain in respective regions.

Lapnis-framed face shield by DOST-Forest Products Research and Development Institute (FPRDI).

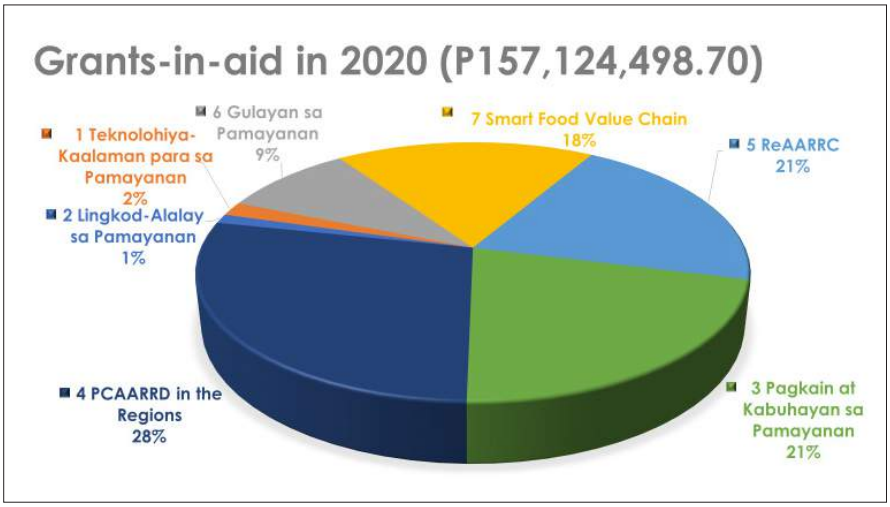
Bamboo, 'tawa-tawa,' and 'sapang' hand soaps.



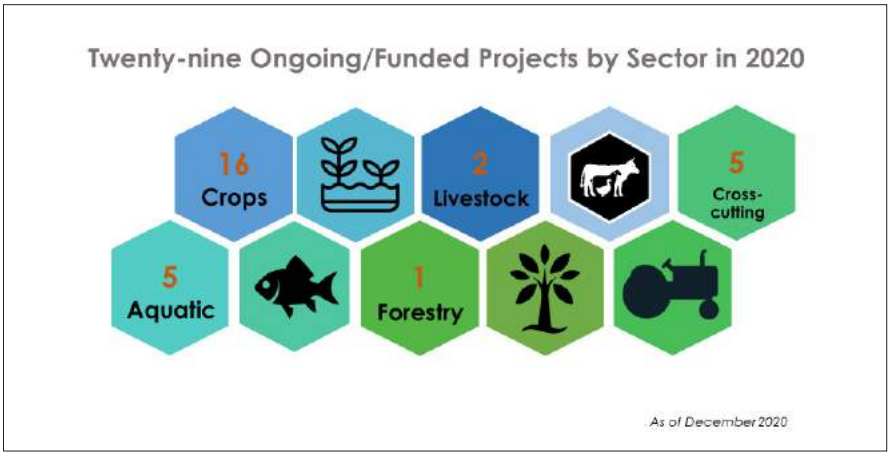
Gulayan sa Pamayanan.

Smart Food Value Chain.

Summary



The total budget allotted for GALING-PCAARRD Program.



Ongoing/Funded Projects of the GALING-PCAARRD Program.

Summary of the GALING-PCAARRD Program.

DOST's Eleven-Point Agenda

Despite the challenges brought by disasters in 2020—from the Taal Volcano eruption, COVID-19 pandemic, and onslaught of typhoons—the Council was able to address the issues concerning the AANR sector by employing the different strategies identified by the DOST known as the Eleven-Point Agenda, in support to achieving the Department's vision.

The Eleven-Point Agenda includes the following:

1. Pursue R&D to address pressing national problems.
2. Conduct R&D to enhance productivity and improve management of resources.
3. Engage in R&D to generate and apply new knowledge and technologies across sectors.
4. Strengthen and utilize regional R&D capabilities.
5. Maximize utilization of R&D results through technology transfer and commercialization.
6. Develop STI human resources and build a strong STI culture.
7. Upgrade STI facilities and capacities to advance R&D activities and expand S&T services.
8. Expand STI assistance to communities and the production sector, particularly micro-, small-, and medium-enterprises (MSMEs).
9. Provide STI-based solutions for disaster risks and climate change adaptation and mitigation.
10. Strengthen industry-academe-government and international STI collaboration.
11. Enhance effectiveness of STI governance.

The only DOST agenda not applicable to DOST-PCAARRD is Agenda 8: Expand STI assistance to communities and the production sector, particularly the MSMEs. The Council ensured that the 10 strategies are feasible and applicable to all the ISPs being implemented by its partners.

The following are the Council's significant contributions and accomplishments under each agenda. These became essential in bringing hope to the AANR sector, proving that no disaster can take away the resilience of Filipinos in improving the quality of life through the help of S&T.

DOST-PCAARRD-funded Research on Fall Armyworm (FAW)

With the incursion of FAW (*Spodoptera frugiperda*) in the Philippines, DOST-PCAARRD funded six projects to supplement and complement the present efforts of various government agencies in managing the said insect pest. FAW samples from eight different regions in the Philippines were morphologically verified and thus far 181 samples have already been subjected to polymerase chain reaction (PCR) for continuous verification. MaxEnt and Stella modeling software predicts almost all parts of Luzon, Western and Central Visayas, and Northern Mindanao are at high-risk level of FAW infestation. In terms of FAW management, preliminary field trials showed that commercially available insecticides with cyantraniliprole or pyridalyl as active ingredient, are efficient against FAW but further evaluation will still be done to validate their effectivity. On the other hand, entomopathogens (EPN) *Beauveria bassiana* and *Metarhizium anisopliae* showed potential effects on FAW eggs and larval instars depending on the conidial concentration. *Eocanthecona furcellata* and species of ladybugs were also initially studied as potential natural enemies of FAW.

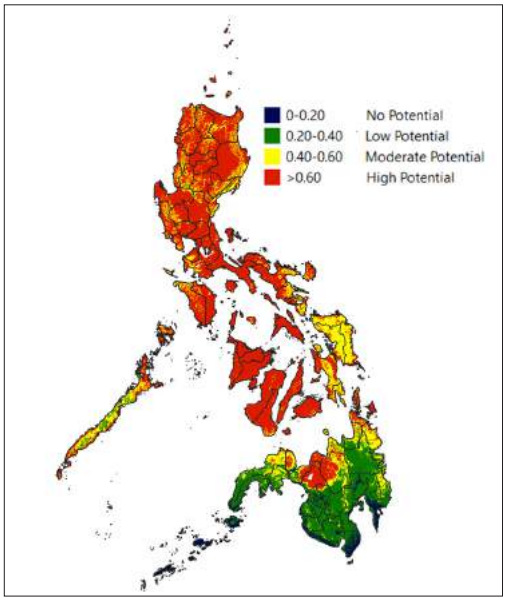
Pangtawid Program for Coastal Communities in Palawan Affected by the Luzon Lockdown through Seaweed Farming

Seaweeds and their derivatives (e.g., carrageenan) are export commodities and are therefore largely affected by the disruption in the global market and supply chain due to the COVID-19 pandemic. During the entire ECQ, seaweed farmers suffered economic consequences as demand for raw material decreased and prices fell. The lifting of ECQ in Palawan on May 1, 2020 called for an intervention to support seaweed farmers in coping with this economic crisis. Assisting seaweed farmers would help meet their daily basic needs and also attain food security in the country despite the pandemic.

The project utilized the laboratory-reared cultivars from the completed DOST-funded project, "Use of Branch and Spore Culture Technologies to Enhance Seaweed Production in Farms." The cultivars are being propagated in established

Fourth instar FAW larva feeding on the corn leaves in the field.

Damage assessment for FAW bio-efficacy evaluation conducted last October 9, 2020 at Central Experiment Station, UPLB.



FAW distribution map generated using MaxEnt 3.14 software based on 453 global occurrences (permanent populations) and selected environmental predictors.

FAW larvae exposed to conidial concentration of entomopathogens *Beauveria bassiana* (top) and *Metarhizium anisopliae* (bottom).

seaweed nurseries of Palawan State University (PSU) in San Vicente, Quezon and Bataraza, Palawan. Selected fast-growing cultivars from these nurseries were dispersed to the target beneficiaries of the project to augment their livelihood and subsequently increase their income. The project established 3 hectares (ha) of sea-based seaweed nurseries using pre-selected, fast-growing cultivars in the municipalities of Narra, Dumaranan, and Bataraza, Palawan. At least 100 seaweed farm families benefited from the project and trained on community-based seaweed enterprise.

DA-PCA-DOST-PCAARRD Coconut Hybridization Program in CALABARZON

Geared towards guaranteeing the production and ensuring the sustainability of quality hybrids for the production of selected high-value products including coconut sugar, virgin coconut oil (VCO), and 'buko,' the project titled, "Performance Evaluation of the 2-Pronged Coconut Hybridization Scheme in CALABARZON," is being implemented by the DA-Philippine Coconut Authority (PCA) in Region IV. The project is one of the front-runners in producing quality planting materials and improving coconut productivity from 45 nuts to 150 nuts/tree per year. The team was already able to produce and distribute approximately 3,000 hybrids of PCA 15–10 hybrid or the Tacunan Dwarf x Laguna Tall (TACDxLAGT) hybrids in Catanauan, Gumaca, General Luna, and Candelaria in Quezon, among many others. It was observed that the produced hybrid nuts are significantly robust, have thicker girth, and have good vegetative growth. Moreover, the research team also capacitated extension workers and farmers with the hybridization technology, good agricultural practices, pest management, and farm maintenance.

Establishment of farm module in Bataraza and Narra, Palawan.

The TACDxLAGT hybrids produced by the project thru assisted hybridization scheme in D'Farm in Brgy. Caldong, Sampaloc, Quezon.

The TACDxLAGT hybrids produced by the project thru assisted hybridization scheme in Feria's Farm in Brgy. Calong-colong, Tagkawayan, Quezon.

Distribution of the TACDxLAGT hybrid seedlings for planting in Gumaca and Candelaria, Quezon.

Cost-competitive Aquafeed from Lab-lab

Algal mat, commonly known as lab-lab has a huge potential as a natural aquafeed for the aquaculture industry. It can be an alternative feedstock for high-cost formulated commercial aquafeed and can be a source of organic nutrition for fish fingerlings. However, the rainy season and typhoon occurrences limit its availability when needed. This study developed the lab-lab biomass as a cost-competitive feedstock for milkfish fingerlings.

An automated machine vision-based capable of harvesting the algal mat was designed and fabricated. The automated machine can accurately identify and collect the lab-lab.

Drying characteristics of lab-lab were investigated. The convective method was recommended for drying lab-lab considering its advantages over microwave drying and solar drying in terms of drying time and energy consumption. Dried materials were transformed into powder form, which was used in the feeding trials.

A combination of 25% lab-lab and a 75% formulated diet generated the best fish growth for milkfish fingerlings.

The cost competitiveness of lab-lab will significantly reduce the production cost of milkfish and help farmers and milkfish producers increase their profitability.

The project team headed by Dr. Alvin B. Culaba (second from left) and Engineering students from De La Salle University (DLSU) harvesting Lab-lab.

Automated lab-lab harvester used in the field at Brgy. Parong-Parong, Hagonoy, Bulacan.

Dr. Irene Kernot (right), Horticulture Program Manager of ACIAR, and Dr. Celia Medina (left) examine mango leaf sample.

Dr. Celia DR. Medina (left), entomologist from UPLB, shows to Dr. Stefano De Faveri (right), Project Leader from the Department of Agriculture and Fisheries of Queensland, Australia, the damage of insect pests on a mango fruit.

Area-Wide Management (AWM) of Mango Fruit Fly Trial

Reduced fruit fly infestation, improved yield and quality mango fruits, and increased volume of export quality fruits by applying an integrated approach in pest management is expected in the ACIAR-DOST-PCAARRD project titled, "Development of Area-Wide Management (AWM) Approaches for Fruit Flies in Mango for Indonesia, Philippines, Australia, and the Asia-Pacific Region." For the Philippine component, small-scale area-wide control treatments in Samal Island, Davao del Norte are being evaluated. Research on identifying the most suitable and affordable male annihilation block is being undertaken. The research team is also looking into the potential of hydrolyzed baker's yeast as a practical protein bait for fruit flies. Meanwhile, integrating AWM, disease control, and best management practices into commercial systems are also being conducted.

Dry Reverse Transcription-Loop Mediated Isothermal Amplification (RT-LAMP) Test Kit with DIVA Feature for Top Swine Viral Diseases

Classical swine fever (CSF) or hog cholera and porcine reproductive and respiratory syndrome (PRRS) are the most economically damaging, contagious viral

diseases of swine. These are serious and often fatal diseases and suspected cases need to be confirmed via laboratory testing.

In 2020, the dry RT-LAMP test kit was developed to promptly and more conveniently detect these diseases. It is a novel modification of the original wet detection method because it eliminates the use of dry ice or freezer and can be brought anywhere and used anytime without worries of reagent degradation. It also has the DIVA benefit, which stands for "differentiate the infected from the vaccinated animal," making it a better diagnostic test than Reverse Transcription Polymerase Chain Reaction (RT-PCR), which cannot differentiate the infective field strain from the live attenuated vaccine viruses incorporated in commercial vaccines. The RT-PCR indiscriminately amplifies both the vaccine virus and the infective field strain virus, hence giving a false positive result.

The test kit is a complete package that carries a built-in ribonucleic acid (RNA) extraction procedure with corresponding reagents and the RT-LAMP premixes with dye. After extracting the RNA from the sample, the RT-LAMP reaction can be completed in 30 minutes at 60°C. This reaction applies to both CSF and PRRS tests.

Breeding Protocol for *Penaeus vannamei*

The success of any selective breeding program relies on the genetic diversity of the founder lines so that the selection progress forward without the negative influence of inbreeding depression. Three families of *P. vannamei* (Kona, SIS, and Philippine local) were obtained from different commercial broodstock producers to establish the base population with high genetic diversity.

Population batches of Kona and SIS lines of *P. vannamei* that are adapted to the local condition were produced. The first step of the selection process has been applied to both the Kona and SIS lines and their cross. F1 and F2 generations were already obtained and reared to maturity. The selected individual exhibited about 17–30% increase in growth performance as compared with normal unselected population.

Four out of 30,000 local broodstock and 50 out of 45,000 juveniles survived the white spot syndrome virus (WSSV) infection in the natural pond conditions and showed natural resistance against WSSV.

Two batches of F3 population of selected crossbreed (Kona male x SIS female) were produced and around 1,000 juveniles per batch are being reared and will undergo the selection process for growth. Currently, this F3 population is reared in nursery tanks and will be used to further breed to produce the F4 generation.

Moreover, F3 generation of the reciprocal cross of Kona female x SIS male (all selected for growth) was also produced at around 1,500 juveniles and currently reared and prepared for maturation. The pure lines selected for growth of F2 Kona and SIS lines are now mature and currently being conditioned for breeding and mating to generate the F3 selected pure lines.

The locally produced RT-LAMP test kit for CSF (left) and PRRS (right). (CLSU)

Selected *P. vannamei* broodstock.

Cassava Starch-Potassium Sorbate Coating for Extended Shelf Life of Salted Duck Eggs

A technology for extending the shelf life of salted duck eggs was developed. This involves soaking the boiled salted eggs in a coating composed of cassava starch (4–6%), glycerol (1–3%), potassium sorbate (0.3–0.5%), and water (90–95%) and drying in a 50±3°C cabinet dryer for two hours. The process extends the shelf life of the eggs stored at ambient temperature from 5 to 12 weeks. The approximate cost of this coating for 100 eggs is P5.65, at about 1.5 milliliters (ml) coating per egg.

This practical coating not only extends the shelf life of salted duck eggs but also prevents moisture loss and microbial contamination while improving sensory characteristics. The improved process was registered as a utility model at the Intellectual Property Office of the Philippines (IPO-Phil) in 2020.

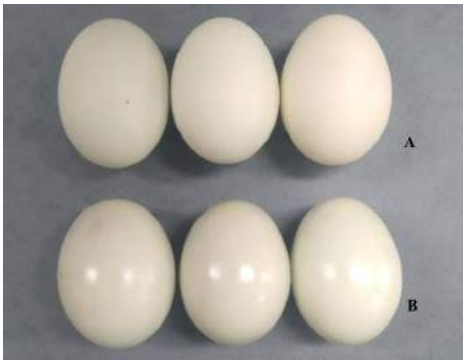
Development of Simple Cooling Facility for Overnight Storage of Fresh Milk

Maintaining milk quality in the absence of refrigeration in villages is a problem affecting many dairy buffalo farmers in the country. Generally, milk is transported from the farm to the milk collection center with minimal cooling or with no cooling at all. This allows microorganisms to grow and multiply quickly, eventually reaching levels unsafe for human consumption.

In the absence of cooling facilities at the farm, the traditional method of using salt and ice was optimized. The amount of ice vis-à-vis the optimal amount of salt was studied along with the sensory and physico-chemical qualities of the milk during storage.

The process involved pouring the milk to be cooled in a clean and sanitized stainless milk can with a cover and placing it in an insulated box surrounded by alternate layers of cracked ice and rock salt. Table 1 shows the recommended amount of salt and ice for different volumes of milk as well as the cost to cool a kilogram of milk.

For 16 hours, the quality of fresh buffalo milk was maintained, with the first 2 hours of storage, having a significant drop in temperature from 30–31°C to <10°C; for 14–16 hours, the temperature was maintained at ≤100°C. The color and odor of milk did not change and no off-odor was detected. The acidity did not change much and the pH before and after the 16-hour storage is within the standards of good quality milk. The technology was rolled out to five dairy farmers in San Jose City who adopted the technology for cooling milk from their afternoon milking.



The difference of the uncoated (A) versus the coated salted duck egg (B). (UPLB)

The intense yellow color of the coated salted duck egg yolk. (UPLB)

Table 1. Recommended amount of salt and ice for different volumes of milk and the cost to cool a kilogram of milk.

Amount of Milk (kg)	Amount of Salt (kg)	Amount of Ice (kg)	Cost to Cool a Kilogram of Milk (P)
10	0.50	5	2.88
15	0.75	7	2.71
20	1.00	8	2.38

In the absence of cooling facilities at the farm, this salt and ice mixture has shown to decrease milk temperature to <100°C for 16 hours, enough to ward off bacterial growth overnight. (PCC)

The First Calf Locally Produced by Fixed Embryo Transfer

PAG-ASA is the very first calf locally produced through Fixed Time Embryo Transfer (ET) Technology. The embryo was transferred to a surrogate cow in July 2019 and on April 24, 2020, PAG-ASA was delivered as a healthy calf at 33 kg while Nueva Ecija was on community quarantine. The successful implantation and pregnancy have been confirmed by an ultrasound as early as 45 days after its transfer.

Embryo transfer is an important assisted reproduction technique, wherein embryos from a genetically superior female donor cow are removed, fertilized in the laboratory, and transferred to the hormonally-synchronized surrogate or recipient cows. With the successful local production of PAG-ASA, more genetically superior calves can be produced from genetically superior cows

Salted Duck Egg Powder Developed

In 2020, the processing of salted duck eggs into powder was completed, thus unlocking a new flavor and another product innovation for the market. Salted duck egg powders can be produced by cabinet drying or spray-drying, among other methods. The cabinet-drying method can be used for small-scale production of salted duck egg powder, but will produce a darker color with a coarser texture. For medium- to large-scale commercial production, spray-drying is recommended, as it can produce a lighter color with finer particles. This new technology will benefit both duck raisers and duck egg processors as well as bakeries, cake and pastry producers, dessert manufacturers, and restaurant operators.

The locally produced calf at PCC using fixed time ET technology. (PCC)

The cabinet-dried salted duck egg powder (left) is darker than the spray-dried (right) powder. (UPLB)

Agenda 2: Conduct R&D to Enhance Productivity and Improve Management of Resources

Aeroponics for Quality Plant Material Production of Purple Yam

Due to several constraints, such as prevalent pest and disease problems and limited sources of quality and disease-free plant propagation materials in CAR and other regions, the production of purple yam or 'ubi,' which is one of the in-demand rootcrops in the food processing industry, continues to decline. To address these constraints, a study was conducted on the use of aeroponic cultivation or simply aeroponics, a hydroponic system where roots are bare and are sprayed with a nutrient solution to enhance the multiplication of quality planting materials (QPM) of four purple yam varieties.

Among the significant accomplishments of this research is the fabrication and installment in BSU of one unit aeroponic system using different ubi planting materials, such as tissue culture-derived plants, slips, vine cuttings, and mini-tubers. Along with this setup, nutrient solutions were tested. The four purple yam varieties—'Kinampay,' 'Sampero,' 'Mindoro,' and 'Zambal' were also planted in the field for evaluation in different agro-ecological zones while another experiment was also set to compare the growth and yield of ubi using the aeroponics system over conventional cultivation.

Tissue-cultured plants (left) as sources of planting materials that were acclimatized (center) and transplanted (right) to the aeroponics system. (BSU)

The experimental setup of the aeroponics system for purple yam. (BSU)

Growing ubi plants using the aeroponics system (left) and conventional method (right) at four months after transplanting. (BSU)

Optimized Production and Use of Fertigroe® Nitrogen (N), Phosphorus (P), and Potassium (K) Nanofertilizers

FertiGroe® N, P, and K nanofertilizers were formulated to improve efficiency of crops' nutrient uptake and yield. The production process of these FertiGroe® nanofertilizers was optimized in terms of raw materials and other parameters. The particle size of the granulated nanofertilizers is between 70–100 nanometer (nm) and current data showed stability of the FertiGroe® N, P, and K nanofertilizers at 12 months after production at room temperature.

Application protocol to increase the yield of specific crops has been developed. Field validation of FertiGroe® N, P, and K nanofertilizers for rice, corn, sugarcane, banana, coffee, cacao, and vegetables has been conducted. Initial efficacy tests on the use of Fertigroe® nanofertilizers on these crops showed an increase in nutrient uptake of N, P, and K from 25% to 50%. The application of FertiGroe® nanofertilizers reduced the amount of inorganic fertilizer use in most annual crops by 50%–75% and 25%–50% for perennial crops.

The product is for registration at the DA-Fertilizer and Pesticide Authority (FPA) once efficacy tests on various crops have been completed. A spin-off company in UPLB is being established for the manufacturing and marketing of the FertiGroe® N, P, and K nanofertilizers.

FertiGroe® N, P, and K nanofertilizers.

Actual production of FertiGroe® in Alltrade Marketing and Manufacturing (ATMM) in Baliwag, Bulacan.

Nutrio® Biofertilizer for Improved Sugarcane Production

Nutrio® foliar spray biofertilizer was developed and pilot-tested in selected sugarcane farms in Regions III and VI. Nutrio® supplemented the N requirement of sugarcane and helped reduce the amount of use and cost of N chemical fertilizer input by 50%. A toxicological study on *Enterobacter sacchari* S18, the microbial component in Nutrio® biofertilizer, showed that the product is safe for use in sugarcane and other crops.

In the first pilot test site in Concepcion, Tarlac, cane yield increased by 10% when one half of the rates recommended by DA-Sugar Regulatory Administration (SRA) was supplemented with Nutrio (1/2 SRARR + Nutrio®). In EB Magalona, Silay, Negros Occidental, a yield increase of 27.3% was obtained when sugarcane plants were applied with 1/2 SRARR + Nutrio®. Six demonstration trials were conducted in selected farms in Regions III and VI. Treatments, which made use of Nutrio® as a supplement to farmers' practice of fertilization rate (FP) and DA-SRA's recommended rate, showed a positive effect on plant growth parameters, cane yield, and sugar yield, compared with the FP alone.

Comparative partial budget analyses of the different fertilizer application treatments showed a positive change in net income due to the use of Nutrio® in sugarcane production. In pilot test areas, the application of 1/2 FP+Nutrio® resulted in an additional profit per hectare ranging from P6,891 to P20,784. In the demonstration trials, the same application rate resulted in an additional profit per hectare ranging from P21,980 to P72,744. Also, the application of 1/2 SRARR+Nutrio® gave an additional profit per ha of P21,980.

Nutrio® mixed with water.

Farmers spraying Nutrio® on sugarcane plants.

Production of Nutrio® foliar spray biofertilizer is licensed to Fullmight Agricultural Corporation. IPOPhil approved the inventor's patent application declaring the invention as novel, inventive, and industrially applicable. The product generated sales and interest through the project's promotional activities.

Automated Furrow (AutoFurrow) Irrigation System for Sugarcane Block Farms

An AutoFurrow Irrigation System that integrates crop production models, irrigation management strategies, soil and crop sensors, and control systems was developed. AutoFurrow is a cost-effective system that helps reduce labor in irrigating a hectare of sugarcane field. It is more efficient compared with the conventional way of opening and closing channels to irrigate the field.

AutoFurrow system supplies water only when needed based on the soil moisture in the specific plot. It automates furrow irrigation using microcontrollers, which is electronic circuitry that can be uploaded with computer programs to generate

electrical signals used in controlling other mechanical peripherals. It also used solar panels to make the system independent from electrical power supplies even if in the middle of the farm.

In Brgy. Dampe, Floridablanca, Pampanga, sugarcane block farms irrigated by AutoFurrow system obtained an average yield of 178.13 ton-cane per ha (TC/ha), 352.55 bags/ha of sugar produced, and water productivity of 39.82 kg per cubic meter (m^3). These results are higher compared with the farmer's conventional practice with 112.50 TC/ha average yield, 165.95 bags/ha of sugar produced, and 17.10 kg/m^3 of water productivity. AutoFurrow irrigation in sugarcane block farms increased yield by 58.34% and generated water savings of 47.50%. Installation of AutoFurrow system is recommended for SRA-initiated sugarcane block farms for increased yield, better water productivity, reduced labor requirement, and increased irrigation efficiency.

AutoFurrow Irrigation System.

Seven out of the 10 different varieties of cacao identified and tested.

Demonstration of the grafting method for cacao seedlings.

Multilocation Trial of Promising Varieties of Cacao in Different Agro-climatic Zones

A program led by the USM is implemented to identify cacao varieties suited to do well in different agro-climatic zones. Adaptability trials on the performance of 10 different cacao varieties were conducted to identify the recommended high-yielding cacao varieties specific to various locations and environmental conditions of the country.

The research team has already grafted 10 varieties of cacao in the nursery, propagated cacao seedlings in the field, and distributed cacao mother plants as scion sources to different locations. Budwood gardens were established in the identified project sites. Regular observation of pests and diseases infecting the early stage of cacao was also done.

The identification of superior cacao varieties in terms of yield, tolerance to pests and diseases, bean characteristics, and availability to local growers ensures and sustains increased productivity.

Utilizing Young-aged Falcata and Yemane for Veneer, Plywood, and Construction Material

To determine the youngest age of falcata and yemane trees that can be harvested, the project "Anatomical, Physical, Mechanical and Veneering Properties of Falcata (*Falcataria moluccana* (Miq.) Barneby & JW Grimes.) and Yemane (*Gmelina arborea* Roxb.)," was initiated. The materials were collected from Agusan del Sur, Butuan City, and Agusan del Norte following the standard procedures in sampling and properties testing. Lumber quality or grade yield per log per species was evaluated based on the National Hardwood Lumber Association (NHLA) standards.

It was found out that the lumber recovery and grades improved from 4 to 8 years old. Based on the cost analysis it is viable to harvest falcata trees with a diameter of 16 centimeters (cm) and above, which is attained even by 4-year-old trees. On the other hand, yemane trees require a diameter of 16.29 cm and above, which belongs under 6- and 8-year-old trees, to be viable for harvest.

Instead of waiting for 8–12 years, it is feasible to cut falcata and yemane trees at 4–6 years old as far as mechanical properties are concerned. This may help widen the raw material base of the local wood-based industries.

Five-year-old falcata (top) and seven-year-old falcata (bottom).

Sample wood wastes from falcata and gmelina.

For. Kathreena Gutierrez (right) showing Dr. Marcelino Siladan (center) the SLSU's hedge garden with Batikuling seedlings.

Quality Planting Materials of Indigenous Tree Species

'Makaasim' (*Syzygium nitidum* Benth) and 'Batikuling' (*Litsea leytensis* Merr.) are indigenous tree species both threatened due to the demand for wood pallets, furniture, and wood carving. To solve this, a project was implemented to generate and promote S&T interventions in producing quality planting materials for Makaasim and Batikuling. This is to support the needs of the wood-based industry and the National Greening Program (NGP) of the government. With Southern Luzon State University's (SLSU) existing clonal nursery, the project team was able to develop a scientific way of producing high-quality and needed volumes of Makaasim and Batikuling. The team also developed protocols for the vegetative propagation of Makaasim and Batikuling, as well as cost analysis for the quality planting material production of both tree species.

Mussels, Sea Cucumbers, and Seaweeds as Biofilters in an Integrated Multi-Trophic Aquaculture (IMTA) System

The Integrated Multi-Trophic Aquaculture (IMTA) is a new image of a traditional polyculture technique where multi-trophic refers to the explicit incorporation of species from different trophic positions or nutritional levels in the same system. Through IMTA, some of the food, nutrients, and energy considered lost in finfish monoculture are recaptured and converted into crops of commercial value, while biomitigation takes place. In this way, all the cultivation components have economic value, as well as a role in the services and recycling processes of the nutrients in the system. Moreover, IMTA provides economic diversification and reduces economic risk using the appropriate species.

Milkfish (*Chanos chanos*) is cultured in the fish cage and utilize commercial fish feeds as food. The co-cultured IMTA organisms monitored for their growth and assimilation of excess feeds are the filter-feeding bivalves including 'amahong' (*Modiolus philippinarum*), 'imbao' (*Anadontia* sp.), 'litob' (*Anadara* sp.), 'tipay' (*Pinctada margaritifera*); the detritus feeder sea cucumber (*Holothuria scabra*); and two species of seaweeds (*Eucheuma denticulatum* and *Kappaphycus alvarezii*).

Two experimental IMTA setups (with and without fish cages) were already established. Data on the growth of mussels, sea cucumbers, and seaweeds were generated. The physicochemical factors affecting fish cage organisms were already processed and analyzed. Further, an initial stable isotope analysis of the 40% IMTA organism samples in Kyoto University, Japan has been conducted.

Biodiversity S&T Initiatives

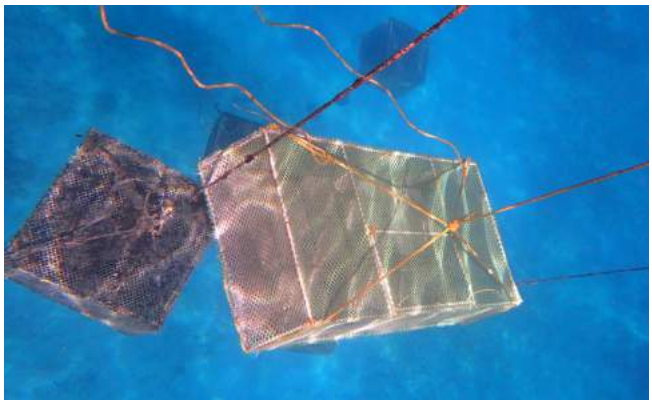
Biodiversity and Vulnerable Systems Research (BiVER) Program

The BiVER program was implemented to provide a systematic and regular study of biodiversity and vulnerable ecosystems in the Eastern Visayas region. Vulnerable ecosystems are defined in this program as fresh and marine systems, which are fragile

Filter feeding brown mussels (*M. philippinarum*) cultured in suspended cages.

IMTA setup along with the culture of milkfish (*C. chanos)* in Mariculture Park.

Culture raft in Barangay Tamisan (without fish cage) used as control setup.



Suspended cages of mussels, bivalves, and sea cucumbers.

due to their high susceptibility to anthropogenic activities and/or the functional significance of the habitat.

Notable accomplishments of the program are the inventory of flora and fauna (taxonomy and genetic), data gathered on the environmental quality of ecosystems, development of computational models of economically important river systems, and development of a BiVER database system and website containing research data, serving as an accessible source of information for the public.

Activities of the program were conducted in collaboration with DOST-Philippine Science High School (PSHS) senior high school students and staff. They were also able to develop Project Freshwater Morphology Information Gathering System (FRIES), a technology designed to help predict the rise and fall of water levels in the Binahaan River, which will be very useful during the onset of typhoons. All information is stored on their website, which will be maintained and continuously improved even after the completion of the research.

Biodiversity Assessment for Sustainable Management in Key Biodiversity Areas (KBAs) of Central Visayas

This research program was implemented in support of the biodiversity management and conservation efforts of the Niche R&D Center for Biodiversity based at Cebu Technological University (CTU) in Argao, Cebu. A total of five KBAs namely: Balinsasayao Twin Lakes Natural Park (BTLP), Mount (Mt.) Bandilaan Forest Reserve (MTFR), Raja Sikatuna Protected Landscape (RSPL), Talibon Protected Landscape (TPL), and Mt. Mabinay were surveyed for richness in biodiversity.

Several endangered flora and fauna were recorded from BTLP including the endangered *Nyctimene rabori* and the near threatened *Pteropus pumilus*. A new species record of orchid (*Corybas* sp.), two new species of Zingiber, and one new species of Begonia were likewise documented during their expedition in MTFR, and probably the longest species of earthworm in the Philippines was found in RSPL.

In 13 caves surveyed in MTFR, 5 bat species were recorded with 1 noted as endangered (*Rhinolophus arcuatus*). On the other hand, in 11 caves surveyed in Mt. Mabinay, 11 species of bats were collected, 2 species of which were noted as near threatened (*Miniopterus schreibersii* and *Hipposideros lekaguli*), and 1 species was noted as endangered (*R. arcuatus*).

Entomophagy and Entomotherapy Practices of Ethnolinguistic Groups in Sultan Kudarat and South Cotabato

This research project aimed to provide baseline data on the practices of entomophagy and entomotherapy of selected indigenous people in Mindanao, particularly the Manobo Dulangan, Teduray, and Tboli ethnolinguistic groups.

Preliminary research findings of the research showed that all three ethnolinguistic groups (Manobo Dulangan, Teduray, and T'boli) are practicing both entomophagy and entomotherapy. The knowledge of using insects for food and medicine was transmitted by their elders. It was noted that the tribes always conduct rituals before the collection of insects for consumption. Some of the documented insects that are consumed are those found in coconut wine, bees, grubs, locusts, grasshopper, cricket, and others.

Significant medicinal uses of insects were revealed during the interview. Bees were recorded for the cure of fever and runny nose, dragonfly for body pain or mental disorder, honey bees for measles and beri-beri, bumblebees for stomach ache, crickets for easy delivery of the baby, ants for diarrhea and vomiting, beetles and bugs for epilepsy, etc. Some folkloric beliefs were also documented. Only the Tedurays were documented to practice Geophagy or the eating of soil among the three groups.

Trophic Status and Aquatic Biodiversity Assessment for Sustainable Upland Freshwater Ecosystems in Lake Sebu, South Cotabato

Lake Sebu is a Municipality in South Cotabato where three lakes are located. The recently concluded project aimed to determine the trophic status and bathymetry and assess the abundance distribution and diversity of plankton, fishes, and macroinvertebrates of the three upland lake ecosystems, namely: Lake Sebu, Lake Lahit, and Lake Seloton.

On the hydrology of the lakes, the discharge rates of eight river tributaries that flow into Lake Sebu were also recorded. Bakdulong river had the highest discharge rate of 0.3 cubic meter per second (m^3/s).

A total of 723 species of insects are classified under 12 orders and 62 families in which at least one is a possible new species.

Twelve species of aquatic plants, 9 plankton genera, 12 species of fish (e.g., *Oreochromis* sp., *Clarias batrachus*, *Channa straita*, etc.) were recorded and identified, and few sponges were also collected. Four new species were discovered which may be under a new genus and the other two were already warranted as new species and were named *Spongilla lahitensis* sp. and *Spongilla sebuensis* sp.

The study recommended the eventual phase-out of fish cages in Lake Sebu and Lake Seloton, provision of sustainable sources of income to avert the quarrying operations in the area, creation of a buffer zone around the lake, and re-establishment of forest cover.

DNA Barcoding of Reef Fishes in Northern Luzon and Southern Mindanao

The diversity of reef fishes and population connectivity of *Scarus quoyi* and *Terapon jarbua* in Northern Luzon and Southern Mindanao (as affected by North Equatorial Current and Mindanao Current, respectively) are being investigated to provide new information and a better understanding of the biodiversity profile and degree of connection of reef fishes in the said areas, which are important inputs for management and conservation.

A total of 150 species of reef fishes was collected in Northern Luzon (Cagayan and Isabela) and 373 species of reef fishes in Southern Mindanao, particularly in Davao and Sulu Archipelago. The island chain of Basilan, Sulu, and Tawi-Tawi contributes most to this number with over 304 unique species in the fish checklist. From the collected species, 200 genetic barcodes are currently generated and this will be made available in a biodiversity database, which are important inputs for the management of fisheries.

Research staff measuring the outflow discharge in Lake Sebu (left) and a possible new species of insect found in one of the lakes (right).

Lake Seloton specimen #4 that probably belongs to a new genus (top left), Lake Seloton specimen #6 that probably belongs to a new genus (top right), *Spongilla lahitensis* sp. (lower left) and *Spongilla sebuensis* sp. (lower right).

Display of reef fishes in the wet market of Sta. Ana, Cagayan.

Project personnel preparing the fish samples for photography and morphometrics.

Project personnel extracting tissue from fishes collected in Sta. Ana, Cagayan.

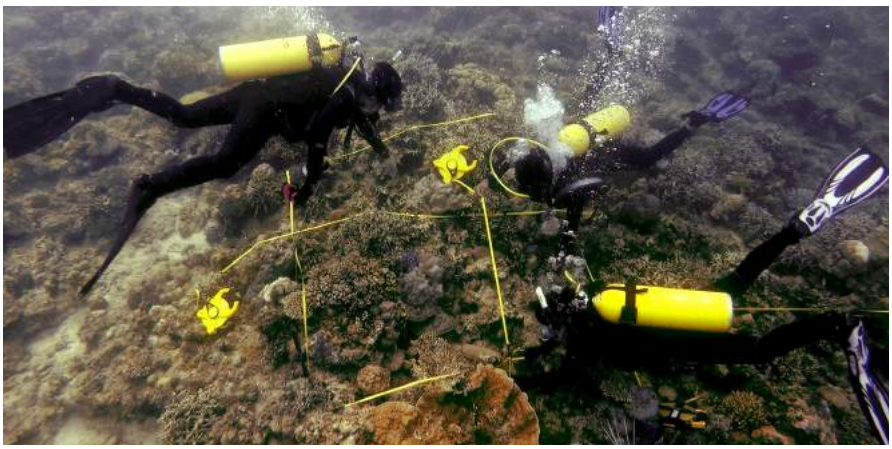
Giant Clams

Field Surveys of Giant Clams

With the continuing efforts to bring back the giant clams (*Tridacna gigas)* from the brink of extinction, the giant clam program continues to survey giant clams and corals on reefs in different parts of the country. Survey results showed that both wild and restocked giant clams are naturally reproducing in some reefs (e.g., Bohol; Guiuan; Samar; Camiguin; Island Garden City of Samal; Hundred Islands and Bolinao, Pangasinan) where juveniles of the endangered *T. gigas* and *in situ* spawning in Samal Island, Mindanao was also observed. The program is thus optimistic that natural spawning can restore depleted giant clam population from overexploitation and natural threats. In addition, giant clam diversity was also highest in well-regulated marine protected areas.

Giant Clam Genetic Resources

To complement these field survey results, the program made use of cutting-edge technologies to reveal the genes important for the growth, development, survival, and resilience of giant clams. To generate key genetic resources from local giant clam stocks, *ex situ* spawning and next-generation sequencing were conducted. A closer look at the giant clam genes revealed the molecular pathways involved in the growth and survival of a giant clam in culture and identified potential settlement and metamorphosis inducers, which can later be harnessed to enhance existing giant clam culture techniques and to improve juvenile survival. Beyond its aquaculture applications, the genetic resources generated by the program can also be used to understand how well giant clams in the wild can adapt and survive in an ocean environment that is constantly affected by stressors brought about by human activities.



Divers deploy equipment and collect water samples to obtain information on environmental parameters.

A diver conducting a phototransect survey for giant clams and corals on a reef.

Population Genetic Structure and Adaptive Trait

Many studied population structures of invertebrates across sites in the country have been conducted but only a few have worked on demonstrating the correlation of genetic structure with an adaptive trait. The Philippines in collaboration with Taiwan jointly determines the connectivity of giant clam resources from sites in the Luzon Strait, South China Sea, and West Philippine Seas. Also, the Philippine team added temperature stress experiments in collaboration with the local research institutions in Palawan, Polillo, and Batanes to determine differences in giant clam response to temperature using total messenger RNA (mRNA) expression. To date, this is the first giant clam population genetic study in the country.

Capability Building and Awareness-raising

The program conducted public fora and training workshops with local government unit (LGU) partners and other stakeholders at each study site to impart information on the value of giant clams and the

***Ex situ* spawning of giant clams is conducted to study early giant clam development.**

RNA extracted from different giant clam stages is subjected to next-generation sequencing analysis.

benefits of proper conservation and monitoring methods. Program teams presented survey data to the LGUs to inform them of their local giant clam stocks, which may help them formulate conservation plans.

Through capacity building and collaboration, the program raised awareness on the plight of giant clams nationwide. Personnel of Western Philippines University (WPU) in Palawan were trained in the spawning, culture, and restocking of different giant clam species. Importantly, sites with promising prospects for giant clam conservation were identified. For example, sites with functioning hatcheries, such as Bohol, Davao, Guiuan, Samar, and Palawan may soon be able to start their own giant clam cultures. On the other hand, sites with diverse giant clam populations like Apo Reef and Calaguas may be able to develop sustainable giant clam tourism. In the Island of Samal, Davao del Norte, the famous "Taklobo tours" is already a steady source of income for their tourism industry. They, too, have helped raise awareness for the conservation of giant clams.

The continued conservation and recovery of giant clams will improve the health of our coral reefs and

Tissue collection from the mantle of a giant clam.

Retrieval of *T. crocea* for temperature experiments at the field station.

Processing of giant clam mantle tissues for DNA extraction and PCR amplification.

will provide many socioeconomic benefits. We hope that giant clams in the Philippines can safely continue to grow and thrive under the care of local communities, government agencies, and various other stakeholders and advocates. Together, we can work towards creating a sustainable future for giant clams in the Philippines.

Support to NICERs for Better Productivity and Resource Management

Tamarind R&D Center

The Tamarind R&D Center of DOST's NICER Program, established at PSAU in Magalang, Pampanga aims to improve the quality and production of sour and sweet tamarind through S&T interventions. The Center envisions a sustainable tamarind industry by increasing crop productivity and farmers' income. To date, among the significant accomplishments of the program include increasing the area of sour tamarind plantation in Central Luzon by 32 ha. Moreover, two tamarind lines, the PAC Sour 2 and Golden Sweet, which both have outstanding pod characteristics and potential for registration as new varieties were identified. PAC Sour 2 is a sour type tamarind and has the following characteristics: thick pod shell (0.56 millimeters [mm]), a high percentage of pulp flesh (50.86%), pod weight of 15.34 grams (g), and has three or more seeds per pod. On the other hand, Golden Sweet is a sweet type tamarind that has a shell thickness of 0.73 mm, pod weight of 16.69 g, 42.43% pulp, and three or more seeds per pod.

Eastern Visayas Center for Crustacean Research and Development (EVCCRD)

Crustaceans, particularly blue swimming crabs (BSC) are the focus of the Center's R&D efforts. The program has classified eight fishing gears/methods in catching BSC in Maqueda Bay, Villareal Bay, Zumarraga Channel, Southeastern Samar Sea, and Leyte Gulf fishing areas. From the eight fishing gears, crab entangling net was the predominant fishing gear

Laboratory analysis and training with local project partners at the Aquatic Biodiversity and Biotechnology Research Center of the WPU.

Information dissemination for high school teachers in Brooke's Point Palawan.

Dr. Virgilio DM. Gonzales (2nd from left), Program leader of the NICER Tamarind R&D Center, shows to DOST-PCAARRD representatives the tamarind seedlings in the PSAU nursery.

Dr. Darwin E. Totaan, PSAU researcher, collects tamarind leaf samples.

Immature sour tamarind pods.

used by 1,222 municipal fishers, followed by crab liftnet, crab pot, trammel net, sweeping entangling net, fish corral, trawl, and crab hand picking.

Results of the R&D showed low catch per unit effort (CPUE) from the top three fishing gears used in catching BSC, which indicates a declining population of BSC. The annual production of BSC in four major fishing areas contributes relatively to the total production in Samar province. It has also a significant contribution to the supply chain of the fishery industry, specifically for the local consumers and export market (crab meat processing). The program generated initial scientific information that would be helpful for policy recommendation on the limitation of BSC fishing effort in the operational range of 1.8–10 meters (m) water depth, as well as the banning of filter net (dyakus) in rivers that catch juvenile BSC and other immature crustaceans along Maqueda Bay and its vicinities. Initial R&D efforts of the center particularly on resource assessment and the development of culture technology are significantly important in the management of the BSC resources in Samar to sustain the fisheries as well as increase the catch of fishers.

Through the Center's facility upgrading component, the microbiology laboratory of Samar State University (SSU) was already improved/enhanced with the procurement of various equipment and supplies under the R&D project, which maximized the capability of the program personnel, researchers, graduate, and undergraduate students to do research.

Matured blue swimming crab.

Assessment of fishing gears for blue swimming crab.

Resource assessment of blue swimming crab conducted in Maqueda Bay.

Procured equipment of the NICER were set up at the Microbiology laboratory.

Sea Cucumber Research and Development (R&D) Center

The Center is focused on assessing the status of sea cucumber fisheries in Mindanao, developing mariculture technology for *Holothuria fuscogilva* (teatfish) and refining the culture production of *H. scabra* (sandfish) that are important for management and livelihood production. The *H. fuscogilva* and *H. scabra* are highly valued species in the international trepang trade and are boosting the trepang industry in the Philippines.

The Center accomplished significant activities in its first year of operation, which include the assessment of 58 sea cucumber species, of which *H. scabra* is among the top five commercially abundant species in Mindanao. The Center was able to describe that the *H. fuscogilva* occurs only in deeper waters (>30 meters) in Tawi-Tawi, Misamis Oriental, and Misamis Occidental and described to be fast declining in number to date. The Center has initially produced 28,000 sandfish juveniles for ocean nursery rearing and sea ranching later and successfully spawned teatfish broodstock in a hatchery. This is very helpful to supplement the livelihood of coastal gatherers of sea cucumbers in the study sites. The Center assessed the status of *H. fuscogilva* catch in the protected and unprotected study sites in Mindanao and abundance of this sea cucumber species in Capayas Island Marine Sanctuary compared to other sites and identified the roles of marine protected areas (MPAs) in the conservation of *H. fuscogilva*.

Center for Mollusk R&D

The Center described that the cephalopod fishery of Panay Island is marked by high biodiversity, consisting of a total of eight species: 4 squids (*Uroteuthis duvaucelii*, *U. edulis*, *Sepioteuthis lessoniana*, and *Sthenoteuthis oualaniensis*), 2 cuttlefish (*Sepia recurvirostra* and *S. latimanus*), and 2 octopuses (*Octopus cyanea* and *Cistopus indicus*). The Center assessed that trawl has the highest catch among all the gears with an annual catch of 1,151.0 tons (t) in 2019–2020; 407 t of this are from Capiz, while 750.2 t were from Concepcion, Iloilo.

The Center's R&D on Mollusk produced the publication "Field Guide to the Commercially-Important Mollusks of Panay, Philippines," which was also launched virtually during the DOST-PCAARRD's event, Recognizing Excellence (GALING) Amidst the Pandemic on December 22, 2020. This serves as a useful reference for researchers, academe, LGUs, and other government agencies across the country to drive strong information awareness and understanding of our mollusk resources towards their proper and sustainable management.

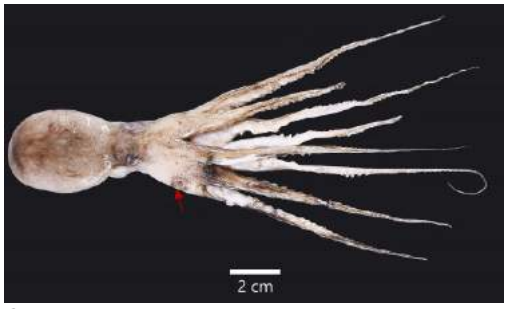
***H. fuscogilva* collected in Tawi-Tawi.**

An encountered *H. scabra* during one of the sea cucumber catch monitoring.

Reconnaisance survey at the coral reef areas in Lopez Jaena.

MSU Naawan Chancellor, and NICER for Sea Cucumber Program leader along with the beneficiaries, and LGU of Camiguin during the seeding and turnover of sandfish juveniles in Benoni, Camiguin.

***U. edulis*.**



***Octopus cyanea*.**

***Uroteuthis (Photololigo) duvaucelii*.**

Seaweed R&D Center (SeaRDeC) in Tawi-Tawi to Support the Seaweed Industry in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM)

To optimize the seaweed (*Kappaphycus* and *Eucheuma*) value chain in Tawi-Tawi and create and promote a commercially sustainable seaweed industry in BARMM, the program, "Establishment of a Seaweed R&D Center in Tawi-Tawi to Support the Seaweed Industry in BARMM" under the NICER was implemented.

In its first year of implementation, the program conducted hands-on trainings on seaweed propagation and maintenance in the laboratory, preparation of culture media and cleaning of cultivars, and preparation of laboratory propagated seedstocks to be out-planted in the land-based nursery and actual out-planting in the hatchery. The program was able to prepare IEC materials (flyer and poster) of laboratory and land-based propagation of *Kappaphycus* and *Eucheuma*, and the importance of proper seaweed postharvest processing and carrageenan which will be translated to Tausog, Sinama, and Bisaya dialects. Protocols on laboratory and land-based propagation of *Kappaphycus* and *Eucheuma denticulatum*; GIS mapping of economically important seaweeds; and laboratory protocols to extract carrageenan from *Kappaphycus* and *Eucheuma*, analyze texture, measure viscosity, gel strength, syneresis index, and melting and gelling temperature were also prepared.

Policy Initiatives for a More Conducive S&T Policy Environment

Policy Advisory on Legislative Issues

The year 2020 was a productive year for DOST-PCAARRD's Policy Action Group (PAG). Collectively, the PAG evaluated and provided policy advisories to 159 policy documents consisting of House and Senate bills, resolutions, draft executive and administrative orders, draft implementing rules and regulations, and other policy documents affecting the AANR sector. These also included policy-related inputs for DOST and other requesting agencies, such as the National Economic and Development Authority (NEDA) and Department of Trade and Industry (DTI). To cite a few, the Council provided significant inputs to bills on the National Land Use Act, Cacao and Coffee Industry Development Acts, Agriculture Information System Act, and Single-use Plastic Products Regulation Act. The Council also participated in 23 hearings and meetings, including discussions with the IATF Task Group on Food Security (Food Value Chain and Logistics, Water Security, and Agribusiness) and technical working group (TWG) for the Coffee and Cacao Industry Development Acts.

National Land Use Act

The Council expressed its support to the passage of the National Land Use Act (NALUA) as this is important in harmonizing and systematizing the government's mandates and initiatives in managing land and land resources. Business as usual land-use planning process is no longer sufficient to ensure the sustainability of our land resources as manifested by unregulated land conversion; widespread decline of land productivity; and the unabated deterioration of soil, water, biodiversity, and ecosystem services.

For the improvement of the bills, DOST-PCAARRD strongly recommended the adoption of a landscape-wide watershed-based approach in land use planning as this will ensure the sustainability

Seaweed cultivar laboratory.

Seaweed varieties in Tawi-Tawi.

of the watersheds and ecosystems within the landscape unit as the pillar of sustainable economic development. This recommendation is borne out of the DOST-PCAARRD-funded policy study on watersheds and is aligned with the proposed solution of the United Nations Convention to Combat Desertification where the objective is to integrate conservation, land, and water management, restoration, and site-specific uses of land.

Cacao and Coffee Industry Development Act

The Council supported the proposed Cacao and Coffee Industry Development Acts as it recognizes the need to promote and enhance local production, significantly expand our country's market, and strengthen the competitiveness of the Philippine cacao and coffee industries. As part of the TWG, the Council, along with DA and DTI, thoroughly reviewed the proposed sets of bills for the two commodities and drafted a substitute bill for both, which will be jointly submitted by the three agencies to the Congress.

For coffee, the Council manifested its support to the substitute bill, which is a revised version of the initially proposed Executive Order (EO) creating the Philippine Coffee Council. In the case of cacao, DOST-PCAARRD recognized the integral role of the proposed establishment of the Cacao Centers of Excellence as a one-stop shop for cacao R&D, technology transfer, and capacity building.

Digital Transformation Act

The Digital Transformation Act is among the supported legislative bills of DOST-PCAARRD as it fosters digital literacy and competence among Filipinos. DOST, as the lead agency for STI, strongly advocates the use of digital and modern technologies in bringing science-based solutions in different sectors. Likewise, the Council also expressed its support to the Philippine Digital Workforce Competitiveness Bill, which empowers our country's workforce and advances digital inclusion in the country.

Virtual focus group discussion (FGD) with eggplant farmers in Talavera, Nueva Ecija.

The Council stressed the importance of mainstreaming R&D for emerging technologies, such as but not limited to biotechnology (e.g., genomics, gene-editing, etc.), digital technologies (e.g., big data, internet of things, GIS, etc.), nanotechnology (nano-imprint lithography, solar energy, etc.), and neurotechnology (e.g., autonomous vehicles, artificial intelligence, etc.). The Council also recommended including digital technology transfers and extension services under areas for training and skills development to help farmers engage with ICT-based tools for farming.

Policy Research and Advocacy

Review of Crop Biotechnology Policies

DOST-PCAARRD embarked on a policy study that assessed existing and emerging policies and biosafety regulations governing crop biotechnology in the Philippines through the project, "A Review of Policies on Crop Biotechnology: Impact on Food Security and Agriculture Development in the Climate Change Era."

The study's assessment points to the redundancy in functions or layers and the limited in-house experts and dedicated staff as the sources of inefficiencies in biotechnology regulations. These factors significantly delay the issuance of permit approval or disapproval for direct application and commercialization and propagation. Proposed institutional reforms were generated to address the source of inefficiencies. For example, the Biotechnology Authority of the Philippines, proposed in House Bill 3372 to promote and regulate biotechnology, is recommended to play a developmental role, which will ensure continuous funding and support to biotech R&D. On the other hand, Biosafety Committees attached to select national government agencies (NGAs) should be strengthened by augmenting its personnel requirements and building the capacity of personnel tasked to review applications. The study also supported the National Committee on Biosafety of the Philippines (NCBP)-initiated TWG recommendations that will streamline the regulatory process.

On regulating biotechnology products, the emerging consensus among the scientists and experts convened by the policy study is that regulation should be product-based instead of the process-based approach, which is currently adopted in the Philippines. This means that characteristics of and risks associated with the product shall be the focus of the regulation.

Valuing Bio-resources and Ecosystem Services in Bataan National Park (BNP)

DOST-PCAARRD's preliminary work towards developing policy options for access and benefit-sharing (ABS) and payment for ecosystem services (PES) mechanism was initiated through the valuation of bio-resources and ecosystem services. Using the case of BNP, this pioneering work implemented by UPLB assessed the economic benefits of the park's bio-resources, recreational ecosystem services, and passive-use values. This valuation would be crucial in establishing policy options that would strike a balance between biodiversity conservation and pursuing economic growth and development, as well as optimal resource allocation.

The project estimated that the total annual economic value of BNP's forest ecosystem services amounted to a range of P120 M (with onsite households' estimate of passive values) to P208 M (with offsite households). For the bio-resources, seven species of flora: 'yantok' (*Calamus* sp.), 'kalinag' (*Cinnamomummercadoi*), 'hinggiw (*Ichnocarpusfrutescens*), 'gugo' (*Entadaphaseoloides)*, 'dita' (*Alstoniascholaris)*, 'sambong' (*Blumeabalsamifera)*, and 'bignay' *Antidesmabunius* and five species of fauna: honeybee (*Apis* sp.), 'musang' (*Paradoxorushermaphroditus),* 'baboyramo (*Sus philippinensis*), 'labuyo' (*Gallus*), and 'bayawak' (*Varanusmarmoratus)* found in BNP were identified to have strong commercial and economic potential.

The study also estimated the value of Tala River and Lumutan Falls' recreational services, which totaled P3.7 M and P15.4 M, respectively. The visitors are willing to pay more for improvements to the sites' accessibility, safety, waste management, and restroom facilities. For the passive use values of BNP's forests and selected ecosystem services, biodiversity conservation, flood regulation, and provision of sustainable livelihood were selected. Taking advantage of these opportunities through enterprise development can generate income for both the residents inside BNP and the protected area. Should these opportunities materialize, resource extraction and use should be sustainably managed for all the stakeholders to benefit from the bio-resources in the long run.

Streamlining Financial Management Policies for Publicly-funded R&D

In 2019, DOST-PCAARRD presented to the Philippine Congress through the Congressional Planning and Budget Research Department (CPBRD) its priority legislative agenda for the succeeding congress. Among the identified policy issues concerning the AANR and S&T sectors, the policies constraining the R&D activities in the country were recommended by CPBRD to be further investigated. The meeting paved the way for discussions on having a systematic evaluation of procurement law and other policies affecting R&D.

Presentation of the financial management reform to the CPBRD as part of PCAARRD's legislative agenda.

Lumutan Falls at BNP.

FGD with the indigenous communities at the BNP.

This prompted the Council to invest in the policy analysis project titled, "Assessment of Policy Constraints to the Effective and Efficient Conduct of Public R&D in the Philippines," where the CPBRD is particularly involved. Through the study, the problem—the law, the implementers and their capacity or the lack of observance of the law by some agencies shall be better understood and empirical evidence shall be derived. In 2020, the project has already conducted several virtual key informant interviews (KII), FGDs, and surveys to gather insights and information on the respondent's knowledge of procurement and attendant policies, organizational capacities, the incentive systems, and emerging policies governing human resources for S&T and cash budgeting for R&D. Such evidence shall form part of the Council's future advocacy initiatives as it enhances its role in policy analysis and advocacy in the AANR.

Integrated Approach to Impact Assessment: Simplified Guidelines for DOST

In support of the DOST's goal of mainstreaming impact assessment (IA) into its overall monitoring and evaluation protocol, DOST-PCAARRD developed a guidance document that presents its knowledge and experience derived from its long years of work on IA. Through the guidance document, the Council intends to share with DOST units the concepts and methodologies, and learnings in monitoring and implementing past IA initiatives. Specifically, the document will discuss basic principles and concepts, general methodological approaches, challenges and issues, and guidelines in communicating the results of IA.

While those initiatives are mostly confined to assessing S&T interventions in the AANR sector, the concepts and methodologies presented can easily be adopted in other sectors like health, energy, and emerging industries. Several impact studies relevant to the said sectors were also cited in the document.

This document will serve as guidelines for the staff of DOST agencies, including the top management, planning officers, and the program managers, that DOST has officially included in the conduct of IA in its monitoring and evaluation (M&E) system. Other researchers and agencies may also find this useful as a guide in evaluating their developmental project.

Results-Based Monitoring and Evaluation (RBME) System

The Council has been assiduously conducting its M&E function to ensure that its R&D investments yield relevant and high-quality S&T solutions for the AANR sector. Its M&E mechanisms include a wide range of activities that aim to capture the accomplishments of programs and projects. However, most of these mechanisms are apt in monitoring program/project results up to the level of outputs (i.e., 6 Ps—publication, patents, products, people and services, places and partnerships, policies) as they pertain to accomplishments per component activity of projects.

To address this seeming focus on the identification and measurement of outputs, the Council began the development and institutionalization of the RBME system for its programs/projects. This is an M&E enhancement initiative that seeks to expand the focus of regular monitoring to include not only outputs but also outcomes and impacts. Through this initiative, the regular monitoring being done by the Council will cover program/project results at different levels and various stages in the R&D continuum, such as from technology generation to technology transfer and utilization.

With the establishment and tracking of objectively verifiable indicators and their corresponding means of verification at various levels of program/project results, the RBME system will enable an up-to-date demonstration of how the Council's interventions are generating changes or improvements in the AANR sector. The system will be applied to programs/projects under the Council's ISPs.

Agenda 3: Engage in R&D to Generate and Apply New Knowledge and Technologies Across Sectors

Protein Hydrolysates from Marine Fisheries Species

Marine resources offer a vast option of protein sources. Proteins, if hydrolyzed by enzymes will produce hydrolysates. These protein hydrolysates offer vast functional characteristics intended as food supplements for sick people (or people with low immune responses). This R&D is directed to produce food that is easy to digest in the form of supplements; low molecular weight peptides instead of high molecular weight proteins, as appropriate diet should provide complete nutrition; and at the same time, boost sickness healing (and/or increase the immune system responses).

The project is in collaboration with Pascual Pharma Corporation (PPC), a Philippine drug company, which will adopt the products/protocols that will be developed. This R&D potentially benefits in advancing the pharmaceutical industry, in general, which initiates researches on the use of bioavailable proteins and bioactive peptides from marine species to develop easy, digestible foods with complete nutrition and potential efficacy as food supplements. Currently, the project has already produced protein isolates from marine species, such as big-eyed scad, oysters, and sardines, and their protein content was already determined. Big-eyed scad has the highest yield of protein isolates among the marine species used but protein isolates from the oyster have the highest protein content. This information is important to further refine the process protocols in developing hydrolysates from marine species.

Colloidal Gold Nanoparticles (AuNPs) Immune Assay for the Rapid Detection of Bacterial Pathogens in Freshwater Tilapia Aquaculture

Among the various disease-causing pathogens, bacterial pathogens are the major cause of infections and disease problems in wild fish and fish reared in confined conditions. An important prerequisite for diagnosing and establishing proper treatment and preventive action against diseases is disease detection. Thus, the Aerobac test kit was developed. The project utilized nanotechnology and genome-related technologies in the development of a rapid detection kit against bacterial pathogens in tilapia (i.e., *Aeromonas hydrophila* and *Enterococcus faecalis*).

Dr. Jose Peralta, Project leader from the University of the Philippines Visayas (UPV), doing spray drying of enzyme digested marine fisheries samples the protein hydrolysates into powder.

Hydrolysates from (left) big eyed scad, (middle) oyster, and (right) sardines.

The project developed and produced two DNA-based detection kits for *Aeromonas hydrophila* and *Enterococcus faecalis*. The Aerobac test kit caters to the need of fish farmers, students, and researchers in the provision of a reliable and user-friendly diagnostic technique for pathogenic bacteria that could result in a possible disease threat to the culture system. It is recommended that the detection of *A. hydrophila* and *E. faecalis* using protocol B be further investigated to obtain accurate results. The Modified Protocol A-2 produced from the Detection Protocol A represents a platform that can be used to accommodate easy, accurate, and rapid detection of many bacterial species using an array of probes and be easily adapted and used in kitchen-type laboratories.

The developed technology will contribute to the tilapia aquaculture industry and help prevent fish mortality in the earliest stages, thereby giving farmers immediate precautionary and preventive actions against disease outbreaks.

Mangrove Crab Crabifier Application

Of the three mangrove crab species in the Philippines, *Scylla serrata* or the giant mangrove crab is capable of growing faster and bigger compared to *S. tranquebarica* and *S. olivacea*. There is no obvious morphological marker to distinguish one species from the other. Fishermen are unable to determine whether the species of crablets captured from the wild or sold by the traders are the species that they need. An application called Crabifier was developed by combining genetic marker technology and image analysis to trace for a possible morphological method for species identification in juveniles.

Aerobac test kit developed by CLSU under the leadership of Dr. Karl Marx A. Quiazon.

Identification of juvenile mangrove crab (*Scylla serrata*) using Crabifier application.

Crabifier is a free and accurate Android-based mobile application that can identify the species of juvenile crablets of the genus *Scylla*. It allows the mangrove crab farmers to pick their species of choice from juveniles captured from the wild and to confirm the species being sold by the traders. This application also prevents the mangrove crab farmers from overstocking regardless of the species to compensate for the expected loss and operation expansion by clearing out more mangrove areas. The use of this application can revolutionize this process by providing a mechanism that can allow our mangrove crab farmers the option to improve their production processes.

Mangrove crab traders and buyers have positive feedback on the Crabifier application. The researchers have currently visualized how the convolutional neural network's last intermediate layers differentiate species to increase accuracy.

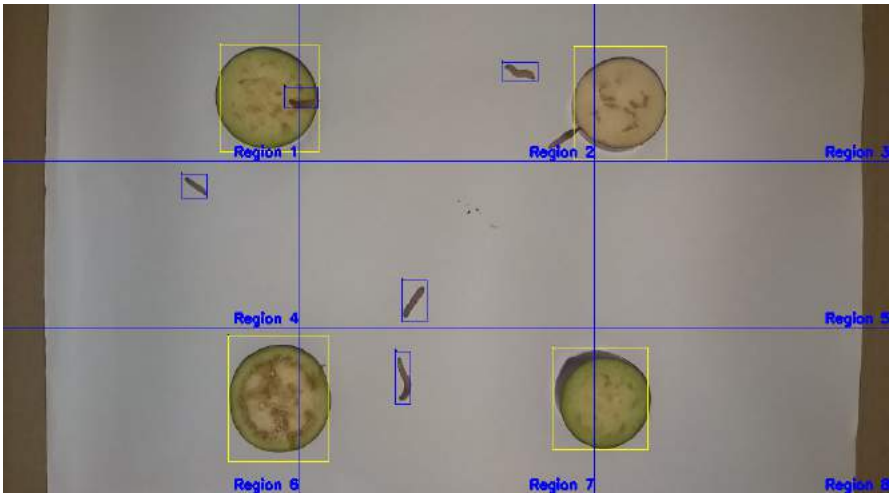
Crabifier is free to download at Google Play and has been optimized for use in low-resolution phone cameras and inexpensive Android phones. It has been tested in the field with mangrove crab farmers/fishers and used to classify more than 1,000 crablets from traders who source crablets in Bicol, Sorsogon, and Iligan. There are currently more than 700 active users of Crabifier.

Eggplant Fruit and Shoot Borer (EFSB) Motion Tracking Software

The EFSB, *Leucinodes orbonalis* Guenee, is the most destructive insect pest of eggplant. When the larva feeds on the shoots, it causes wilting on fruits, which affects their marketability. EFSB damage can result in up to 90% yield loss at high infestation. Through the project, "Development of Improved Eggplant Varieties with New Plant Defense Genes for Multiple Insect Resistance Using Innovative Technologies," a software that tracks the movement of EFSB larva has been developed.

The said software is a low-cost innovative technology that explores the use of video motion tracking algorithms to design and develop a computer program that would enable researchers to track and document larval movement and feeding preference in a precise manner. Also, the software may be used for similar lepidopteran pests. Using a universal serial bus (USB) web camera or an internet protocol camera connected to a computer. The program will track the movement, feeding patterns, and behavior of EFSB as input to determining the eggplant genotypes most or least preferred for feeding.

EFSB motion tracking setup. (UPLB)



EFSB tracking frames. (UPLB)

Cellulosic Nanocrystals from Wood and Processing Wastes of Industrial Tree Plantation Species (ITPS)

With the use of nanotechnology, alternative potential products can be developed from ITPS, either from solid timber or from wastes generated from their processing. Nanotechnology offers new and exciting opportunities in utilizing timber, providing possibilities not only in deriving new wood-based feedstocks and end-products but also in obtaining novel lumber products modified with other nanomaterials that enhance performance, quality, and product durability.

A program was conducted to harness the wood wastes from falcata, yemane, and mangium into nanocellulose. This is considered a promising material for a variety of applications ranging from composites, medicine, and electronics. With the developed protocol for obtaining nanocellulose from the three species and determination of its potential, applications may expand the market opportunities for tree plantation species and generate better prices for the timber that small-scale tree plantation growers produce.

Agenda 4: Strengthen and Utilize Regional R&D Capabilities

DOST-PCAARRD in the Regions

Despite the threat of the worldwide pandemic experienced in 2020, DOST-PCAARRD and the regional consortia continued strengthening their partnership in addressing regional development and concerns and creating greater impact on the advancement in the AANR sector. The 15 regional consortia and its member-institutions, which consisted of 280 R&D implementing (SUCs/higher education institutions [HEIs], research and development institutes [RDIs]) and non-R&D implementing agencies (LGUs, non-government organizations [NGOs], other government offices [GOs], etc.) responded to the needs of stakeholders in the regions through the Council's banner programs on strategic R&D, R&D results utilization (RDRU), capability building and governance, and policy analysis and advocacy.

During the year, the institutionalization of the consortia was implemented in the regions through the program, "Support to the Implementation of the Regional Collaborative Program (RCP) for Agriculture, Aquatic and Natural Resources Research and Development," and approved during the annual Joint Regional Research and Development Coordinating Council (RRDCC) Chairpersons, consortium directors, and DOST-PCAARRD Directorate Meeting held on January 31, 2020 at the DOST-PCAARRD Innovation and Technology Center (DPITC). The Council provided a total budget of P30.4 M for the consortia management and operations for the year.

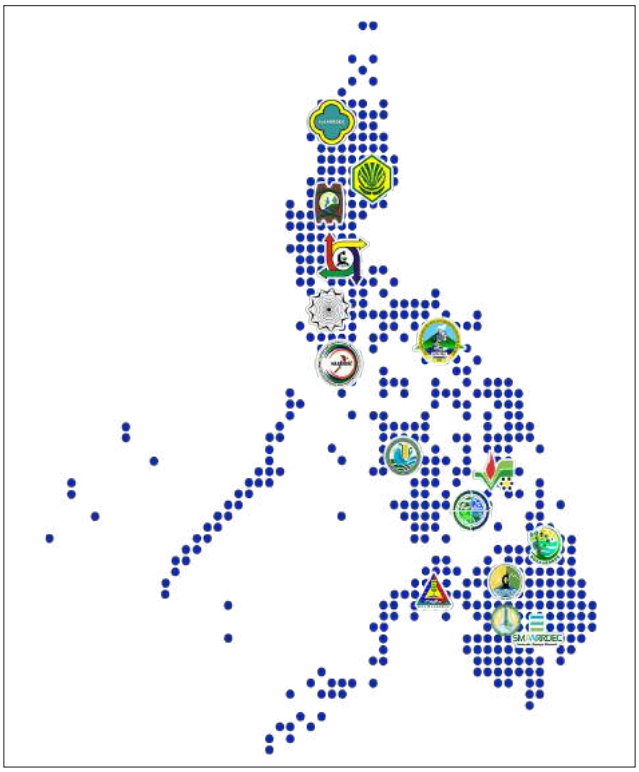
DOST-PCAARRD approved four R&D projects endorsed by the consortia and for implementation by different consortium member institutions. Moreover, in response to the needs in the regions for food production and distribution brought about by the pandemic, 26 QRPs were also approved and funded. The Council continued to support and provide experts/evaluators during the conduct of Regional Symposium on R&D Highlights and Commodity Reviews, as well as attending RRDCC meetings of the consortia as part of its M&E activities in the regions.

The Council revived the prestigious Ugnay Award for regional consortia since 2012. The award is given to the most outstanding consortia in recognition of their efforts as partners of the Council in planning, monitoring, evaluating, and coordinating R&D and technology management activities in the regions, which is given annually from 1995 to 2004 and biennially thereafter until 2012.

In the midst of uncertainties caused by the COVID-19 pandemic, the partnership remains strong to fulfill its goal and carry out concerted programs and activities that respond to the immediate needs of its stakeholders in the regions. DOST-PCAARRD will continue to provide technical and financial support to the regional consortia.

Establishment of Niche Centers in the Region (NICER)

In 2020, a total of three niche centers were established: Philippine Native Pig Center (IV-B), Halal Goat Science and Innovation Center (X, XII), and Seaweed R&D Center (BARMM).



Fifteen DOST-PCAARRD regional consortia.

Agenda 5: Maximize Utilization of R&D Results through Technology Transfer and Commercialization

Technology Transfer and Commercialization

DOST-PCAARRD has been continuously spearheading efforts to increase the diffusion of open innovation practices and to take on global challenges to increase policy focus on the impact of R&D research results. Through technology transfer activities, the Council has evolved not only for the ultimate commercialization of technologies but to be relevant in addressing the present call of times. Further, the Council's technology transfer efforts also focused on programs that will increase community resilience to climate change, as well as improve the plight of the poor in conflict vulnerable areas.

For 2020, the Council implemented the program, "Disaster Risk Reduction on Climate Change Impacts on Agricultural Farms in the Cordillera Administrative Region (SAFE CAR)," which aims to achieve its goal to address and minimize the effects of disaster and calamities titled by using S&T interventions in the farm and communities. Within its course of implementation, the six project components of the SAFE CAR Program initiated various activities in partnership with concerned SUCs and LGUs. The program produced a pool of champions and empowered the communities on Disaster Risk Reduction-Climate Change Adaptation and Mitigation (DRR-CCAM). It also made the farms resilient to the impacts of climate change and ensured sustainable food production in times of disasters.

Apayao State College (ASC) President Nelia Cauilan visited the established demo farm in Pudtol, Apayao.

Participants harvesting potatoes during the field day in Bauko, Mt. Province.

Harvest festival conducted in Tublay, Benguet showcasing the S&T interventions applied in farmers' farms.

Similarly, DOST-PCAARRD also embarked on the "SAFE Project on Philippine Native Animals for Disaster Risk Reduction in Hazard-Prone Areas of Benguet (SAFE-PNADRRHAB)."

DOST-PCAARRD also initiated social protection programs through successful collaborations between researchers across different research institutions to address the needs of the poor and to prioritize disadvantaged communities and social groups across the nation. The Council believes that this approach protects the country's vulnerable sector by building resilience and providing access to income-earning opportunities.

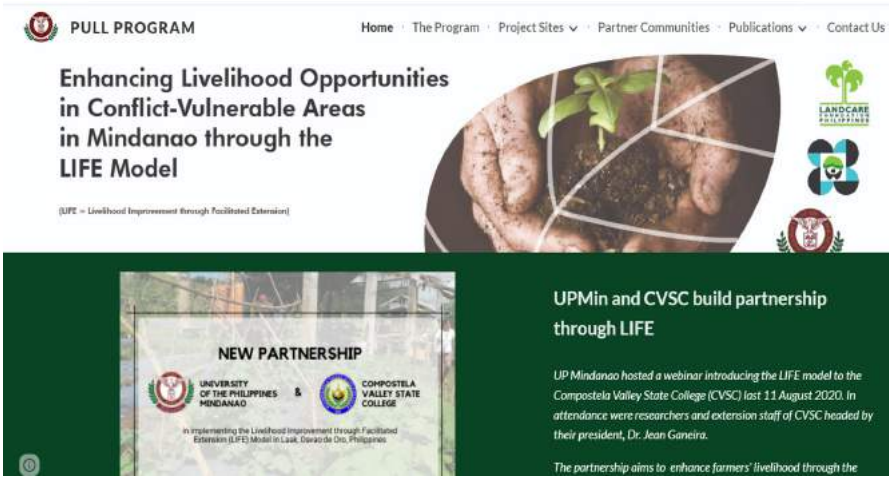
One of these programs is, "The Science and Technology for Community-based for Inclusive Development (STC4iD) Program," which has been ongoing for the past 2 years. The program aims to establish sustainable and resilient AANR-based communities through S&T. The program intends to become a demonstration of technology transfer modality in the identified Geographically, Economically, and/or Socially Disadvantaged (GESDA) communities and social groups in the AANR sector. The existing five community-based partner organizations were continued to be strengthened by the five partner SUCs during this period. The production/adoption of their identified commodities and technologies for livelihood were also sustained. So far, the program has conducted 13 trainings for 173 farmer cooperators; signed 7 MOAs/MOUs among partner institutions; and produced 16 modules and 29 IEC materials, 7 of which have been filed for copyright and 2 trademarks for the STC4iD logo and BIGANI logo. In 2020, aside from coordination with other agencies, agreements were also drafted and signed.

One of the 12 native pig breeders provided to native pig raisers in Itogon, Benguet.

Itogon Native Pig Raisers Association (INPRA) General Assembly.

Training on Mushroom Production conducted by CMU on July 29, 2020.

Farmer cooperators in Jolo, Sulu planting cassava.



The website was created for the PULL Program to convey specific and helpful information to other stakeholders.

Another program is "Enhancing Livelihood Opportunities in Conflict-Vulnerable Areas in Mindanao through the LIFE (Livelihood Improvement through Facilitated Extension) Model," which aims to establish more improved, sustainable, and resilient community-based livelihoods for the conflict-vulnerable in the AANR sector. The project has been implemented in three conflict-vulnerable areas, namely, Ipil (Zamboanga Sibugay), Koronadal (South Cotabato), and Ampatuan (Maguindanao). These areas were identified based on their agricultural

nature and their relevance to various grades of conflict. Six farmer organizations from those three conflict-vulnerable areas composed of 241 members were organized. As a result, the program improved farmer's social capital; increased their income and diversified their livelihood; facilitated access of farmers to programs of various agencies; and increased farmer knowledge and skills on organic agriculture and seaweed production, including functional literacy and numeracy.

DOST-PCAARRD Commercialization Programs: Delivering Results and Responding to the Call for Relief Assistance

Three major programs under the DPITC platform have been making waves since the Center's establishment in 2016. These are the IP-TBM, DOST-PCAARRD National Agri-Aqua Technology Business Incubation (ATBI), and SciCAT.

In 2020, the IP-TBM program welcomed the year by officiating 25 new partnerships under "Support to the University's Strategies in Technology Acceleration Initiatives by Nurturing the Intellectual Property and Technology Business Management Offices of the Consortia Member Agencies (SUSTAIN IP-TBM)." Under SUSTAIN, five agencies from the first two batches of IP-TBM served as mentors, whose objective is to help capacitate five more agencies within their respective regions in IP management and commercialization. The number of IPs filed by the IP-TBM program has reached a total of 1,593 IP applications: 195 patents, 564 utility models, 109 industrial designs, 84 trademarks, and 641 copyrights covering the year 2018–2020. Promotion of R&D-generated agri and aqua technologies was also held through a virtual National Pitch Day on top of virtual technology pitch days conducted in the regions.

DOST-PCAARRD conducts the MOA signing ceremony and inception meeting for the Support to the University's Strategies in Technology Acceleration Initiatives by Nurturing (SUSTAIN) the Intellectual Property and Technology Business Management (IP-TBM) Offices of the Consortia Member Agencies Phase 2 on January 30, 2020 at DPITC.

The National Technology Pitching Day led by the DOST-Forest Products Research and Development Institute (FPRDI).

The ATBI program likewise reached new heights with 16 ATBIs established nationwide. It has now produced 30 graduates and is now supporting a total of 154 incubatees. The total gross income of the incubatees' enterprises is now at P24.6 M. These paved the way for the creation of 469 jobs.

Moreover, the ATBI program was recognized by the Securities and Exchange Commission (SEC) as a registered corporation on August 14, 2020. The said program will be under its official name, "Agri-Aqua Business Incubation Network of the Philippines, Inc." (AABINPhil, Inc.). With the vision of being "a premier enabling association promoting agri-aqua technology business incubation in the Philippines," the registration was initiated by its incorporators and founding members who are part of the first batch of the ATBI program led by Dr. Ruth C. Diego of the BSU-ATBI.

A media campaign of the ATBI program was also launched, which is the first of its kind.

DOST-PCAARRD continues its commitment in transforming ordinary farms into SciCAT farm

tourism enterprises that showcase technological convergence to improve productivity and capacity for sustainable farming practices. To date, seven SciCAT farms have been established, in which 15 POTs are being implemented. These technologies were initially transferred to 22 adopters; two of which are farmer-associations who will also be adopting the SciCAT program concept in its member farms.

For the tourism component, necessary renovations of farm structures were conducted including the establishment of four SciCAT entrance signage/ markers and four pergola photo booths, which serve as additional attractions on the farm.

The program also helped generate 22 job opportunities and conducted a series of COVID-19 relief operations wherein around 5 t of fresh fruits and vegetables and 4,500 seedlings per planting materials were distributed to frontliners and the community to help alleviate the country's situation amidst the pandemic.

Furthermore, listed in Table 2 are technologies that were successfully commercialized in 2020 through the Council's initiatives.

The 51 IP-TBM offices, 16 ATBIs, and 13 SciCAT sites across the country serve as centers for SUCs' and RDIs' Intellectual Property (IP) management, technology business incubation, and science-based agri-tourism, respectively. It is notable that these projects not only delivered their primary objectives and functions. They also serve as strategic locations for DOST-PCAARRD to extend help to COVID-19 communities in support of RA No. 11469 or the Bayanihan to Heal as One Act. Relief assistance of various projects which started in February 2020 was valued at P1.1 M. Envisioned to be of service to Filipinos, these projects also became an immediate means in helping Filipinos amidst the COVID-19 crisis.

ATBI social media accounts.

Magsasaka-Siyentista Naomi Dimpas implementing the Farmer Livestock School Goat Enterprise Management (FLS-GEM) technology in the SciCAT farm.

The harvested 'pakbet' vegetables produced in Dimpas Greentigrated Agri-Tourism Farm in Davao Oriental.

The SciCAT signage of the Silan's Farm in Indang, Cavite.

Establishment and Institutionalization of the Agri-Aqua Business Hub

The Agri-Aqua Business Hub was formed to allow DOST-PCAARRD to contribute to the development of the Philippines' AANR sector through engaging in the

agribusiness industry. This initiative aims to support its clientele by offering services that will ultimately lead to new profit opportunities or the formation of new enterprises.

Table 2. List of technologies commercialized in 2020.

No.	Technology	Agency	Adopter/Licensee
1	Chevon Valley canned products	ISU	DV Boer Farm International Corporation
2	Goat semen extender (SemEx)	ISU	DV Boer Farm International Corporation
3	Meat detection test kit	UPLB	IDtechnologies Laboratory, Inc. (IDtech Lab) (spin-off)
4	Botanical dewormer	CapSU	BDOZ Veterinary Products Trading/ Dr. Bede P. Ozaraga (spin-Off)
5	'Makahiya' tea	CapSU	D'Alfincoles Food and Beverages Trading/Dra. Ma. Dorothee Villaruz (spin-off)
6	Kaong sugar	CvSU	MAWCO (direct licensing)

Meeting with organic vegetables entrepreneurs.

Services Offered

Several factors will be considered to generate or enhance an enterprise and together with the Council's R&D outputs, the services offered by the hub will be utilized to ensure that the Council can cater to clients ranging from small-scale farmers to large established enterprises. The services provided are enterprise assessment, technology assessment, preparation of investment packages and other relevant IEC materials, capacity building, loan facilitation, market linkaging, market monitoring, market advisories, institutional networking, and post-TBI mentoring. The tools to be used in the enterprise and technology assessment will determine the gaps and risks within the enterprise, which will then dictate the type of support the hub will provide. An investment package in the form of a handbook will also be generated to serve as a guide for the client in keeping the enterprise sustainable. In terms of capacity building, the hub will collaborate with both public and private training institutions to foster human capital development among its clientele. Any financial assistance needed will also be handled by creating a linkage between a client and a suitable credit service provider. The hub also aims to create its real-time market database to be able to accurately disseminate market information through numerous channels. The team formulated the initial draft containing an extensive overview of how the services will be implemented.

Testing the Effectiveness of the Strategies

Before going fully operational, the strategies are currently being tested. The Agri-Aqua Business Hub has been focusing on three enterprises, particularly tilapia, 'lakatan,' and organic vegetable enterprises. Interviews have been conducted with the representatives from the specified enterprises. The team will continue to monitor their improvements through multiple assessments and proper interventions. Simultaneously, the tools and methods used in assisting the enterprises will also be examined to make sure that the hub will be ready to go into full swing.

Agenda 6: Develop STI Human Resources and Build a Strong STI Culture

The DOST-PCAARRD Human Resource Development Program (HRDP) encountered significant challenges in 2020. The COVID-19 pandemic, which resulted in global lockdown during the first quarter led to changes in how the HRDP is being implemented. The DBM issued the National Budget Circular 580, "Adopting Economy Measures in the Government Due to the Emergency Health Situation," which discontinued funding of local and foreign travels and at least 10% of the cost of training, seminars, and workshops. Likewise, the community quarantine and social distancing implemented to reduce the spread of COVID-19, significantly affected the way non-degree training courses are taught. Hence, while the human resource development programs were still implemented in 2020, accomplishing the original set targets for specific programs was not possible. However, it did not hinder other programs to accomplish more than their targets. HRD Programs that were significantly affected are the Re-entry, Sandwich, and Non-degree Training Programs. The GREAT Program scholars encountered difficulty in conducting their thesis/ dissertation due to the lockdown, which caused a delay in completing their degree. On the other hand, more applications were received for the Thesis/Dissertation Assistance and Publication Incentives Programs.

For 2020, DOST-PCAARRD generated P35.2 M from DOST to support human resources development, particularly the BSP and the GREAT Program. The Council likewise provided P36.2 M for the continuation of its capacity-building activities and programs—the GREAT Program, Thesis/ Dissertation Assistance, Re-entry, Publication Incentives, Sandwich, and Non-Degree Training Programs to improve the Council's reach and ensure continued relevance in the sector. The final reduced budget is still higher than the 2019 budget.

To continue providing enhancement courses to members of the NAARRDN, DOST-PCAARRD online Learning Management System (LMS) was developed. The LMS houses the DOST-PCAARRD non-degree training courses, which are being conducted online synchronously starting the fourth quarter of 2020.

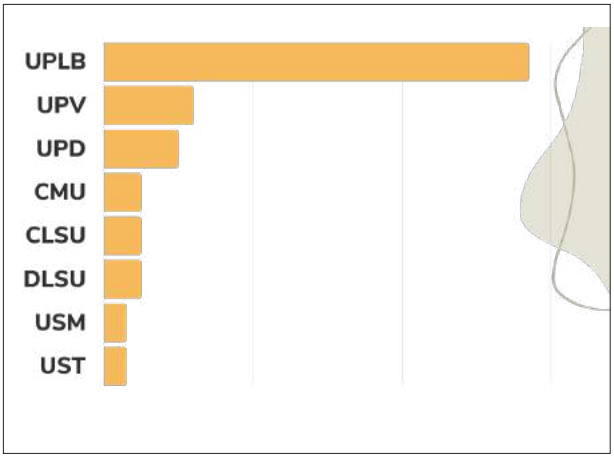
Graduate Research and Education Assistance Program

From 2017 to 2020, 62 grantees (45 Master's Degree [MS], 17 Doctor of Philosophy [PhD]) have already been awarded with GREAT Scholarship. For 2020, DOST-PCAARRD managed and monitored 41 scholars (16 PhD and 25 MS), including 4 MS and 3 PhD for 2020 intake.

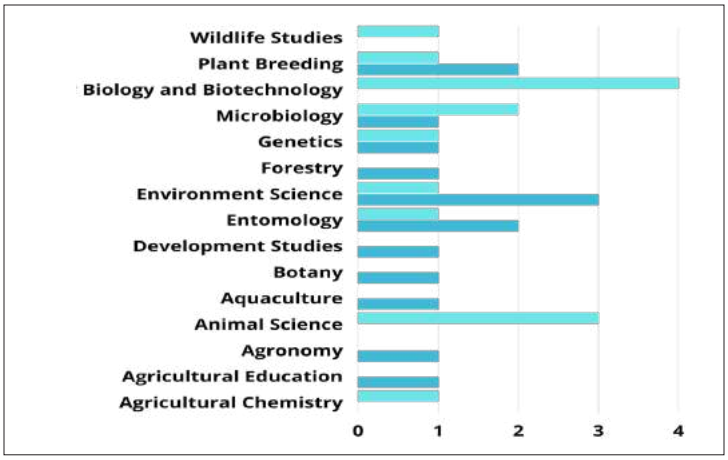
Despite the pandemic, four scholars were able to obtain their degree as of August 2020—three MS and the first PhD completer Dr. Rey J. dela Calzada obtained his PhD in Fisheries at UPV in July 2020.

Dr. Rey J. dela Calzada is the first PhD completer of the GREAT Program. He finished his PhD in Fisheries at UPV. His thesis is anchored on the project under the Shrimp ISP.

Ms. Blair Ann L. Adora of DA-Region 9 obtained her MS in plant pathology at UPLB in December 2020. The approved re-entry project, "Management of White Root Rot (*Rigidoporus lignosus*) Using Endophytic Fungi from the Roots of Healthy Rubber Tree," will be implemented as part of the Rubber ISP.



Distribution of 2020 ongoing GREAT scholars per study post.



Degree and course of thesis/dissertation assistance grantees, 2020.

Another MS scholar completed her degree courses in December 2020, thus a total of five GREAT completers for 2020.

In addition, the first re-entry proposal of a GREAT completer was approved in CY 2020. Ms. Blair Ann L. Adora of DA-Region 9 had her re-entry proposal titled, "Management of White Root Rot (*Rigidoporus lignosus*) Using Endophytic Fungi from the Roots of Healthy Rubber Tree," with a budget of P5 M approved for implementation during the last quarter of 2020.

The fields of specialization for MS revolve around the following sectors: MS—23 from agriculture, 10 from aquatic, and 12 from the natural resources; and PhD—8 from agriculture, 7 from aquatic, and 2 from the natural resources.

Thesis/Dissertation Assistance Program

The DOST-PCAARRD Thesis/ Dissertation Assistance provides financial support for graduate students' thesis/dissertation expenses of up to P100,000 (PhD) or P50,000 (MS) for research that falls within the priority areas of the Council. The Council provided thesis/dissertation assistance to 30 graduate students (15 PhD and 15 MS). The majority of the grantees for the year are studying at UPLB (93%), while the CLSU and the CMU had one grantee each. Fields of specialization are aquaculture, agricultural chemistry, agricultural education, agronomy, plant breeding, botany, entomology, genetics, microbiology, molecular biology and biotechnology, animal science, forestry, environmental science, and development studies.

Publication Incentives Program

DOST-PCAARRD's Publication Incentive Program (PIP) continue to gain popularity in 2020. Partnering the program with a training course on Technical Writing for Publication in a Refereed Journal being sponsored by the Council for researchers and scholars in the NAARRDN. The Council has been encouraging and motivating NAARRDN researchers, authors, DOST-PCAARRD staff, and scholars to publish their research results in reputable local refereed and/or international journals. Publications in refereed journals entitle the author to a publication grant of P25,000–P70,000, the amount of which depends on the impact factor of the journal where the article was published. This is the Council's way of promoting scientific productivity in the AANR sector to encourage the generation of new ideas leading to more innovative researches, advancement of science and generation of technology. Despite the pandemic, the number of grantees continues to rise in 2020 with 58 research articles from 51 researchers from the NAARRDN. Total grants for publication incentives amounted to P3.495 M benefitting various institutions in 13 regions. It is worthwhile to note that 95% of these submissions were published in international journals, denoting the high quality of journal articles by these researchers.

Non-degree Training Program

Likewise, the non-degree training program encountered a major setback in 2020 with the implementation of social distancing and travel restrictions. The challenge, however, did not stop the Council in offering enhancement courses to its partners. The DOST-PCAARRD online LMS was developed to allow the Council to continue reaching its partners through online training.

Two face-to-face and eight online training courses were implemented in 2020, which benefited 222 researchers, scientists, engineers, and technical staff in the NAARRDN and DOST-PCAARRD. Training courses offered in 2020 include R&D management related courses, such as formulating and packaging proposals; technical writing for publication in a refereed journal; and enhancing the work foundation of newly hired DOST-PCAARRD staff and other related courses, such as the agribusiness master class, online module development, and learning tools for online training. Technology-based training on mangrove crab culture and rubber production was also conducted online.

Training modules for the different courses were compiled, reviewed, standardized, and uploaded in the LMS. Currently, 18 training courses with 198 modules are already uploaded in the LMS. By the fourth quarter of 2020, selected training courses were already conducted online through the LMS. Currently, synchronous training courses are still restricted and are offered by invitation only.

To maximize the use of the LMS, technology-based learning materials that are products of DOST-PCAARRD-funded projects, including PowerPoint presentations, videos, and brochures were collected from the technical research divisions and the consortia and also uploaded in the LMS. These learning materials were sorted by ISP and are now accessible through the LMS. These learning materials are open to the public and can be accessed anytime. To date, there are 4 brochures, 102 PowerPoint presentations, and 30 videos uploaded in the LMS.

Balik Scientist Program

The operations of the program have been hampered due to travel and mobility restrictions. Despite the challenge, the program was able to engage Balik Scientists who assisted the host institutions in their research activities amidst the health crisis and also contributed to the COVID-19 efforts.

This year, DOST-PCAARRD facilitated the approval of nine short-term and three long-term Balik Scientists.

Short Term

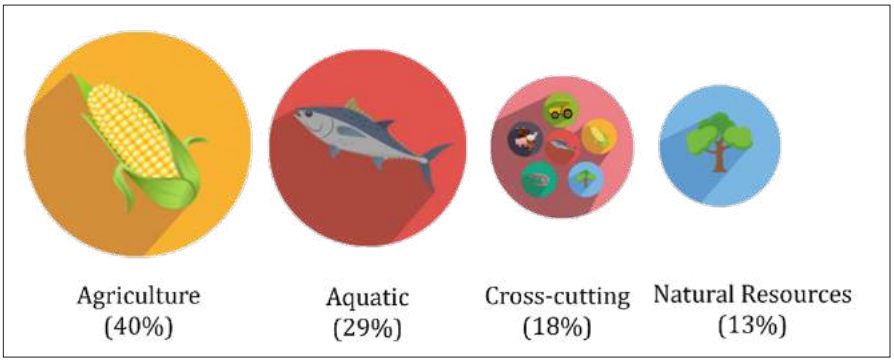
- **Dr. Josefino C. Comiso**, Scientist Emeritus, NASA Goddard Space Flight Center, Greenbelt, Maryland, United States of America
- **Ms. Shirley K. Chavez,** Certified Computer Professional and Project Management Professional, Alberta, Canada.
- **Dr. Nelzo C. Ereful**, Senior Post-doctoral Researcher, National Institute of Agricultural Botany, Cambridge, United Kingdom
- **Dr. Narceo B. Bajet**, retired Senior Scientist, Eurofins STA Laboratories, Inc., Longmont, Colorado, USA
- **Dr. Venecio U. Ultra, Jr.**, Assistant Professor, Department of Earth and Environmental Sciences, Botswana International University of Science and Technology
- **Dr. Nonawin Lucob-Agustin**, Research/Teaching Assistant, International Center for Research and Education in Agriculture, Nagoya University, Japan
- **Dr. Maria L. Chu**, Assistant Professor, Soil and Water Resources Engineering, University of Illinois at Urbana-Champaign, USA
- **Dr. Guillermo A. Mendoza**, Professor Emeritus, University of Illinois, USA
- **Dr. Joel L. Cuello**, Professor, University of Arizona, USA

Long Term

- **Dr. Jayvee A. Saco**, Assistant Professor, Batangas State University (BatSU)
- **Dr. Leilani Sumabat-Dacones**, Assistant Professor, Institute of Biology, College of Science, University of the Philippines-Diliman, Quezon City
- **Dr. Nikki Heherson A. Dagamac**, Assistant Professor, University of Santo Tomas

In addition to the new awardees this year, two short-term and six long-term Balik Scientists continued their engagement this year.

- **Dr. Janneli Lea A. Soria**, Research Fellow, Earth Observatory of Singapore from Nanyang Technological University



Distribution of technology-based materials uploaded in the LMS per sector.

- **Dr. Guillermo A. Mendoza**, Professor Emeritus, University of Illinois, USA
- **Dr. Wilfred John E. Santiañez**, Assistant Professor, UP-MSI
- **Dr. Irene B. Rodriguez**, Associate Professor, UP-MSI
- **Dr. Charina Lyn A. Repollo**, University Researcher, UP-MSI
- **Dr. Zenith Gaye A. Orozco-Bautista**, Assistant Professor, Institute of Biology, UP Diliman
- **Dr. Deo Florence L. Onda**, Associate Professor, UP-MSI
- **Dr. Michael Y. Roleda**, Professor, UP-MSI

The Council actively participated in the formulation of the BSP supplemental guidelines. The said guideline allows Balik Scientists to be engaged on alternative mode of engagements whether remote or on-site. This also gives the Balik Scientists the leeway to conduct the activities on a flexible schedule and provide extension in the engagement duration should the activities of the Balik Scientists become affected due to lockdowns or community quarantine.

The program also conducted a virtual forum on November 17, 2020. The BSP Online Forum themed, "Balik Scientist: Kabalikat sa Agham at Teknolohiya sa Pagharap ng Hamon sa Kalusugan, Kabuhayan at Kinabukasan," showcased the activities and contributions being done by Balik Scientists amidst the COVID19 pandemic. The forum had three parallel sessions namely: livelihood, education, and health participated by Balik Scientists, hosts institutions, researchers, and interested social media users.

Philippine Agribusiness Master Class

The Agribusiness Master Class (AMC) is a collaborative initiative among DOST-PCAARRD, ACIAR, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia for the development of inclusive value chains in the AANR sector. In particular, it aims to develop capabilities in understanding priorities in agribusiness value chains and evaluating inclusive value chain interventions. The AMC is a prime environment to foster agribusiness leadership and collaboration among a cohort of researchers, policymakers, and private sector managers in the Philippines.

AMC is a three-part training series conducted from November 2019 to September 2020 with mentors composed of experts from CSIRO, the University of Queensland in Australia, and the Foodlink Advocacy Co-operative. Thirty participants from NGOs, private institutions, SUCs, farmer organizations, and government agencies were carefully selected to join the training. At the end of the training, the Philippine AMC group was able to analyze 20 value chain mini projects covering crops, livestock, forestry, and aquaculture commodities, as well as cross-cutting concerns such as marketing and distribution of agricultural commodities.

The AMC is concluded through the session titled, “Philippine AMC: A Call to Action,” which was participated by His Excellency Steven Robinson, Australian Ambassador to the Philippines; Professor Andrew Campbell, ACIAR Chief Executive Officer (CEO); Dr. Howard Hall, ACIAR Agribusiness Research Program, and Dr. Reynaldo V. Ebora of DOST-PCAARRD, among others.

DOST-PCAARRD S&T Awards Program

DOST-PCAARRD confers the S&T awards to recognize the outstanding performance and contribution of its partners—researchers/scientists, research administrators, R&D institutions, and media practitioners in the AANR R&D. With these awards, the Council hopes to inspire and encourage more people to get involved in R&D, to effect change, and create a great impact on the AANR sector to contribute to technological, social, and economic development in the country.

For 2020, DOST-PCAARRD conferred its annual awards namely, Best R&D Papers, Dr. Elvira O. Tan, and Ulat SIPAG. Also, this year, the biennial award, Ugnay, was revived after 8 years to give recognition to the most outstanding regional consortium. Winners were awarded their plaques of recognition or trophies and cash incentives or award grant.

Best R&D Paper Awards

The council received a total of 17 entries from the consortia with 9 entries for the research category and 8 for development category. These entries are winners from the Regional Symposium R&D Highlights (RSRDH).

On December 1, 2020, DOST-PCAARRD hosted its first online

National Symposium on Agriculture and Aquatic Resources R&D (NSAARRD) where the finalists of the Best R&D Paper Awards presented their papers to the board of judges. The event garnered 3,500 views from FB Live and Youtube Live.

For the Research Category, the first place was awarded to the paper, "Harnessing Entomopathogenic Fungi (EPF) for the Control of Citrus Rind Borer (CRB) (*Prays endolemma* Diakonoff) on Satsuma Mandarin (*Citrus unshiu*)," presented by Dr. Jonar I. Yago from Nueva Vizcaya State University (NVSU). Second place winner is the paper, "From Functional Genomics to Functional Applications in Cacao Production and Varietal Improvement," presented by Dr. Edward A. Barlaan, from USM. The third place goes to the paper, "Classical Swine Fever Surveillance in Mindanao Towards its Control and Eradication," presented by Dr. Alan P. Dargantes from CMU.

For the Development Category, the first place was awarded to the paper, "Improvement of Mango Production through S&T Innovation and Support Mechanism for Capacity Development in Bataan and Zambales." Dr. Hermogenes M. Paguia from Bataan Peninsula State University presented the paper during the NSAARRD. For the second place, the paper, "Community-based Participatory Action Research on Sustainable Corn Production in Sloping Areas (SCoPSA) in Barangays Divisoria Sur and Divisoria Norte, Maddela, Quirino," was presented by Ms. Chonalyn A. Pascua from the Department of Agriculture-Regional Field Office (DA-RFO) 2.

Ulat SIPAG Awards

For the Print Category, first place was awarded to Mr. Julio P. Yap, Jr. of Agriculture Magazine, Panay News, and MARID Agribusiness Digest. Second place was awarded to Mr. Cecilio T. Gunio, Jr. of Manila Standard.

For the Broadcast Category, first place was awarded to Hermelina C. Tenorio of Syensya na Tekno Pa, Radyo Agila, Eagle Broadcasting Corporation. Second place was awarded to Custer C. Deocaris of Pinoy Scientist, Radyo Agila, Eagle Broadcasting Corporation. Third place was awarded to Josephine D. Agapito of Pinoy Scientist, Radyo Agila, Eagle Broadcasting Corporation.

Dr. Elvira O. Tan Awards

The Outstanding Published Paper in Agriculture Category was awarded to "*Cocos nucifera* L. ('Catigan Green Dwarf') Provides Insights into Genomic Variation Between Coconut Types and Related Palm Species." The Outstanding Published Paper in Aquatic Sciences Category was awarded to, "Reproductive Development of the Threatened Giant Grouper (*Epinephelus lanceolatus*)." The Outstanding Published Paper in Natural Resources and Environment Category was awarded to, "Mapping Fishing Activities and Suitable Fishing Grounds Using Nighttime Satellite Images and Maximum Entropy Modelling."

Ugnay Award

The first place for the Most Outstanding Regional R&D Consortium was awarded to the Cagayan Valley Agriculture, Aquatic and Resources Research and Development Consortium (CVAARRD). Second place was awarded to Visayas Consortium for Agriculture, Aquatic and Natural Resources Program (ViCARP). Third place was awarded to Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development (CorCAARRD).

Winners of the DOST-PCAARRD S&T Awards were announced during the DOST-PCAARRD S&T Awarding Ceremony on December 22, 2020. With the conferment of these awards, the Council continues to encourage participation in innovation and recognize the works of Filipino scientists in the AANR sector.

Best R&D Paper Award

Best Development Paper Award

First Place

"Improvement of Mango Production through Science & Technology Innovations and Support Mechanisms for Capacity Development in Bataan and Zambales"

Hermogenes M. Paguia, Rina Q. Paguia, Cherrilyn E. Ventura, Rowena B. Valerio, Maricel A. Javier, Lorna R. Roldan, Randy B. Gaguit, Roel M. Morales, Janice M. Baysa, Ferdinand M. Domingo, and Gregorio J. Rodis

Best R&D Paper Award

Best Development Paper Award

Second Place

"Community-based Participatory Action Research on Sustainable Corn Production in Sloping Areas (SCoPSA) in Barangays Divisoria Sur and Divisoria Norte, Maddela, Quirino"

Chonalyn A. Pascua, Lovelyn A. Gaspar, Ferdinand V. Cabantac, Archival B. Sabado, Charles Paulino, Mandy E. Yanuaria, Wesley Dumahin, Fidelino R. Cabantac, Rolando D. Pedro, Telesfora Tomas, Nida Juan, Jovencio Salvador, Rodolfo Marquez, Roselle M. Labucay, Dennie Ruma1, Ariel Oarde1, Rose Mary G. Aquino, and Narciso A. Edillo

Best R&D Paper Award

Best Research Paper Award

First Place

"Harnessing Entomopathogenic Fungi (EPF) for the Control of Citrus Rind Borer (CRB) (*Prays endolemma* Diakonoff) on Satsuma Mandarin (*Citrus unshiu*)"

Jonar I. Yago, Elmerito T. Irabagon, Lori Shayne A. Busa, Melvin R. Cubian, Jo-Eliz M. Gonzales, Mark Christopher E. Valdez, Jessie I. Yago, Billy Joe N. Llantero, and Kuan-Ren Chung

Best R&D Paper Award

Best Research Paper Award

Second Place

"From Functional Genomics to Functional Applications in Cacao Production and Varietal Improvement"

Edward A. Barlaan, Emma K. Sales, and Antonio C. Laurena

Best R&D Paper Award

Best Research Paper Award

Third Place

"Classical Swine Fever (CSF) Surveillance in Mindanao Towards its Control and Eradication"

Alan P. Dargantes, Jose A. Escarlos Jr., Melrose P. Condino, Ma. Lebeña B. Montemayor, Gladys S. Escarlos, Ted Aries A. Daguro, Rowland S. Awiten, Rys Marie June T. Roa, Chopit Chrinli P. Camacho, Airish Jane B. Risma, and Michael P. Clementir

Dr. Elvira O. Tan Award

Outstanding Published Paper in Aquatic Sciences Category

"Reproductive Development of the Threatened Giant Grouper (*Epinephelus lanceolatus*)"

Peter A. Palma, Akihiro Takemura, Gardel Xyza Libunao, Joshua Superio, Evelyn Grace de Jesus-Ayson, Felix Ayson, Josephine Nocillado, Lachlan Dennis, Josielou Chan, Truong Quoc Thai, Nguyen Huu Ninh, and Abigail Elizur

Dr. Elvira O. Tan Award

Outstanding Published Paper in Agriculture Category

"De Novo Genome Sequence Assembly of Dwarf Coconut (*Cocos nucifera* L. 'Catigan Green Dwarf') Provides Insights into Genomic Variation Between Coconut Types and Related Palm Species"

Darlon V. Lantican, Susan R. Strickler, Alma O. Canama, Roanne R. Gardoce, Lukas A. Mueller, and Hayde F. Galvez

Dr. Elvira O. Tan Award

Outstanding Published Paper in Natural Resources and Environment Category

"Mapping Fishing Activities and Suitable Fishing Grounds Using Nighttime Satellite Images and Maximum Entropy Modelling"

Rollan C. Geronimo, Erik C. Franklin, Russell E. Brainard, Christopher D. Elvidge, Mudjekeewis D. Santos, Roberto Venegas, and Camilo Mora


Ugnay Award
First Place
Cagayan Valley Agriculture, Aquatic and Resources Research and Development Consortium (CVAARRD)


Ugnay Award
Second Place
Visayas Consortium for Agriculture, Aquatic and Natural Resources Program (ViCARP)


Ugnay Award
Third Place
Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development (CorCAARRD)


Ulat Sipag Award
First Place, Print Category
JULIO P. YAP, JR.
Agriculture Magazine, Panay News, and MARID Agribusiness Digest


Ulat Sipag Award
Second Place, Print Category
CECILIO T. GUNIO, JR.
Manila Standard


Ulat Sipag Award
First Place, Broadcast Category
HERMELINA C. TENORIO
Syensya na Tekno Pa, Radyo Agila
Eagle Broadcasting Corporation


Ulat Sipag Award
Second Place, Broadcast Category
CUSTER C. DEOCARIS
Pinoy Scientist, Radyo Agila
Eagle Broadcasting Corporation


Ulat Sipag Award
Third Place, Broadcast Category
JOSEPHINE D. AGAPITO
Pinoy Scientist, Radyo Agila
Eagle Broadcasting Corporation

CVAARRD oral presentation for Ugnay Award, August 27, 2020 via Zoom.

CorCAARRD oral presentation and field validation for Ugnay Award, August 26, 2020 and Sept 7, 2020, respectively via Zoom.

ViCARP oral presentation and field validation for Ugnay Award, March 10–11 2020, VSU, Baybay City, Leyte.

Ugnay Award trophy.

External Awards Received

Dr. Melvin B. Carlos received the following recognition during the year:

- Completed the Senior Executive Class Shuttle Course Batch 1 (with honors) and Outstanding Capstone Paper Award Policy Paper at the Development Academy of the Philippines; and
- Conferred Career Executive Service Officer (CESO) Rank IV by the Office of the President on December 3, 2020.

Agenda 7: Upgrade STI Facilities and Capacities to Advance R&D Activities and Expand S&T Services

Facilities Development for the NAARRDN

The implementation of R&D projects by various DOST-PCAARRD regional partners requires the upgrading and/or improvement of its partner's facilities to enable them to deliver the desired outputs and to enable them to continuously conduct R&D. The five projects are the following:

1. **Upgrading of Fish Health Laboratory of the Freshwater Fisheries Center (FFC)** to improve health management and increase fish production in ISU, Echague, Isabela;
2. **Upgrading of the Horticulture Plant Tissue Culture Laboratory** to increase its capacity and improve the efficiency of producing planting materials for horticulture crops, especially different bamboo species in VSU;
3. **Upgrading of the Dairy Complex** making it suitable for the conduct of research, development, and training activities related to assisted reproduction technologies (ART), specifically artificial insemination and embryo transfer, genomics, and nutrition in UPLB-DTRI;
4. **Capacitate the NwSSU-Agro-Environmental Laboratory** as a service laboratory to perform analysis of heavy metal concentration in soil, water, and plant tissue samples in NwSSU; and
5. **Upgrading of the Cacao Postharvest Facility** to address the cacao postharvest handling and processing component of the ongoing Cacao R&D project, particularly in obtaining bean yield and quality by conducting sensory evaluation of cacao product in USM.

Agenda 9: Provide STI-based Solutions for Disaster Risks and Climate Change Adaptation and Mitigation

Climate Change Adaptation and Mitigation

Enhancing Climate Change Resiliency of Farmers in CALABARZON

With the threat of climate change on the social and ecological aspect of food, there is a need to investigate the appropriate decision support system (DSS) that would enhance farmers' resiliency to climate change impacts. The DSS is a tool in the zoning of land uses for better planning and for providing valuable insights to enhance the effective implementation of the Council's ISP on Climate Change. The project, "Development of Decision Support System for Enhancing Climate Change Resiliency of Smallholder Upland Farmers in Selected Communities of CALABARZON, Philippines," was implemented in collaboration with five selected municipalities/LGUs, namely: Silang, Cavite; Nagcarlan, Laguna; Rosario, Batangas; Tanay, Rizal; and Sariaya, Quezon.

Through the DSS project, the research team was able to collect soil samples from the different study sites, install hydrological equipment, prioritize indicators for the capability of land for agroforestry in the five study sites using the Analytical Hierarchy Process (AHP), develop different thematic maps, gather data on present and future climate data, engage the local stakeholders in determining individual parameter for land capability modeling using AHP, and validate land capability distribution models. In all of these activities, the participation of a considerable number of farmer representatives from several barangays in each of the partner LGUs is remarkable. The GIS-based Agroforestry Land Capability Mapping Scheme (GIS-ALCAMS) was also developed, hence the "Guidebook on GIS-based ALCAMS." The guidebook aims to equip the technical staff members of the LGUs, concerned government agencies, and other development institutions in assessing the land capability for agroforestry using GIS technology.

The 7-ha coffee-based (Robusta coffee) agroforestry farm in Brgy. Concepcion Banahaw, Sariaya, Quezon visited by DOST-PCAARRD.

Results of the project provided practitioners and farm managers with early warning estimates of how different environmental factors, particularly climate will affect the land capability distribution. Moreover, these served as useful baseline information for decision-makers and planners in mainstreaming management, land use, and local action plans to help the farm managers and smallholder farmers design and develop a climate-resilient agroforestry farm.

Smarter Approaches to Reinvigorate Agriculture as an Industry in the Philippines (SARAI)

In response to the pressing challenges brought about by climate change, specifically to the agriculture sector, the SARAI program provided science-based advisories on different crops (rice, corn, banana, coffee, cacao, coconut, sugarcane, tomato, and soybean) in the country. The program strengthened its technologies and extension efforts by creating pathways to bring SARAI technologies to partners and farming communities. With joint efforts from SUCs and several NGAs all over the country, SARAI was able to develop and improve various technologies and systems which are now being deployed nationwide.

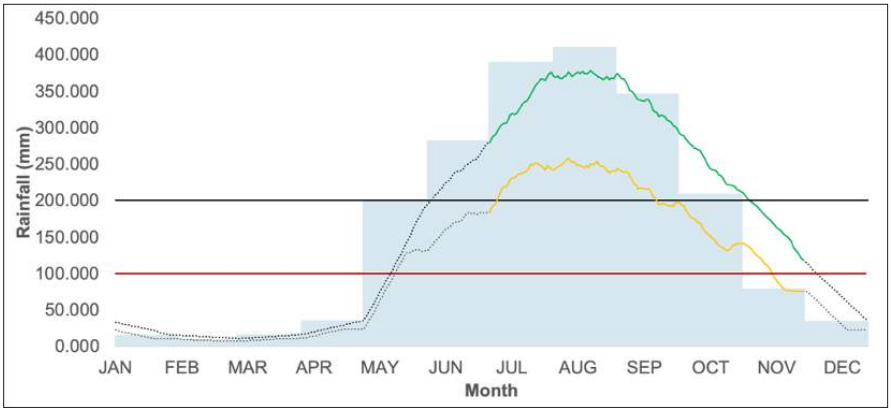
SARAI Knowledge Portal: One-stop-shop for SARAI Services and Products

The SARAI Knowledge Portal, which can be accessed at www.sarai.ph, offers a wide range of agricultural services on web and mobile platforms for its priority crops: rice, corn, banana, coconut, coffee, cacao, sugarcane, tomato, and soybean. Users of the portal can use the different applications in the portal as the basis of their farm management and decision-making. Applications in the portal can be divided into four categories: farm management solutions, monitoring and decision support systems, geographic information system, and mobile applications. In 2020, the number of users and new users of the portal increased. A total of 9,848 users visited the portal with 9,764 recorded as new users. Since there is a need for wider dissemination of the SARAI outputs, users can now access the SARAI Knowledge Portal on their mobile phones by downloading the SARAI agricultural monitoring application.

Adaptive Planting Calendar (APC) for Rainfed Rice and Corn

Shifting of planting dates as one of the adaptation measures to climate change is widely practiced among farmers. However, the effects of climate change include less predictable rainfall due to disturbed rainfall patterns and weather variability. A systematic approach was devised in computing the planting period, onset of flowering and maturity stages of crops, and harvest period. The computation for planting date is based on the required amount of water absorbed by the crop for a specific number of days. For rice to have a reasonable yield, it needs at least 200 mm of water in 30 days while corn needs at least 100 mm of water in 20 days. Every month, the rainfall outlook for five succeeding months is released in SARAI Knowledge Portal. Using this information, expected rainfall for the whole duration of cropping season (i.e., 4–6 months) and water required by the crops before cropping and during different growth stages is estimable. Planting advisories are uploaded in the SARAI Knowledge Portal (https://www.sarai.ph) quarterly. The expected yield given the advised planting dates can also be simulated using crop models with Decision-Support System for Agro-technology Transfer (DSSAT). Different planting windows will give farmers more options in scheduling their cropping season by making room to consider other factors, such as rental of production materials and availability of production inputs.

SARAI Knowledge Portal.



SARAI APC.

Agricultural Drought Monitoring and Forecasting System Using Remote Sensing Technology

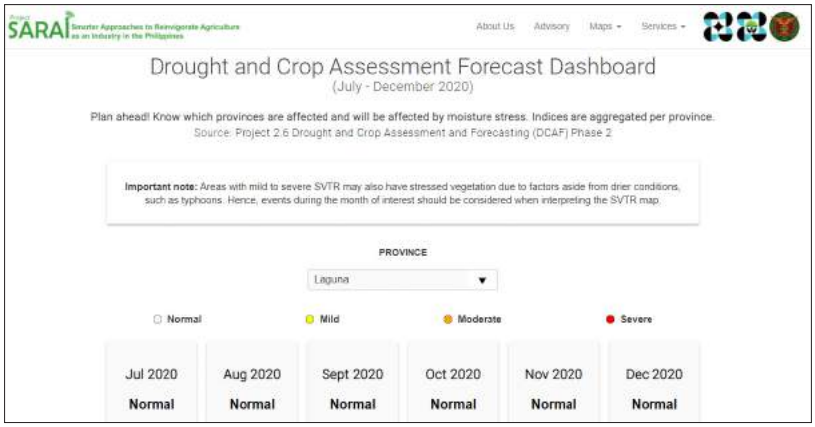
The Drought and Crop Assessment and Forecasting (DCAF) utilizes technologies like satellite imageries, global positioning system (GPS), climate models, and other geospatial tools to mitigate the effects of drought in the Philippines. It uses multiple drought indices, including the localized agricultural drought index and Standardized Vegetation Temperature Ratio (STVR). This drought index describes different drought characteristics, such as drought duration, severity, and extent. During the weak El Niño event in 2018–2019, the DCAF project was able to describe the development of drought at a country scale using multiple drought indices. Monthly maps of rainfall, temperature, vegetation, and drought indices were utilized to investigate the drought development.

Coffee Application Harvest Date Estimator (CAPHE): Harvest Date Estimator for Better Coffee Quality

Harvesting cherries at the right maturity produces better-tasting coffee. Through SARAI Program, a mobile application named CAPHE was developed. This mobile app forecasts the best harvest date of Robusta, Arabica, Liberica, and Excelsa coffee varieties based on the local temperature forecast and the coffee phenological data. CAPHE can also be used for scheduled farming practice advisories that are based on the stages of coffee fruit development. Once CAPHE App is downloaded to a mobile phone, it can already be used anywhere even without internet connectivity. The application is still being field-tested in different areas of the country and being fine-tuned to ensure accuracy and ease of use before launching it to the public.

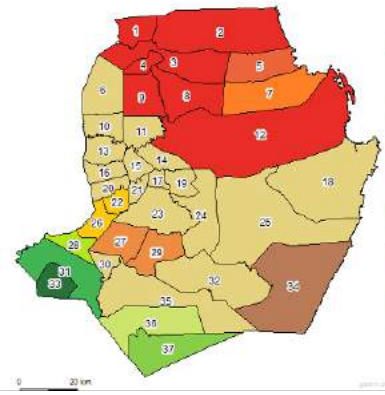
Optimal Geographic Insurance Units (GIU) for Weather Index-based Crop Insurance (WIBI) in the Philippines

WIBI allows farmers to get compensation for yield losses caused by very little or excessive rainfall, based on scientific data instead of field inspection reports. SARAI established the most efficient geographic insurance units (GIUs) or locations with similar risk profiles. Based on various criteria and analyses of synthetically generated and validated rainfall data from 2010 to 2050, the project defined a total of 12 GIUs in Isabela, 7 in Iloilo, and 5 in Bukidnon. The GIUs are intended to minimize risk and thus reduce the premium for the insurance product. By defining GIUs for WIBI, the insurance products will have high potential in effectively helping farmers cope with and eventually manage climate risks.

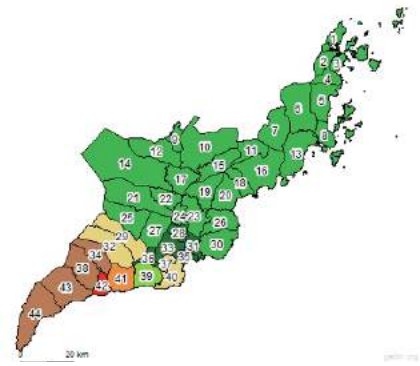


DCAF dashboard.

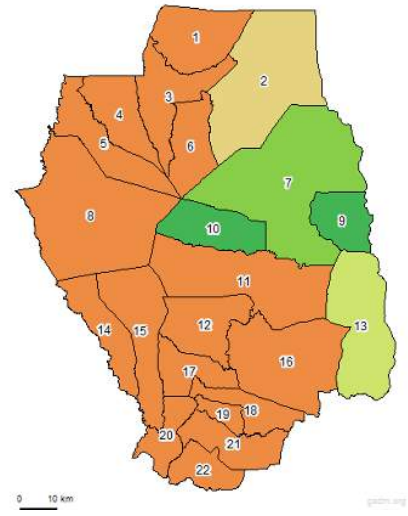
CAPHE application.



GIU	Units
1	Cabagan, Delfin Albano, Ilagan, San Pablo, Santa Maria, Santo Tomas, Tamauini
2	Divilacan
3	Maconacon
4	Alicia, Angadanan
5	Cabatuan, San Mateo
6	Ramon
7	Cordon
8	Dinapigue
9	Jones
10	San Agustin
11	Santiago City
12	District 2, District 3, District 5, District 6



GIU	Units
1	Guimbal
2	Igbaras, Miagao, San Joaquin, Tubungan
3	Oton
4	Tigbauan
5	Alimodian, Iloilo City, Leon, Pavia
6	Leganes, New Lucena, San Miguel, Santa Barbara, Zarraga
7	District 3, District 4, District 5



GIU	Units
1	Cabanglasan, Lantapan
2	Impasug-Ong
3	Malaybalay City
4	San Fernando
5	District 1, District 3, District 4

Water Advisory for Irrigation Scheduling System (WAISS)

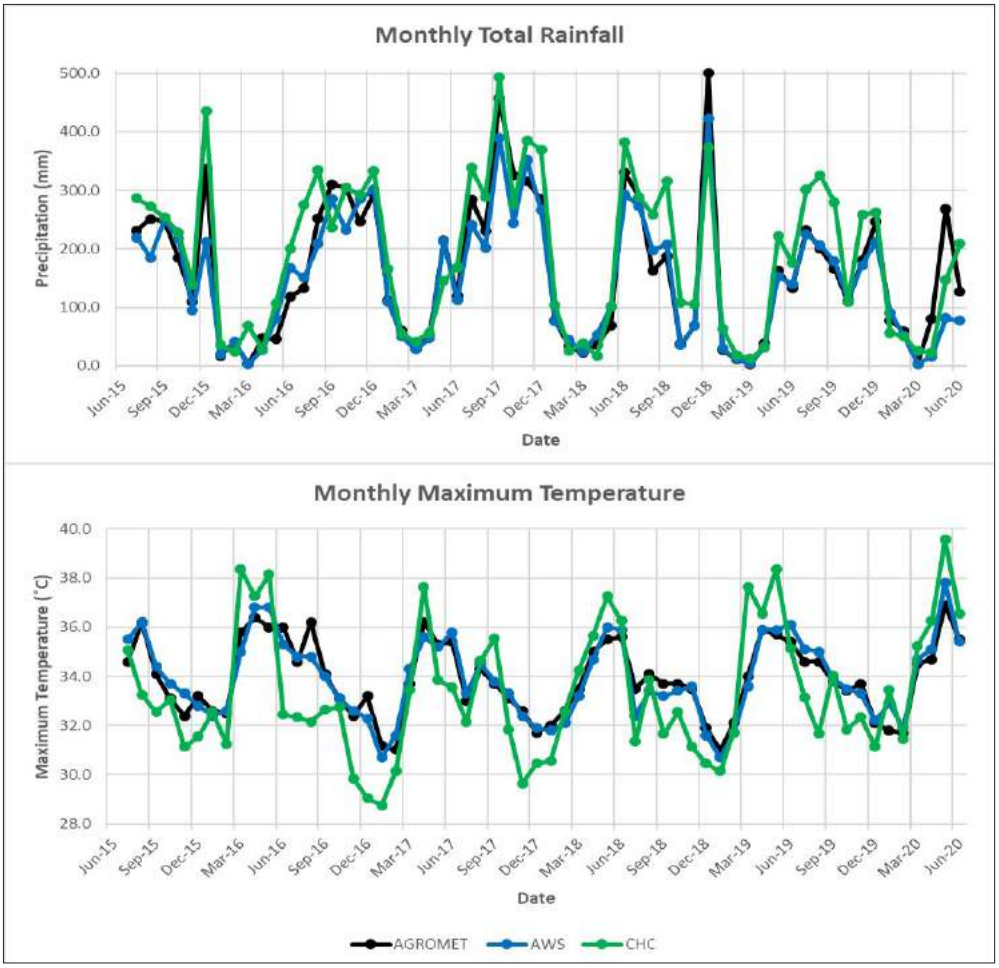
WAISS is a smart monitoring and decision platform that can provide farmers with an efficient approach for crop irrigation. It promotes the practice of smart irrigation by applying the right amount of water to crops at the right time and place. WAISS uses two methods: the soil moisture-based and the evapotranspiration-based (ET-based) irrigation scheduling method. Moreover, it incorporates climatic data, soil characteristics, crop type, and farm management strategies in analyzing irrigation requirements and scheduling. A demo site has been established in UPLB for drip-irrigated corn where soil moisture-based and ET-based WAISS were installed for field testing and validation. The performance of the WAISS field unit is currently being tested in comparison with commercially available soil moisture sensors with a data logger.

Enhanced Operation and Connectivity of Automatic Weather Station (AWS) and Unmanned Aerial Vehicles (UAV) Units for Crop-environment Monitoring and Forecasting

Before farmers can adjust the amount of irrigation and fertilizer application levels, they must first understand the seasonal variations in precipitation and temperature values in their farms. The SARAI program uses AWS in monitoring these parameters. It contributes to a better understanding and eventually helps in the management of the risks related to weather. Similarly, SARAI uses UAV or drones for aerial monitoring of crop growth and health. Together with a multispectral camera, drones can provide spectral images as well as measurements, such as Normalized Differential Vegetation Index (NDVI) to gauge crop health, growth stages, and extent of pest and disease damages. Since 2015, SARAI has installed 20 AWS in experimental farms throughout the Philippines and trained personnel from different SUCs and government agencies on AWS installation and maintenance. Each SARAI site is capable of providing reliable real-time weather data, short-term weather forecasts, and advisories to the local farmers. It can also provide historical data that researchers can use for different studies, such as crop modeling to simulate crop development, growth, yield, water, and nutrient uptake, or in creating forecast algorithms.

WAISS field unit.

SARAI AWS in Cebu Technological University.



Time series of five year precipitation and temperature data of SARAI AWS in UPLB-IPB.

Disaster Risk Reduction and Mitigation

Coastal Acidification

Coastal acidification is the localized acidification of coastal waters resulting from eutrophication (as seen in Bolinao, Pangasinan) and volcanic vents in Mabini, Batangas). Its effects on seawater carbonate chemistry, marine organisms, communities, and populations are examined to provide insights on how acidification as a stressor threatens food security, as well as ecological and environmental stability.

pH and Aragonite Maps

Variation in carbonate and other environmental parameters across a gradient of influence from acidification and over time was examined and the baseline data on pH and aragonite saturation state Ω (used to track acidification) from 59 coastal waters and seas in Luzon, Visayas, and Mindanao were compiled and presented as pH and Ω maps. This baseline information is important as a basis to compare future changes in acidity and to identify potentially vulnerable areas in the country. In general, sites with acidic waters are affected by eutrophication and other man-made disturbances, such as discharge from resorts and mining companies. Coral cores were used to follow the physico-chemical variations across sites and samples and over time. Variability in linear extension rate was seen in the coral cores.

Changes in Planktons and Microbes Biomass

The program tries to understand the impact of acidification on the tiny plankton and even smaller microbes at the base of the

Water sampling for nutrients, chlorophyll, and carbonate parameters in Bolinao, Pangasinan.

Coral coring using the hydraulic power pack drill system.

Dry-run of mesocosm experiment in Bolinao, Pangasinan using a fabricated mesocosm setup unit.

marine food web. Changes in their biomass and types can influence larger organisms that rely on them for food and interact with them in other ways. Microscopic analyses of samples from Batangas highlights the differences in density of phytoplankton forms at small spatial scales, which points out the patchy distribution characteristic of these microorganisms. Phytoplankton abundance and distribution seem to be influenced more by nutrients than low pH levels. A total of 43 bacterial groups were identified up to the class level using molecular techniques (16S rDNA primer). Initial results of the phytoplankton culture experiments suggest an onset of acidification effects on both monocultures and mixed cultures, but potentially recovered in abundance towards the end.

Sample collection for an ocean acidification microcosm experiment in Lucero, Bolinao, Pangasinan (left) and the samples cultured in the laboratory and subjected to various pH treatments (right).

Monitoring of seawater chemistry and health of juvenile giant clam *T. gigas* subjected to different temperature and pH treatments simulating ocean future conditions.

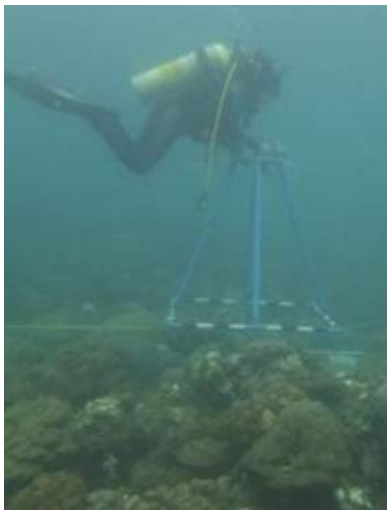
Effects on Benthic Communities (Including Biofilm, Microbes, Calcifying Macroalgae, Giant Clams, Sponges, and Sea Cucumbers)

To understand the effects of acidification and related stressors on reef benthic communities, a combination of laboratory and field experiments is conducted to understand the responses of different organisms to acidification. Results from experiments showed the negative impact of future scenarios of ocean warming and acidification. Specifically, fish farm effluent, which is eutrophic and acidic, can alter the eukaryotic microbial community crucial for coral settlement. It was also found that either lowering the pH or elevating the temperature enhances grazing activity. *Ex situ* experiment also revealed that warming and acidification shifted the microbial community of sponge that can result in an imbalance of the association between sponge and its microbiota.

Impacts on Demography

The program investigates the impacts of acidification on the demography (i.e., the growth, death, and reproductive rates) of populations of reef-building corals. It then compares these impacts to those of ocean warming and human activities. Data on the corals' demographic rates are then fed into simulation models to project possible impacts of various environmental stressors into the future, which are validated against long-term monitoring data from the same reefs. The fieldwork surveys in Lian, Batangas in July 2020 captured coral bleaching (30–31°C water temperature), which coincided with reports of bleaching in other areas in the Philippines. All growth forms of corals were affected by bleaching. Statistical and demographic models continue to be developed from image data. Preliminary conceptual and scenario-building models were initiated by estimating the relative threat level of stressors (sedimentation, eutrophication, acidification, upwelling, warming).

Survey and collection of sponge species in a reef area adjacent to CO_2 vents in Mabini, Batangas.



A researcher captures images of a fixed quadrat using tetrapod to track corals over time.

Water sampling right above the vent in Tingloy, Batangas using a syringe.

Iodine-129 as a Tool for Nuclear Activities Detection

The Fukushima Project determined the impacts of past nuclear activities in the Philippines by analyzing radionuclide Iodine-129 in corals and seawater samples from various locations in the country. Analysis of coral cores from Baler, Aurora and Vinzons, Camarines Norte revealed that radionuclide contaminants from nuclear bomb testing in the Pacific in the 1950s to 1960s, as well as from the Fukushima Daiichi Nuclear Power Plant Accident in 2011, may have already reached the coasts of the Philippines. Further, results on the analysis of 79 seawater samples from around the Philippines also showed that Iodine-129 levels in the West Philippine Sea area are higher than the rest of the country. Thus, results demonstrated that Iodine-129 can be a powerful tool to detect the presence of nuclear activities, understand ocean currents and processes that transport the radionuclides, and provide useful information should similar incidents happen in the future.

Coral sampling in Vinzons with PCAARRD collaborators from the University of the Philippines Diliman-Marine Science Institute (UPD-MSI). Footage of drilling the coral core from one of the coral targets identified before the actual sampling.

Offshore Coral Reef Stabilization Technology

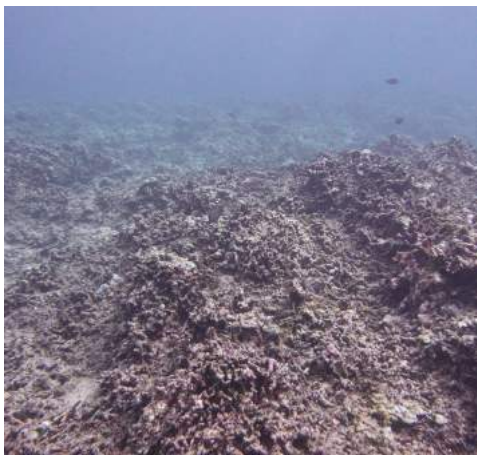
Historical data on Apo Reef Natural Park (ARNP), Occidental Mindoro marks periods of reef-wide destruction brought about by the Crown of Thorns (*Acanthaster planci*) outbreak followed by high-intensity storms. Damage was severe and extensive, causing the hard coral cover to drop significantly, resulting in the decline of surface complexity across the entire reef complex. It is clear from this experience that protection alone from extractive activities is not sufficient to maintain the health of the reef complex. Dynamic management and assisted rehabilitation strategies should also be implemented in ARNP to assist recovery.

Through close cooperation with the ARNP-Protected Area Management Office (ARNP-PAMO) of the Department of Environment and Natural Resources (DENR), and the Municipal Environment and Natural Resources (MENRO) of Sablayan, capacity building activities, ecological surveys, and substrate stabilization activities were conducted. Substrate stabilization setups were exposed to strong wave energy generated by three consecutive typhoons that hit ARNP from October to November 2020. Despite its exposure to consecutive high energy events, partial binding of coral rubble was observed after three months which was facilitated by different benthic organisms that included sponges, hard corals, and coralline algae. Invertebrates were already found taking refuge in these bound substrates.

Researcher preparing for solvent extraction of Baler coral samples.

Analyzing Vinzons' coral slabs using 3D-XCT in collaboration with DOST-ITDI.

Dr. V.S. Ticzon, the Project leader, during the training on reef fish size estimation for ARNP-PAMO and MENRO-Sablayan participants (September 2020).



The reefs of ARNP are in a poor state after multiple natural disturbances hit the reef in the latter part of 2019. Mean cover of dead corals with algae and rubble was generally high across monitored stations.

Bound coral rubble fragments observed in one of the substrate stabilization setups. Juvenile Diadem was found sheltering between the spaces created by the aggregation while a sponge was found attached on its surface.

Agenda 10: Strengthen Industry-Academe-Government and International STI Collaboration

Support to the Los Baños Science Community

The Los Baños Science Community through the Los Baños Science Community Foundation, Inc. (LBSCFI), a non-stock, non-profit organization composed of 23 member agencies from within the Los Baños Community continued to get administrative and financial support from DOST-PCAARRD. As a member of the foundation, the Council continuously supports its programs and activities through its various sectoral committees. LBSCFI continues to facilitate the transfer and adoption of S&T research outputs and services generated by its member-agencies to clients and users through various projects.

The Council plays a significant role in the activities of LBSCFI, serving as Secretariat of the Foundation and leads the LBSCFI information committee. In 2020, the activities of the Foundation were hampered by the pandemic. However, the Council continued to provide technical support to and participated in the virtual celebration of the annual Syensaya: The Los Baños Science Festival—the local activity in celebration of the NSTW, which showcases S&T exhibits of the member-agencies (Wonderama) and features a Techno-forum where issues affecting the local community are addressed through S&T interventions. Also, the Council facilitates the evaluation of R&D papers submitted for the different awards being conferred by the Foundation. For 2020, the Youth Science Award was given to deserving senior high school students.

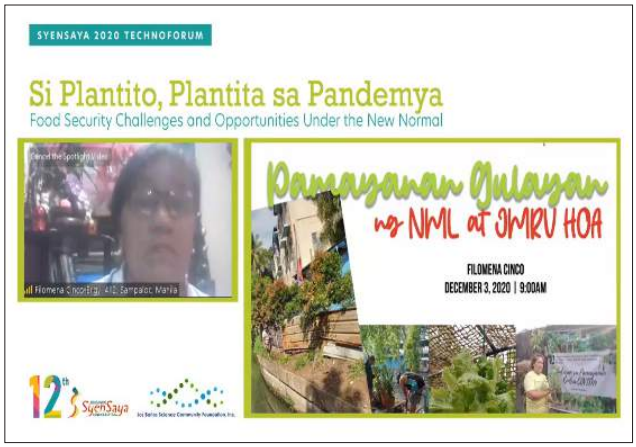
International S&T Collaboration

The COVID-19 pandemic affected most of the international activities of DOST-PCAARRD, particularly the Global Technology and Information Search (GTIS) activities and the International Visitors Program.

The GTIS provides opportunities for the DOST-PCAARRD staff/ISP managers and NAARRDN researchers to explore new technologies/innovations from other countries and learn their best practices and successful strategies in the AANR sector that could be adopted/adapted in the Philippines. GTIS missions on smart agriculture technologies, ecological mangrove restoration technology, *Clarias macrocephalus* (broadhead catfish) propagation, and big data tools and applications for AANR were proposed to be conducted in 2020. However, these were not pursued due to restrictions on international travel.

Despite the challenges, DOST-PCAARRD was able to explore new partnerships and strengthen its existing international collaborations. To maximize opportunities in STI with international and non-traditional partners, the Council, through DOST, proposed areas for cooperation with France, Germany, India, Indonesia, Iran, Italy, and the United Kingdom. Moreover, the MOU with the Thailand-based AIT was signed on September 28, 2020. The Council also continued the implementation of projects and activities with

2020 virtual Syensaya.



Presentation of Chairwoman Filomena Cinco during the Syensaya 2020 Technoforum.

its bilateral partners (ACIAR, CIP, FFTC) and multilateral partners (APAARI, APO, CORRA), and those under DOST-led partnerships (JSPS, MECO-TECO, MOST-China, ASEAN, e-ASIA).

To overcome the limitations due to international travel restrictions, DOST-PCAARRD tapped opportunities for its staff and researchers in the regions to participate in online/ virtual international fellowships, e-mentoring, trainings, seminars, conferences, symposia, workshops, expert consultations, and fora. Thirty-three international activities were participated by DOST-PCAARRD staff and NAARRDN researchers.

DOST-PCAARRD, in cooperation with various international agencies, coordinated, implemented, and participated in a number of successful and notable programs, projects, and activities to provide better solutions to the various pressing problems in the AANR sector.

New Partnership

Asian Institute of Technology (AIT)

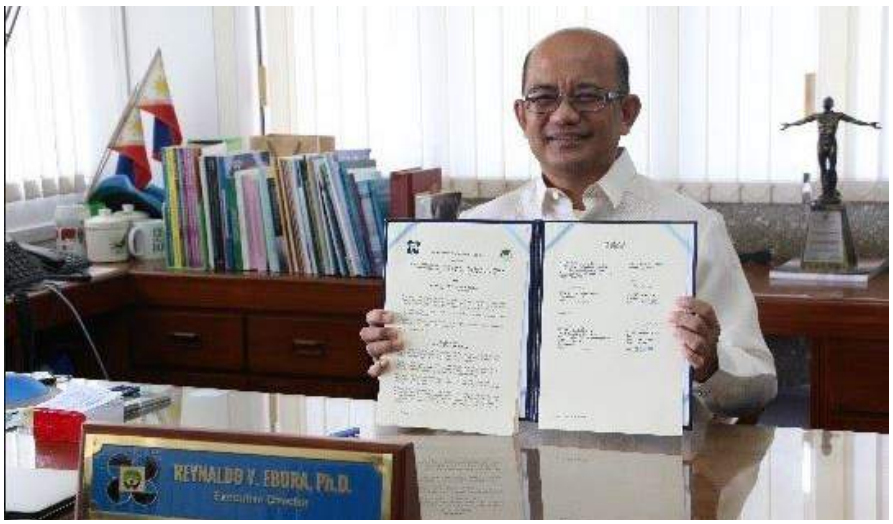
With the goal to intensify its partnership and collaboration with international agencies, DOST-PCAARRD inked an MOU with the Thailand-based AIT on September 28, 2020.

The new collaboration with AIT is an output of the GTIS/Benchmarking activity of Dr. Melvin B. Carlos, DOST PCAARRD Deputy Executive Director for Administration, Resource Management and Support Services (OED-ARMSS), and Dr. Procy B. Sobreviñas, Supervising Science Research Specialist of the Office of the Executive Director for Research and Development (OED-RD) on the best practices in S&T administration for improved resource management and utilization.

DOST-PCAARRD and AIT agreed to implement joint R&D projects, capacity building activities (exchange of researchers, faculty, and scholars), and joint trainings, conferences, symposia, workshops; exchange IEC materials and scientific and technical publications; and participate in scientific seminars, workshops, conferences, and symposia.

The MOU was signed by DOST-PCAARRD's Executive Director Dr. Reynaldo V. Ebora, and AIT's President Dr. Eden Y. Woon. DOST-PCAARRD and AIT are now working on the details of the cooperation work plan focusing on priority areas that include agricultural systems and engineering, aquaculture and aquatic resources management, natural resources management, development and sustainability, environmental engineering and management, climate change, sustainable development, and nanotechnology.

Dr. Eden Y. Woon, AIT President, signed the PCAARRD-AIT MOU on September 3, 2020 in Pathum Thani, Thailand.



Dr. Reynaldo V. Ebora, PCAARRD Executive Director, signed the PCAARRD-AIT MOU on September 28, 2020 in Los Baños, Laguna, Philippines.

Strengthened Existing Partnerships: Bilateral

Australian Centre for International Agricultural Research (ACIAR)

Considering Dr. Ebora's role and contribution in the AANR sector as DOST-PCAARRD Executive Director, the Australian Government, through Hon. Marise Payne, Minister for Foreign Affairs, appointed Dr. Ebora as a member of the Policy Advisory Council (PAC) of ACIAR for 3 years effective July 17, 2020.

The ACIAR PAC plays a key role in the planning and implementation of ACIAR's international agricultural research portfolio. It also provides advice to Australia's Foreign Minister on problems in the agriculture sector of developing countries and on the appropriate policies and programs to address the problems.

Being a member of the ACIAR PAC, Dr. Ebora will have the opportunity to ensure that concerns of the Philippine AANR sector will be considered in the agricultural research portfolio of ACIAR to consequently benefit our country's research agencies, universities, farmers' organizations, and other stakeholders in the private sector. It will also be a good venue for Dr. Ebora to share the Philippines' experience and learn from Australia's best practices in addressing agricultural issues and opportunities faced by smallholder farmers and fisherfolk.

DOST-PCAARRD and ACIAR have been strong partners for more than 37 years in terms of agricultural R&D and in promoting R&D to advance agricultural competitiveness. Aside from coordinating the implementation of ongoing projects under the PCAARRD-ACIAR partnership, new projects were also implemented in 2020, namely: "HORT/2018/192: An Integrated Management Response to the Spread of *Fusarium wilt* of Banana in Southeast Asia," "CS/2020/145: Assessment of Food System Security, Resilience and Emerging Risks in the Indo-Pacific in the context of COVID-19: Stage 2," and "LS/2019/187: Developing a Regional African Swine Fever Socioeconomic and Livelihood Impact Analysis Fund." Technical expertise was also provided by DOST-PCAARRD in the new project, "AGB/2020/120: Philippines Smallholder Dairy: Landscape Analysis and Research Priorities.

PCAARRD Executive Director Dr. Reynaldo V. Ebora.

International Potato Center (CIP)

DOST-PCAARRD co-organized two webinars with CIP, one on "Role of Women in Developing a Climate Smart Seed System in the Philippines" and the other on "Regional Cooperation for Building Resilient Seed System in the Philippines."

The webinar on "Role of Women in Developing a Climate Smart Seed System in the Philippines," held on August 19, 2020, aimed to contribute to developing a policy environment in the Philippines where gender equality drives transformation towards equitable, sustainable, and productive climate-resilient seed systems.

The webinar on "Regional Cooperation for Building Resilient Seed System in the Philippines," on the other hand, was held on October 7, 2020 to discuss the need, scope, benefits, and challenges of regional seed cooperation in developing a climate-resilient seed system in the Philippines. The discussion focused on the challenges faced by the seed sector amidst climate change, expected impacts of the Philippines joining the regional cooperation in seed sector, and potential challenges for joining the regional cooperation.

Food and Fertilizer Technology Center for the Asian and Pacific Region (FFTC)

Dr. Ebora attended the 25th FFTC Technical Advisory Committee (TAC) Meeting last July 21, 2020 via teleconferencing.

FFTC's TAC is composed of 11 leading agricultural scientists/ experts in the Asia-Pacific (ASPAC) region. These experts review

Speakers and moderators during the webinar on "Role of Women in Developing a Climate Smart Seed System in the Philippines" held on August 19, 2020.

Speakers and moderators during the webinar on "Regional Cooperation for Building Resilient Seed System in the Philippines" held on October 7, 2020.

and provide advice on FFTC's policy, program, and themes in the formulation, implementation, and evaluation of FFTC's working programs and activities; deliberate on the priorities of agricultural needs and requirements of countries in the region; and recommend the suitable directions and strategies to improve the performance and effectiveness of FFTC's operation.

During the meeting, Dr. Ebora also provided updates on the seminar-workshop on "Harnessing the Economic and Socio-cultural Opportunities of Farm Tourism," which will be held in May 2021 at DPITC, Los Baños, Laguna. Dr. Ebora further shared the "GALING-PCAARRD Kontra COVID-19 Program" during the TAC meeting.

In terms of capacity building, four NAARRDN researchers and one DOST-PCAARRD official participated as resource speakers and observers in various virtual/online activities organized by FFTC.

Japan Society for the Promotion of Science (JSPS)

DOST and JSPS jointly approved the proposal of DA-Philippine Carabao Center (PCC) on "Development of a Pen-side Nanosensor Diagnostic tool for *Mycobacterium avium* subsp. *Paratuberculosis* and *Mycoplasma bovis*." The research focuses on the development of a fast and easy detection tool for diagnosing *Paratuberculosis* and *Bovine mycoplasmosis* with the use of nanotechnology. Said project will be funded by DOST in 2021 with DOST-PCAARRD as a monitoring agency.

Manila Economic and Cultural Office-Taipei Economic and Cultural Office (MECO-TECO)

DOST-PCAARRD coordinated and monitored the implementation of two MECO-TECO projects, which were approved for funding in 2020. These are "Development of AIoT Technologies for Smarter Farm Management" of UPLB and "APPLex: Automated Pest Identification and Parasitism Level Estimator" of DLSU.

These projects were jointly approved by the Chinese Taipei's Ministry of Science and Technology and the Philippines' DOST.

Malaysian Agricultural Research and Development Institute (MARDI), Rural Development Administration (RDA), International Center for Tropical Agriculture (CIAT)

To implement the MOUs signed with CIAT, MARDI, and RDA, DOST-PCAARRD drafted the work plans of cooperation with the said international partners, focusing on capacity building. The work plans will be negotiated with the three agencies in 2021.

Strengthened Existing Partnerships: Multilateral

Asia-Pacific Association of Agricultural Research Institutions (APAARI)

The Council sent seven researchers from the NAARRDN and two DOST-PCAARRD staff to participate, as resource persons, observers, and participants in various APAARI-sponsored/organized activities on knowledge management, circular agriculture, regional expert consultation on agriculturally important microorganisms, biotechnological tools in aquatic genetic resource management, and Crawford fund e-Mentoring Program. Other APAARI-organized webinars were also participated in by interested NAARRDN researchers and DOST-PCAARRD staff.

Moreover, two DOST-PCAARRD articles "Addressing food security and providing livelihood opportunities through GALING-PCAARRD Program" and "Developing agribusinesses from R&D in the country through DOST-PCAARRD program" were published in the semi-annual APAARI Newsletter.

Council for Partnerships on Rice Research in Asia (CORRA)

Dr. Ebora and Dr. Edna A. Anit, Director of the Crops Research Division (CRD), represented the Philippines through DOST-PCAARRD in the 24th CORRA Annual Meeting held on November 20, 2020 via teleconferencing. Said meeting brought together the senior officials and representatives of National Agricultural Research and Extension Systems (NARES) of major rice-producing and consuming countries to assess, discuss, and agree on collaborative actions and initiatives regarding principal issues and challenges facing the Asian and global rice industry. Discussed during the meeting were the rice-based agriculture research initiatives of CORRA member-countries, the latest developments in genetic modification and gene editing technologies for rice and other crops, and updates on the One CGIAR governance reforms and IRRI partnership with AfricaRice.

The main output of the meeting was the final 2020 CORRA Declaration which stipulates CORRA's commitments and plan of action. As co-organizer of the annual meeting with the International Rice Research Institute (IRRI), the Council endorsed the 2020 CORRA Declaration to the One Consultative Group on International Agricultural Research (CGIAR) System Council Chair and the One CGIAR Executive Management Team requesting to use the CORRA platform in engaging with CGIAR in designing the regional program in Asia.

Association of Southeast Asian Nations (ASEAN)

DOST endorsed Dr. Ebora as a member of the Governing Council of the ASEAN Centre on Microbial Utilisation (ACMU) hosted by Thailand's National Center for Genetic Engineering and Biotechnology. As a member, Dr. Ebora is expected to oversee and provide guidance to the operations of the Center, as well as assist in linking the Center with other international organizations as strategic alliances for research and capacity-building activities. Also, he is currently the Philippine focal point for the Sub-Committee on Biotechnology (SCB) under the ASEAN-Committee on Science, Technology, and Innovation (COSTI).

DOST has also been offering scholarship and training programs to ASEAN researchers, especially for Cambodia, Lao PDR, and Myanmar (CLM) since 2017. The DOST-PCAARRD-monitored project, "Scholarship Offerings for ASEAN Researchers (Cambodia, Lao PDR, and Myanmar)," aims to promote human resource development in engineering and sciences for sustainable socioeconomic development of the ASEAN region particularly in CLM. Implemented by the DOST-Science Education Institute (SEI), the said project has supported a total of 26 scholars (21 MS and 5 PhD). Two scholars from Myanmar already graduated in 2020—Mr. Mo Thant Kyaw from UPLB, MS Environmental Science and Mr. Tun Tun Oo from DLSU, MS Electronics and Communications Engineering program. The other partner universities for the project are UPD and University of the Philippines Manila (UPM).

In 2020, the project "Scholarship Offerings for ASEAN Researchers (Cambodia, Lao PDR, and Myanmar)—Batch 2, Batch 3, and Batch 4," was approved for DOST funding. This is a continuation of the batch 1 project that started in September 2017 and will be completed in September 2021. The new project was proposed considering the interest of CLM in sending more scholars to the Philippines as conveyed during the 10th Informal ASEAN Ministerial Meeting on Science and Technology (IAMMST-10) held last October 19, 2019 in Cebu City.

East Asia Science and Innovation Area (e-ASIA)

Engr. Eduardo V. Manalili, Director of Inland Aquatic Resources Research Division (IARRD), and Dr. Synan S. Baguio, Director of Livestock Research Division (LRD), represented DOST-PCAARRD in various online meetings in preparation for the e-ASIA Annual Board Meeting in September 2020. Discussed during the meetings were the topics and schedule for the 10th Call for Proposals for the e-ASIA Joint Research Program (JRP) and the projects to be awarded from 9th Call.

DOST-PCAARRD also facilitated the approval and funding of two e-ASIA JRP projects from the Philippines: "Assessment on Genetic Diversity and Reproductive Biology of Carangid Fishes for Sustainable Use and Conservation" of UPD for the 8th Call and "Integration of Traditional and Modern Bioproducts Systems for a Sustainable and Resilient Future Under Climate Ecosystem Changes (ITMoB)" of UPLB for the 9th Call.

Japan Science and Technology Agency (JST) United Kingdom Research and Innovation (UKRI)

With DOST as lead, DOST-PCAARRD released the call for proposals for the JST-UKRI-DOST 'Science, Technology and Action' Nexus for Development (STAND). With the aim to connect current and recently funded projects focusing

on sustainable development in Southeast Asia, the proposals should focus on networking and partnership, building outreach and dissemination, and demonstration and pilot activities. Proposals to be approved by the Joint Panel Review will start implementation in 2021.

Ministry of Science and Technology (MOST), China

DOST-PCAARRD facilitated the approval of the proposal, "The Belt and Road of Avian Infectious Diseases—Intervention Strategies to Predict, Prevent, and Control Disease Outbreaks Caused by Emerging Strains of Newcastle Disease Viruses and Avian Influenza Viruses in Philippines and China," under the DOST-MOST China Joint Research Program. As approved by DOST, the new project title is "Development of Intervention Strategies to Predict, Prevent, and Control Disease Outbreaks Caused by Emerging Strains of Newcastle Disease Viruses and Avian Influenza Viruses in the Philippines and China." Once approved by MOST China, the project will commence implementation in 2021.

Asian Productivity Organization (APO)

In view of the international travel restrictions brought about by COVID-19, most of the activities co-organized and co-sponsored by APO were deferred for 2021. Five nominees from the PCAARRD Consortia/NAARRDN were able to participate in the various trainings and workshops that were conducted online by APO and its co-organizers. The DOST-PCAARRD staff and other researchers in the region were also able to participate in the APO-organized webinars related to COVID-19 and health.

Beneficiaries of the "DOST Scholarship Offerings for ASEAN Researchers (Cambodia, Lao PDR, and Myanmar-CLM)" with DOST Assistant Secretary Leah Buendia (8th from left), DOST-PCAARRD Executive Director Dr. Reynaldo Ebora (7th from left), and DOST-SEI Director Dr. Josette Biyo (9th from left) at DOST, Bicutan, Taguig City during the Get Together of DOST, Partner-Universities and Scholars held on January 22, 2020. (DOST-Science Education Institute)

Mr. Mo Thant Kyaw, from Myanmar, graduated MS in Environmental Science at UPLB. (DOST-SEI)

Mr. Tun Tun Oo, from Myanmar, graduated MS Electronics and communications Engineering at DLSU. (DOST-SEI)

Asia-Pacific Economic Cooperation-Policy Partnership for Science, Technology and Innovation (APEC-PPSTI)

DOST-PCAARRD assisted DOST in the dissemination of the call for nominations to the APEC Young Scientist Training (APEC-YST) Program, which will start in 2021. Said program aims to provide young physicists with career development opportunities through Fellowship in Korea and potential collaborations with in-house senior academics.

Partnerships in the Works

Jiangxi Academy of Forestry (JAF) and Jiangxi Academy of Agricultural Sciences (JxAAS)-China

DOST-PCAARRD, JAF, and JxAAS are currently on the final stage of negotiating the MOAs on the "Establishment of Philippines-China Joint Program on Bamboo Research" and the "Establishment of Philippines-China Joint Program on Rice Technology." After getting the concurrence of JAF and JxAAS on DOST-PCAARRD's counterdraft MOAs, the DOST will seek clearance

from the Department of Foreign Affairs (DFA) for the official signing.

Michigan State University (MSU)

DOST-PCAARRD continued its negotiation with MSU for the signing of its MOU, which covers the exchange of materials in research and education, publications, and academic information; exchange of faculty, researchers, and scholars; joint research and meetings for education and research; and technical assistance.

Taiwan Agriculture Research Institute (TARI)

With the expiration of the PCAARRD-TARI MOU in 2017, DOST-PCAARRD has been following up with Chinese Taipei's TARI for the renewal of the MOU, which includes joint R&D and capacity building. As earlier agreed, the said MOU will be subsumed under the DOST-led MECO-TECO partnership.

Capacity Building Activities

Due to the COVID-19 pandemic, all activities organized/sponsored by DOST-PCAARRD's international partners, such as APAARI, APO, and FFTC were conducted virtually. A total of 33 international fellowships, e-Mentoring, expert consultations, webinars, symposia, seminars, trainings, workshops, fora were participated in by DOST-PCAARRD staff and researchers from the NAARRDN. These activities opened doors to enhance linkages, networking, and collaborative activities with international organizations including possible resource generation that would augment support to S&T and R&D programs, projects, and activities for the AANR sector.

Table 3. International S&T-related activities participated by DOST-PCAARRD staff and NAARRDN researchers, 2020.

Partner Agency	Name of Participant/Agency Affiliation	Title of Activity	Date of Activity/ Venue
ACIAR	**Ms. Ma. Cecilia S. Alaban** DOST-PCAARRD	Meryl Williams Fellowship	December 2020–May 2022
APAARI	DOST-PCAARRD staff and NAARRDN researchers	Experiential Learning in Agriculture Education	June 2, 2020
	Dir. Marita A. Carlos DOST-PCAARRD (as speaker)	International Webinar: A Perspective on Capacity Building in Knowledge Management Development in Agricultural Sector	August 17, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Nutri-Garden: Bridge Between Agriculture and Nutrition	September 5, 2020
	Ms. Abigail O. Retuta DOST-PCAARRD **Dr. Darwin A. Basquial** BSU	Crawford Fund e-Mentoring Program	September 2020–August 2021
	Dr. Marilyn B. Brown UPLB **Dr. Jocelyn T. Zarate** UPLB **Dr. Nelly S. Aggangan** UPLB **Dr. Jonar I. Yago** NVSU	Regional Expert Consultation on Agriculturally Important Microorganisms	October 28, 2020
	Dr. Pearl B. Sanchez UPLB	APAARI-FFTC International Symposium on the Practice and Benefits of Circular Agriculture in Waste Reducing and Recycling	November 5–6, 2020

Table 3. (Continued)

Partner Agency	Name of Participant/Agency Affiliation	Title of Activity	Date of Activity/ Venue
	Ms. Angel Queenee D. Dequito UPLB	Regional Capacity Building Programme onBiotechnological Tools in Aquatic Genetic Resource Management and *Ex Situ* Conservation	December 7–18, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Regional Seminar on Agricultural Research in Southeast Asia: Resource Allocation, Performance, and Impact on Productivity	December 11, 2020
APO through DAP	DOST-PCAARRD staff and NAARRDN researchers	Productivity Talk: How COVID-19 is Affecting Rice-based Agrifood Systems	May 26, 2020
	Dr. Raquel M. Balanay Caraga State University (CSU)	Training of Trainers on Building Sustainable Supply Chains for Agriculture (virtual)	May 27, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Productivity Talk on Public Health and Leadership in the Time of a Pandemic	May 28, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Productivity Talk on COVID-19: Impact on Food Supply Chains in Asia	June 4, 2020
	Dr. Wilfredo A. Dumale NVSU	Workshop on Smart Resource Productivity Management	November 16–18, 2020
	Engr. Emmanuel Q. Amatorio UPLB	Workshop on Advanced Postharvest Technology for Horticultural Crops	December 1–3, 2020
	Dr. Emma Ruth V. Bayogan University of the Philippines Mindanao	Workshop on Advanced Postharvest Technologies for Horticultural Crops	December 1–3, 2020
	Engr. Ryan Anthony O. Lualhati UPLB	Workshop on Advanced Postharvest Technologies for Horticultural Crops	December 1–3, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Innovation and Productivity Initiatives in the Public Sector: COVID-19 Response in the Philippines	December 14, 2020,
FFTC	**Mr. Johnrell S. Zuniega** UPLB **Dr. Dormita R. Del Carmen** UPLB	2020 Dragon Fruit Workshop	September 22–23, 2020
	Dr. John Platten IRRI **Dr. Eduardo Jimmy P. Quilang** DA-Philippine Rice Research Institute (PhilRice)	FFTC-MARDI Workshop on Crop Resilience for Adaptation to Climate Change: Rice	September 29, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Symposium on the Practice and Benefits of Circular Agriculture in Waste Reducing and Recycling	November 5–6, 2020
	Dr. Ernesto O. Brown DOST-PCAARRD	Agricultural Policy Forum on Sustainable Agri-Food Systems Under and Beyond COVID-19	December 1–2, 2020
EURAXESS-India	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Horizon Europe—The Next Research and Innovation Framework Programme of the European Union (EU)	October 15, 2020
CGIAR	DOST-PCAARRD staff and NAARRDN researchers	Genome Editing in Agriculture: Innovations for Sustainable Production and Food Systems	September 22, 29 and October 6, 13, 20, 2020

Table 3. (Continued)

Partner Agency	Name of Participant/Agency Affiliation	Title of Activity	Date of Activity/ Venue
Embassy of Canada in the Philippines and the Dalhousie University-Agricultural Campus	DOST-PCAARRD staff and NAARRDN researchers	CHED-EduCanada Webinar: Improving Agriculture through Education Delivery in the New Normal	August 28, 2020
European Research Council	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Grants for Top Researchers from Anywhere in the World	September 15, 2020
Michigan State University (MSU)	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Extension, Community Outreach, and Advisory Services Amid COVID-19 Pandemic	June 25, 2020
	DOST-PCAARRD staff and NAARRDN researchers	Webinar on the Impact of COVID-19 on Global Agriculture Research Systems	August 27, 2020
ASEAN	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Ensuring the Resilience and Sustainability of the Agriculture and Food Sector in ASEAN in the Context of COVID-19	September 3, 2020
WorldFish	DOST-PCAARRD staff and NAARRDN researchers	Fish Talk Nutrition Day Special with Focus on COVID-19	May 28, 2020
Colombian Presidential Agency of International Cooperation (APC-Colombia), and the United Nations Office for South-South Cooperation (UNOSSC)	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Expanding South-South Cooperation in an Interdependent World for the International Day for South-South Cooperation 2020	September 10–11, 2020
British Council	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Writing a Research Proposal for International Collaboration	May 20, 2020
CIP	DOST-PCAARRD staff and NAARRDN researchers	Webinar on Role of Women in Developing a Climate Smart Seed System in the Philippines	August 19, 2020
	DOST-PCAARRD staff and NAARRDN researchers	CIP-CCAFS-DOST-PCAARRD Webinar on Regional Cooperation for Building Resilient Seed System in the Philippines	October 7, 2020
JST	DOST-PCAARRD staff and NAARRDN researchers	JST Connect 2020 Webinar on Bridging Science and Society	December 3, 2020

International Visitors Program

The International Visitors Program is DOST-PCAARRD's opportunity to be recognized in the international science and agriculture community. Since there are travel restrictions related to the COVID-19 pandemic starting March 2020, the Council only welcomed one delegation, with six members from Papua New Guinea (PNG) on January 20, 2020. The delegation was headed by Hon. Minister of Parliament Ross Seymour. The purpose of their visit was to explore DOST-PCAARRD's initiatives in AANR and policy formulation. The visit would help them in attaining their five-year development plan for 2018–2022, especially in areas related to aquaculture and aquatic resources.

Other Activities

National Coconut Planting Day

DOST, through DOST-PCAARRD in partnership with the DA-PCA, launched three technologies on the

PNG delegates and PCAARRD officials during the briefing and meeting at the C.B. Perez Room, PCAARRD and visit at DPITC on January 20, 2020

DOST-PCAARRD ED Reynaldo V. Ebora participated in the ceremonial coconut planting.

UPLB Chancellor Dr. Jose V. Camacho, Jr., DA Undersecretary Evelyn G. Laviña, Former DA Undersecretary Cristino M. Collado, and National Scientist Emil Q. Javier also participated in the ceremonial coconut planting.

production and planting of high-yielding coconut planting materials during the National Coconut Planting Day held on December 8, 2020.

As part of the DOST 20 in 2020, the National Coconut Planting Day is among the identified 20 innovative technologies being funded by DOST and implemented by its partner agencies and institutes that can make impacts in the lives of the Filipino people and can push the country to attain socioeconomic growth and development.

The event featured the coconut hybridization program, 'macapuno' embryo culture technology, and CSet.

The synchronized planting was done in CALABARZON, Mindoro, Marinduque, Romblon, and Palawan (MIMAROPA), BARMM, Regions 1, 5, 6, 7, 8, 9, 10, 11, 12, and 13.

A ceremonial coconut planting was also held at UPLB-Institute of Plant Breeding (IPB). The varieties planted were the PCA 15-10 hybrid (Tacunan Dwarf x Laguna Tall) and Laguna Tall produced through CSet. The ceremony was attended by DOST-PCAARRD ED Reynaldo V. Ebora, PCA Administrator Benjamin R. Madrigal, Jr., DOST CALABARZON Regional Director Alexander R. Madrigal, DA Undersecretary Evelyn G. Laviña, Former DA Undersecretary Cristino M. Collado, DA-PCA Deputy Administrator for R&D Erlene C. Manohar, DOST-PCAARRD CRD Director Dr. Edna A. Anit, UPLB-IPB Director Dr. Rodel G. Maghirang, UPLB Chancellor Dr. Jose V. Camacho, Jr., and National Scientist Emil Q. Javier.

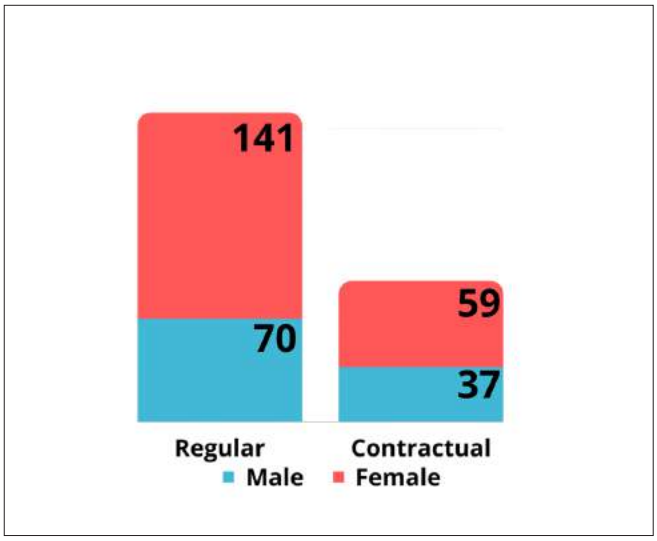
A virtual program was also conducted to officially kick off the National Coconut Planting Day with the theme, "Modern Technologies: Key to Coconut Productivity." DOST Secretary Fortunato T. de la Peña delivered a message, as well as DA Undersecretary Laviña on behalf of DA Secretary William D. Dar. The keynote message was delivered by Senate Committee Chairperson on Agriculture and Food Hon. Senator Cynthia A. Villar.

Agenda 11: Enhance Effectiveness of STI Governance

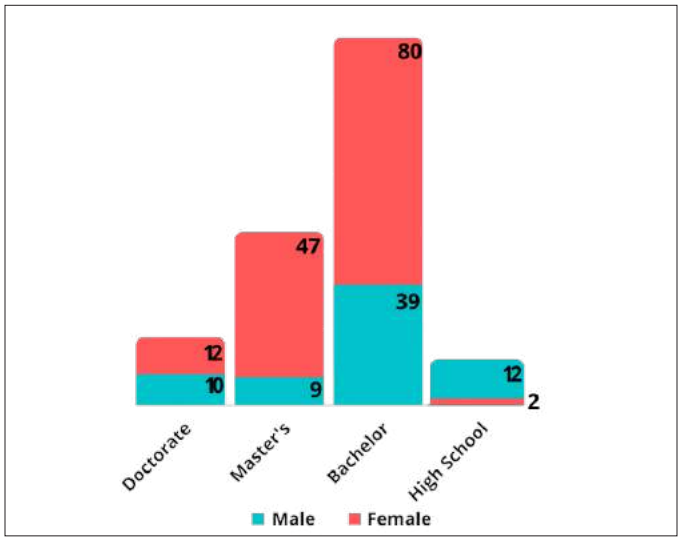
Human Resource Management

Despite the pandemic, the Council has successfully performed its core human resource management functions through online means, aside from the normal practice.

In 2020, it has carried out the recruitment and selection of applicants and issuance processing of 33 appointments, such as promotion - 19; original appointment - 10; transfer - 3 and re-appointment. It has also facilitated the engagement of a service provider for the institutional contract of service of 93 staff to be implemented in January 2021.



DOST-PCAARRD personnel profile, 2020.



DOST-PCAARRD personnel highest educational attainment (regular staff), 2020.

Personnel with Completed Graduate Studies

In 2020, five staff have completed their graduate studies.

(From left) Analiza C. Diaz (Master of Science in Climate Change and Sustainable Development, AIT), Gabriel Paolo L. Peralta (Master in Development Management and Governance, UPLB), Paul Jersey G. Leron (Doctor of Philosophy in Development Studies, UPLB), Rommel V. Visperas (Master in Public Management Technology-based Enterprise Development, Ateneo de Manila University [ADMU]), Ariane Shane DC. Catelo (Master in Management, Laguna College of Business and Arts [LCBA]).

Personnel with Ongoing Graduate Studies (2020)

A total of 28 DOST-PCAARRD staff are pursuing graduate studies (14 PhD and 14 MS). Six employees are newly enrolled in 2020.

Table 4. DOST-PCAARRD staff who pursued graduate studies in 2020.

Name	Degree/Specialization	University	Source of Fund
Glenda P. Fule	Master of Management in Agribusiness Management and Entrepreneurship	UPLB	DOST-HRDP
Rundolfo P. Llamas	Master of Science in Animal Science major in Ruminant Nutrition	UPLB	DOST-HRDP
Katrina Marie V. Mananghaya	Master of Science in Development Communication	UPLB	DOST-HRDP
El Vic R. Madrigal	Master in Development Management and Governance	UPLB	DOST-HRDP
Rick Adrian A. Mulimbayan	Master of Science in Information Technology	DLSU	DOST-HRDP
Diana Rose P. Cabello	PhD in Development Studies	UPLB	DOST-HRDP

Non-degree Trainings Participated by DOST-PCAARRD Personnel

DOST-PCAARRD ensures that staff competence is enhanced through participation in various trainings, seminars, and workshops. Six DOST-PCAARRD staff participated in the following non-degree trainings charged against the DOST-PCAARRD Human Resource Development Fund for the Secretariat.

Furthermore, the DOST-PCAARRD PRAISE Manual has been approved by the CSC on March 12, 2020 and has been implemented during the year. Thus, the first virtual Rewards and Recognition Ceremony was held on December 21, 2020. It has given 50 different awards with plaques and cash incentives.

Table 5. Non-degree trainings participated by DOST-PCAARRD personnel.

No.	Training Title
1	Series of Workshops of Photoworld Asia (Federation of Philippine Photographers Foundation, Inc.) - January 31–February 2, 2020
2	Business Intelligence and Analytics Certification Course - February 11–13, February 26–28, 2020
3	Strategic Decision Making - March 12, 2020, September 16–17, 2020
4	Online Training on Managing Employee Mental Health and Well-Being - July 22–24, 2020
5	Masterclass on Human Resources Analytics - September 16–18, 2020
6	Mental Health First Aid - November 10–11, 2020

Staff Awards

Loyalty Award

Granted to employees who have continuously and satisfactorily served DOST-PCAARRD for at least 10 years.

Tin Award (10 years in service) (From left) Marita A. Carlos, Genny G. Bandoles, Jayvee S. Bautista, Ronilo O. de Castro, Paul Jersey G. Leron, Allan B. Siano, Maria Lea Preciosa E. Balita, Precious D. Libit, Jonathan P. Penalosa	
Crystal Award (15 years in service) (From left) Romeo P. Santiago, Christie A. Surara, Eugene S. Manalang	
Platinum Award (20 years in service) Ruel S. Pagcaliwagan	
Silver Award (25 years in service) (From left) Cynthia V. Almazan, Adelaida T. Calpe, Imelda L. Tandang, Ma. Lea V. Delos Reyes	
Pearl Award (30 years in service) (From left) Maria Theresa T. Bautista, Juanito T. Batalon, Ernesto O. Brown, Ofelia F. Domingo, Susan S. Molina, Eric E. Perez, Dolores N. Suarez	
Jade Award (35 years in service) (From left) Adoracion B. Armada, Andre L. Acedera, Roscelia M. Lambio, Glenda P. Lantacon, Edna R. Lontoc	
Ruby Award (40 years in service) (From left) Felicidad E. Bautista, Delia M. Magtulis	

PCAARRD Recognition Award

Management Excellence

Award given to deserving employees to recognize and reward their exemplary performance, valuable contributions, and ethical conduct/behavior, among other factors.

Noel A. Catibog
Supervising Science Research Specialist/OIC (TTPD)

1st Runner-up

Marita A. Carlos
Chief Science Research Specialist (ACD)

2nd Runner-up

Lilian G. Bondoc
Chief Science Research Specialist (PCMD)

Outstanding Technical Senior

Ma. Theresa T. Bautista
Supervising Science Research Specialist (PCMD)

1st Runner-up

Nimfa K. Torreta
Supervising Science Research Specialist (FERD)

2nd Runner-up

Mia Barbara D. Aranas
Senior Science Research Specialist (SERD)

Outstanding Administrative Senior

Susan S. Molina
Supervising Administrative Officer (OIC-FAD)

1st Runner-up

Adelina S. Jimenez
Administrative Officer V (FAD)

2nd Runner-up

Anna Cristina R. Samonte
Administrative Officer V (OED-RD)

Outstanding Technical Junior

Sharie Al-faiha A. Lubang
Science Research Specialist II (CRD)

1st Runner-up

Annette M. Tobias
Science Research Specialist II (SERD)

2nd Runner-up

Cyrill S. Estimado
Science Research Specialist I (PCMD)

Outstanding Junior Administrative/Non-supervisory Staff

Leandro C. Lameyra
Administrative Assistant III (OED-RD)

1st Runner-up

Abegail Grace M. Maralit
Accountant III (FAD)

1st Runner-up

Georgia M. Lawas
Administrative Officer IV (FAD)

2nd Runner-up

Maria Ester Catalina V. Lajara
Administrative Officer II (FAD)

Special Creativity Award

Awarded for his creativity and dedication to excellence in his more than 3 decades of public service at DOST-PCAARRD.

Laureano U. Reyes
ACD

Retirees

Mandatory

Felisa E. Ocampo
IDD
43 years

Aurelio B. San Valentin
FAD-GSS
18 years

Optional

Celia M. Bueta
FAD-Records
38 years

Corazon P. Salud
FAD-Property
38 years

Demetrio M. Cinco
FAD
36 years

Laureano U. Reyes
ACD
29 years

Carolina T. Bosque
FAD-Accounting
23 years

Exemplary Service Award (posthumous)

In recognition of DOST-PCAARRD staff who passed away in 2020.

Flordeliza R. Gutierrez

Rolando S. Corpuz

Rodelo A. Dimasapit

Andre L. Acedera

Employee Welfare

While the pandemic caused by the new coronavirus has posed a significant effect on the operations of all offices, even when on skeletal workforce setup, the Council was able to procure all supplies used for health protocols in the office (e.g., facemasks, face shields, alcohol, half shoes, tent for the incoming vehicle tire disinfectant). It was still able to comply with all the requirements of the Government Procurement Policy Board (GPPB).

The Council had likewise formulated policy guidelines in observance of the minimum health protocols including but not limited to the guidelines on the use of prescribed footwear, arrangement in purchasing food from the canteen, and in accepting visitors. In the same manner, a sanitation area (including foot bath, wash area, alcohol dispensers, designated racks, and individual footwear exclusive within the office) was provided to employees and visitors. Regular disinfection of the whole DOST-PCAARRD Complex is being conducted every Friday, and if the need arises.

Financial Resources Management

DOST-PCAARRD managed a total of P1.349 billion (B) budget in 2020, broken down into P1.134 B for Current Appropriation and P215 M for Continuing Appropriation. Of this amount, P10.785 M were additional allotment from DBM for salary adjustments and authorized employer's share on retirement insurance.

The current year and prior year appropriations were duly obligated to programmed projects and activities and reached fund utilization rate of 94% and 96%, respectively or a total of 95%. A big chunk of the budget amounting to P1.175 B or 92% went to support the National AANR Sector R&D Program, which contributed to the attainment of the "Organizational Outcome: Increased Benefits to Filipinos from Science Knowhow and Tools for Agricultural Productivity in the AANR Sector." DOST-PCAARRD released funds totaling P1.033 B to various implementing agencies nationwide to support priority R&D and capacity building projects. The remaining unused appropriations were forwarded as continuing appropriation, which is valid for obligation until December 31, 2021 pursuant to RA No. 11520.

DOST-PCAARRD utilized P1.125 B cash allocation during the year covering the payment of current and prior years' obligations. The total disbursements covered 88% of the total obligations. The cash allocation was carefully managed to ensure that all priority expenditures were settled.

In addition to the annual appropriations, the Council managed a total of P119.735 M funds held in trust received from local sources to support and monitor projects and activities. This amount consists of

Face masks and face shields were distributed to the staff, while a washing area and slipper racks were also installed.

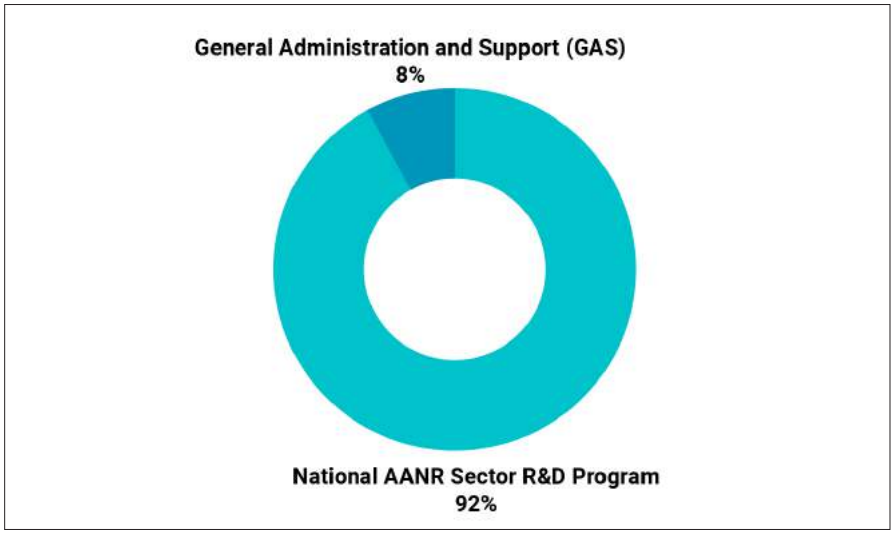
P21.599 M remaining balance from 2019 and P98.136 M generated in 2020. Of the total trust receipts, P58.767 M or 49% were utilized during the year with P46.125 M or 78% spent for R&D activities. The unexpended portion of the fund will be used to sustain ongoing projects and activities in 2021.

Financial monitoring and evaluation activities, as well as Financial Management Webinar Series were conducted with the implementing agencies and members of the regional consortia for the immediate liquidation of GIA releases.

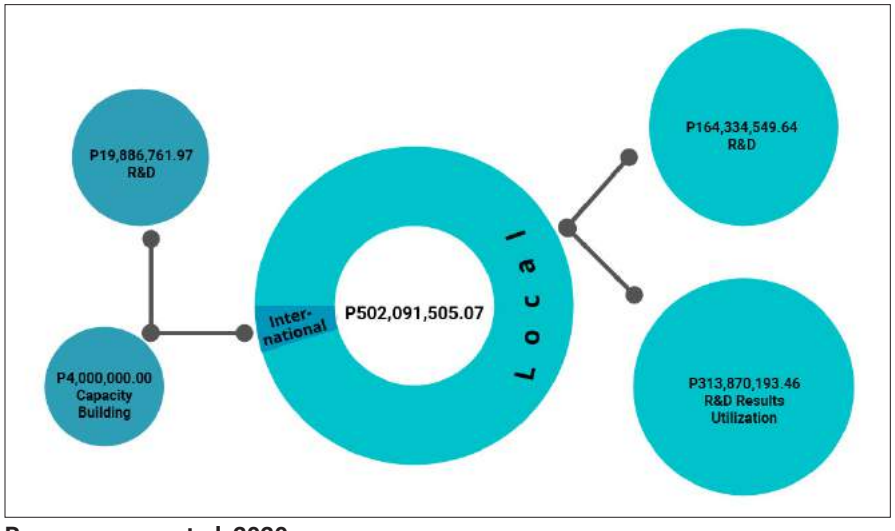
DOST-PCAARRD envisions a brighter 2021 with P1.449 B budget or a 17% increase from CY 2020 budget, covering P1.125 B to support GIA projects and activities.

Resources Generated

For 2020, DOST-PCAARRD generated about P502,091,505.07 from external sources, accounting both in cash and in kind. A total of P478,204,743.10 was generated from local sources, while the remaining P23,886,761.97 from international sources.



DOST-PCAARRD fund utilization, 2020.



Resource generated, 2020.

Continual Improvement

ISO Certification

In 2020, a total of four Quality Management System (QMS) Processes and eight QMS Forms were revised. Furthermore, a total of seven new QMS forms were registered.

Despite the threats posed by natural disasters and health pandemic to DOST-PCAARRD's management system, the Council was able to maintain its ISO 9001:2015 QMS Certification after successfully satisfying all the needed requirements set by SOCOTEC Certification International Philippines, its external certification body.

The Internal Quality Audit (IQA) conducted on July 1–16 prepared the Council for the remote Surveillance Audit on September 14. On November 10–12, the DOST-PCAARRD QMS Process Team proceeded with the review and revision of the Risk Management Plans (RMP) of the 20 certified QMS Processes, each indicating the risk of system disruption due to natural disaster and health pandemic.

Customer Satisfaction

In response to Memo Circular 2020-1 dated June 2, 2020—Guidelines on the Grant of the Performance Based Bonus (PBB) for 2020 under EO No. 80 s. 2012 and EO 201. s. 2016, particularly on Citizen/Client Satisfaction, DOST-PCAARRD revised its Customer Satisfaction Feedback (CSF) forms for its external and internal services incorporating seven service dimensions set by the AO 25 Secretariat, namely: responsiveness, reliability (quality), access and facilities,

communication, integrity, assurance, and outcome.

In line with this, the CSF Information System was enhanced to capture the abovementioned service dimensions and was implemented through AO No. 182 on November 18. This year, the Council received an outstanding rating for the following services:

External: NAARRDN Facilities Improvement Program, Thesis/ Dissertation Financial Support Program, publication dissemination, walk-in/online platforms, non-degree training, and seminar, forum, workshop, conference, and other similar activity; and

Internal: audio visual, FAD, and ICT services and maintenance and repair of facilities.

Knowledge Management (KM) for AANR

Websites Developed for the New Normal

The DOST-PCAARRD Virtual Exhibit was conceptualized and accomplished for the online celebration of the DOST NSTW 2020 held on November 23–29. It has the following features: virtual tour; pictures, videos, and description of technologies; interactive quizzes; events calendar; and live chat.

Likewise, the DOST-PCAARRD events website was developed for the online NSAARRD, which was held on December 1. The website was then enhanced for the DOST-PCAARRD S&T Awards on December 22.

These websites can be accessed through the DOST-PCAARRD Portal.

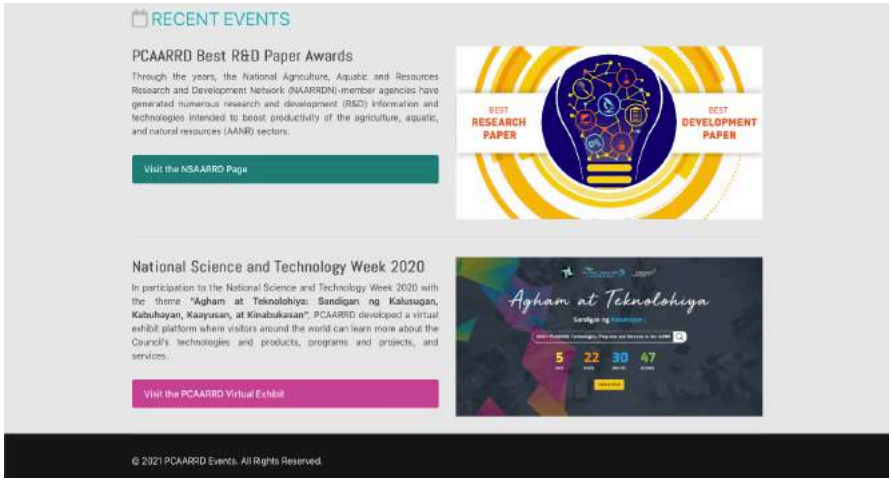
KM Virtual Workshop for the R&D Consortia and CMIs

In lieu of the scheduled face-to-face KM workshops with the consortia KM coordinators and consortium member institution (CMI) representatives, the virtual workshop on "Knowledge Audit and Rapid KM Assessment" was developed in Google classroom. The online workshop was launched on July 29, 2020 via Zoom and attended by 111 participants from the R&D consortia. Inputs from this workshop were audited, consolidated, assessed, and mapped for the development of consortia knowledge nodes under the KM Portal.

Knowledge Management for Agriculture, Aquatic, and Natural Resources (KM4AANR) Portal

The KM4AANR Knowledge Sharing System (KSS) connects all the nodes of the DOST-PCAARRD knowledge network through a one-stop search portal. The KSS integrates various websites and databases maintained by the R&D Consortia and CMIs. The system features a search portal

Virtual exhibit.



Events webpage.

and a recommendation system to streamline knowledge resources management, documentation, storage, dissemination, community interaction, and utilization monitoring.

The project team is currently constructing a bilingual knowledge taxonomy for AANR knowledge artifacts to improve the KM4AANR portal's search engine. Using an English-Filipino or bilingual mode, the search engine will be able to process a query in any of the two languages and come up with relevant results even if most of the content in the current database is in English.

International KM Conference

DOST-PCAARRD, through Applied Communication Division (ACD) Director Marita A. Carlos, participated in the international webinar, "A Perspective on Capacity Building in Knowledge Management Development in the Agricultural Sector of Iran," organized by APAARI and the Agricultural Research, Education and Extension Organization (AREEO) Academic Relations and International Affairs (ARIA) last August 17, 2020. Director Carlos discussed how KM contributed to the transformation of its partner agencies in the NAARRDN in her presentation, "Transformation of Agricultural Innovation System, the Role of the National Agricultural Research System (NARS): A Success Story from the Philippines."

Access to Internal IS

To adjust to the work from home directive of the government, the Council set-up a proxy service to allow staff access to internal information systems that use web browsing protocols. The staff were also provided laptops and mobile wireless fidelity (WiFi).

Support to Gender and Development (GAD)

DOST-PCAARRD drafted and revised the Council's GAD Agenda, which is composed of both GAD Strategic Plan and GAD Strategic Framework. The GAD agenda will serve as the basis and reference for the prioritization and implementation of GAD initiatives in DOST-PCAARRD. The unit also spearheaded the conduct of the GAD Mainstreaming and Evaluation Framework (GMEF), with the primary goal of evaluating DOST-PCAARRD's current GAD initiatives, and consequently identified areas of improvement for the agency's pursuit of gender equality and women's empowerment. With an overall total GMEF score of 49.99, the Council is currently at Level 3 of gender mainstreaming, which means that organizations at this level have already institutionalized GAD-related activities, instead of sporadic and uncoordinated efforts. It also connotes that the agency's GAD Plan and Budget (GPB) have become more strategic in terms of applying gender analysis in regular programs, which results in either increased attribution of the GAD budget and/or more gender-responsive programs.

The Council also consolidated members and representatives of the GAD Focal Point System (GFPS), from top to middle-level management and employees of all divisions in DOST-PCAARRD, and furnished Administrative Order (AO) No. 109 s. 2020, a policy issuance on the Reconstitution of GFPS dated last July 20, 2020. The GFPS is a representative group that leads the agency's gender mainstreaming initiatives and programs. Preparation and submission of DOST-PCAARRD's GAD Accomplishment Report (GAD AR) and GPB are also two of the main mandates of the unit, in compliance with Magna Carta of Women or RA 9710. The draft of the 2019 DOST-PCAARRD GAD AR was submitted to Philippine Commission on Women (PCW) last July for the review process, which was eventually approved for endorsement to the Commission on Audit (COA). The Council achieved a 7.95% GAD attributable budget equivalent to P95,813,907.04 of the total agency budget for 2019. Meanwhile, in October, a draft of DOST-PCAARRD 2021 GPB was prepared and submitted. It was encoded and uploaded to the Gender Mainstreaming Monitoring System (GMMS), PCW's database for monitoring GPB and GAD AR of government agencies and institutions, and is currently being reviewed by PCW.

Policy issuances on PCW-mandated initiatives. In the interest of the service and as mandated by RA 9710, PCAARRD GFPS was recently reconstituted in accordance to PCW Memo Circular No. 2011-2 on the Guidelines for the Creation, Strengthening, and Institutionalization of GFPS. The newly reconstituted GFPS will spearhead the planning, implementation, and monitoring of GAD-related initiatives in PCAARRD networks. On June 4, 2020, an AO on Adopting the Use of Gender-fair Language and Images in Policy Issuances was also signed by Dr. Ebora to ensure that non-sexist language is used in all of PCAARRD's official documents. This policy issuance was also enshrined in CSC Memo Circular No. 12, Series of 2005.

The Council continues to recognize the importance of mainstreaming gender in all its initiatives. The GAD program of the Council is proposed to be strengthened through the project, "Enhancement of Gender

and Development Integration Towards a More Inclusive R&D in AANR." The project is a comprehensive assessment of the extent to which GAD is integrated into PCAARRD R&D and a way to devise integration strategies that can be pursued to incorporate GAD in AANR S&T initiatives. The project was approved by the Directors' Council (DC) on July 21, 2020, with an initial budget allocation of P1 M.

In terms of institutional partnerships, DOST-PCAARRD has collaborated with the Municipality of Los Baños, thru the LB-LGU Public Employment Services Office (PESO), in the implementation of the project, "Gender Responsive Sustainable S&T-based Livelihood Opportunities in Tilapia Cage Culture and Fish Processing for Low-Income Households in Five Coastal Barangays of Los Baños (Phase 2)." The project was able to successfully foster a sustainable and more gender-responsive tilapia cage culture and fish processing for fisherfolk from five coastal barangays in Los Baños. Out of the 50 project cooperators, 15 were women fisherfolk and persons with disability (PWD). Majority of the male-headed household cooperators had a supportive spouse and family members that were also actively involved in the project activities, such as fish processing trainings and capacity building on marketing and selling of fish-based processed products. Training on gender analysis and mainstreaming was also conducted for PESO employees and officers of the fisherfolk association to ensure that their fishing operations remain gender-responsive even after the project duration.

Through this project, the fisherfolk cooperative "Samahan ng mga Mangingisda ng Los Baños" was established, which is a non-profit organization already registered at the SEC. An ex-post evaluation conducted after the project also indicated that the majority of the fisher cooperators confirmed that the top benefits of the project include improvement of their household income, expansion of their social and market linkages, and provision for opportunities to establish camaraderie with the other coastal barangays. The project utilized gender analysis tools, such as the Sustainable Livelihood Approach (SLA) and Harmonized Gender and Development Guidelines (HGDG) to assess the goals, policies, and implementation strategies of the study from a gender lens, and results of the assessment indicated that the project was gender-responsive.

Taal Volcano Relief Operations

DOST-PCAARRD extended help to the victims of the Taal Volcano eruption. In cooperation with the Municipal government of Los Baños, the Council distributed food packs and hygiene kits to the displaced families at the Mendez Covered Court Plaza, Mendez, Cavite on January 24, 2020.

Training Workshop on HGDG for Program Management Staff of the PCAARRD-LB Project on S&T-based Livelihood Enterprises.

Three-day training on Tilapia Cage Culture with respondents from Brgy. Bambang and Tadlac.

Way Forward

Indeed, DOST-PCAARRD proved its relevance in the AANR sector by providing quality programs and services in response to the impacts brought by the COVID-19 pandemic. It also remained steadfast in its commitment to providing strategic leadership in promoting S&T as a platform for AANR products innovation and environmental resiliency, thereby bringing hope and security to its stakeholders amidst the challenges.

Through the lessons learned in 2020, the following strategies will be implemented:

- Continue implementation of the Industry Strategic S&T Program (2016–2022) to fully address the identified gaps in the AANR sector;
- Expand the GALING-PCAARRD Program to respond to the growing needs of the Council beneficiaries even beyond COVID-19 pandemic;
- Aggressively disseminate R&D, technology transfers, and policy researches to our stakeholders and promotion of our knowledge management initiatives
- Continue developing new and enhancing current information systems and databases that are beneficial to the Council's efficient and effective delivery of services;
- Strengthen the customer feedback mechanism to improve the Council's delivery of services;
- Enhance the connectivity to adapt to the new normal;
- Continue implementing S&T programs that have proven beneficial to its stakeholders; and
- Strictly comply with regulatory and statutory requirements of the administration.

List of Acronyms

6 Ps	Publication, patents, products, people and services, places and partnerships, policies
AABINPhil, Inc	Agri-Aqua Business Incubation Network of the Philippines, Inc.
AANR	Agriculture, aquatic and natural resources
ABS	Access and benefit sharing
ACD	Applied Communication Division
ACIAR	Australian Center for International Agricultural Research
ACMU	ASEAN Centre on Microbial Utilisation
ADMU	Ateneo de Manila University
AHP	Analytical Hierarchy Process
AIT	Asian Institute of Technology
AMC	Agribusiness Master Class
AO	Administrative Order
APAARI	Asia Pacific Association of Agricultural Research Institutions
APC	Adaptive planning calendar
APC-Columbia	Colombian Presidential Agency of International Cooperation
APEC	Asia-Pacific Economic Cooperation
APEC YST	APEC Young Scientist Training
APEC-PPSTI	APEC-Policy Partnership for Science, Technology and Innovation
APO	Asian Productivity Organization
AREEO	Agricultural Research, Education and Extension Organization
ARIA	Academic Relations and International Affairs
ARNP	Apo Reef Natural Park
ARNP-PAMO	ARNP-Protected Area Management Office
ART	Assisted Reproduction Technologies
ASC	Apayao State College
ASEAN	Association of Southeast Asian Nations
ASEAN-COSTI	Committee on Science, Technology and Innovation
ASPAC	Asia-Pacific
ATBI	Agri-Aqua Technology Business Incubation
AutoFurrow	Automated Furrow Irrigation System
AWM	Area wide management
AWS	Automatic Weather Station
BARMM	Bangsamoro Autonomous Region of Muslim Mindanao
BatSU	Batangas State University
BCAARRD	Bicol Consortium for Agriculture, Aquatic and Natural Resources Research and Development
BioAP	Biotechnology Authority of the Philippines

BISU	Bohol Island State University
BiVER	Biodiversity and Vulnerable Systems Research
BNP	Bataan National Park
BSC	Blue swimming crabs
BSP	Balik Scientist Program
BSU	Benguet State University
BSU-ATBI	Benguet State University's Agri-Aqua Technology Business Incubation
BTLP	Balinsasayao Twin Lakes Natural Park
BUCAF	Bicol University College of Agriculture
CALABARZON	Cavite, Laguna, Batangas, Rizal, Quezon
CAPHE	Coffee Application Harvest Estimator
CapSU	Capiz State University
CAR	Cordillera Administrative Region
CCAARRD	Caraga Consortium for Agriculture, Aquatic, Forestry, and Natural Resources Research and Development
CCAFS	Climate Change, Agriculture and Food Security
CESO	Career Executive Service Officer
CGIAR	Consultative Group on International Agricultural Research
CHED	Commission on Higher Education
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CLAARRDEC	Central Luzon Agriculture, Aquatic and Resources Research and Development Consortium
CLM	Cambodia, Lao PDR, and Myanmar
CLSU	Central Luzon State University
cm	Centimeters
CMI	Consortia Member Institutions
CMU	Central Mindanao University
CNSC	Camarines Norte State College
COA	Commission on Audit
CorCAARRD	Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development
CORRA	Council for Partnership on Rice Research in Asia
CPBRD	Congressional Planning and Budget Research Department
CPUE	Catch per unit effort
CRB	Citrus rind borer
CRD	Crops Research Division
CSC	Civil Service Commission
CSet	Coconut somatic embryogenesis technology
CSF	Classical swine fever; customer satisfaction feedback
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSU	Caraga State University

CTU	Cebu Technological University
CVAARRD	Cagayan Valley Agriculture, Aquatic and Resources Research and Development Consortium
CVAARRDEC	Central Visayas Agriculture, Aquatic and Natural Resources Research and Development Consortium (formerly CVCIRRD)
CvSU	Cavite State University
DA	Department of Agriculture
DA-BAI	DA-Bureau of Animal Industry
DA-BFAR	DA-Bureau of Fisheries and Aquatic Resources
DA-BPI	DA-Bureau of Plant Industry
DA-FPA	DA-Fertilizer and Pesticide Authority
DA-PCA	DA-Philippine Coconut Authority
DA-PCC	DA-Philippine Carabao Center
DA-PhilRice	DA-Philippine Rice Research Institute
DA-RFO	DA-Regional Field Office
DA-SRA	DA-Sugar Regulatory Administration
DAP	Development Academy of the Philippines
DBM	Department of Budget and Management
DC	Directors' Council
DCAF	Drought and Crop Assessment and Forecasting
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DLSU	De La Salle University
DNA	Deoxyribonucleic acid
DOST	Department of Science and Technology
DOST-FNRI	DOST-Food and Nutrition Research Institute
DOST-FPRDI	DOST-Forest Products Research and Development Institute
DOST-ITDI	DOST-Industrial Technology Development Institute
DOST-NCR	DOST-National Capital Region
DOST-PCAARRD	DOST- Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
DOST-PCAMRD	DOST-Philippine Council for Aquaculture and Marine Resources Research and Development
DOST-PCIEERD	DOST-Philippine Council for Industry, Energy and Emerging Technology Research and Development
DOST-PSHS	DOST-Philippine Science High School
DOST-SEI	DOST-Science Education Institute
DPITC	DOST-PCAARRD Innovation and Technology Center
DRR-CCAM	Disaster Risk Reduction-Climate Change Adaptation and Mitigation
DSS	Decision Support System
DSSAT	DSS for Agro-technology Transfer
DTI	Department of Trade and Industry

e-ASIA	East Asia Science and Innovation Area
ECQ	Enhanced community quarantine
ED	Executive Director
EFSB	Eggplant fruit and shoot borer
ENR	Environment and natural resources
EPF	Entomopathogenic fungi
EPN	Entomopathogens
EPP	Enriched Potting Preparation
EU	European Union
EVCCRD	Eastern Visayas Center for Crustacean Research and Development
FAD	Finance and Administration Division
FAW	Fall armyworm
FB	Facebook
FERD	Forestry and Environment Research Division
FFC	Freshwater Fisheries Center
FFTC	Food and Fertilizer Technology Center
FGD	Focus group discussion
FI	Furrow irrigation
FP	Fertilization rate
g	Gram
GAD	Gender and Development
GAD AR	GAD Accomplishment Report
GALING	Good Agri-Aqua Livelihood Initiatives towards National Goals
GAS	General Administration Support
GC	Governing Council
GESDA	Geographically, Economically and/or Socially Disadvantaged
GFPS	GAD Focal Point System
GIA	Grants-In-Aid
GIS	Geographic information system
GIS-based ALCAMS	GIS-based Agroforestry Land Capability Mapping Scheme
GIU	Geographic insurance units
GMEF	GAD Mainstreaming and Evaluation Framework
GMMS	Gender Mainstreaming Monitoring System
GO	Government organization
GPB	GAD Plan and Budget
GPPB	Government Procurement Policy Board
GPS	Global positioning system
GREAT	Graduate Research and Education Assistantship for Technology
GTIS	Global technology and information search
Ha	Hectare
HABs	Harmful algal blooms

HAGABI	Harnessing Agriculture for A Bountiful Ifugao
HEI	Higher Education Institutions
HGDG	Harmonized Gender and Development Guidelines
HNRDA	Harmonized National Research and Development Agenda
HRDP	Human Resources Development Program
IA	Impact assessment
IAMMST	Informal ASEAN Ministerial Meeting on Science and Technology
IARRD	Inland Aquatic Resources Research Division
IATF	Inter-Agency Task Force
ICT	Information and communications technology
IDD	Institution Development Division
IDtech Lab	IDtechnologies Laboratory, Inc.
IEC	Information, education, and communication
IESM	Institute of Environmental Science and Meteorology
IGB	Intelligent Green Box
ILAARRDEC	Ilocos Agriculture, Aquatic and Resources Research and Development Consortium
IMTA	Integrated Multi-trophic Aquaculture
INPRA	Itogon Native Pig Raisers Association
IP	Intellectual property; ItikPINAS
IP-TBM	Intellectual Property and Technology Business Management
IPOPhil	Intellectual Property Office of the Philippines
IQA	Internal Quality Audit
IRRI	International Rice Research Institute
ISO	International Organization for Standardization
ISP	Industry Strategic S&T Plan/Program
ISU	Isabela State University
ITMoB	Integration of traditional and modern bioproducts systems for a sustainable and resilient future under climate ecosystem changes
ITPS	Industrial tree plantation species
JAF	Jiangxi Academy of Forestry
JRP	Joint Research Program
JSPS	Japan Society for the Promotion of Science
JST	Japan Science and Technology Agency
JxAAS	Jiangxi Academy of Agricultural Sciences
KBA	Key biodiversity areas
KII	Key informant interviews
KM	Knowledge Management
KM4AANR	Knowledge Management for Agriculture, Aquatic and Natural Resources
KSS	Knowledge Sharing System
KSU	Kalinga State University
L	Liters

LAGT	Laguna Tall
LAMP	Loop Mediated Isothermal Amplification
LB	Los Baños
LBCA	Laguna College of Business and Arts
LB-LGU	LB local government unit
LBSCFI	Los Baños Science Community Foundation, Inc.
LGU	Local government units
LIFE	Livelihood Improvement through Facilitated Extension
LMS	Learning Management System
LRD	Livestock Research Division
LSPU	Laguna State Polytechnic University
m	Meter
M	Million
m^2	Square meter
m^3	Cubic meter
MAARRDEC	MIMAROPA Agriculture, Aquatic and Natural Resources Research and Development Consortium
M&E	Monitoring and evaluation
MARDI	Malaysian Agricultural Research and Development Institute
MECO-TECO	Manila Economic and Cultural Office-Taiwan Economic and Cultural Office
MENRO	Municipal Environment and Natural Resources
MHWs	Marine heat waves
MIMAROPA	Mindoro, Marinduque Romblon, Palawan Region
MinSCAT	Mindoro State College of Agriculture and Technology
MISD	Management Information Systems Division
ml	Milliliters
MMSU	Mariano Marcos State University
MOA	Memorandum of Agreement
MOST	Ministry of Science and Technology
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MRRD	Marine Resources Research Division
MS	Master of Science
MSC	Marinduque State College
MSME	Micro-, small-, and medium-enterprises
MSU	Michigan State University
MSU-Naawan	Mindanao State University-Naawan
MSU-Tawi-Tawi	Mindanao State University-Tawi-Tawi
MT	Metric tons
MTFR	Mt. Bandilaan Forest Reserve
NAARRDN	National Agriculture, Aquatic and Natural Resources Research and Development Network

NALUA	National Land Use Act
NARES	National Agricultural Research and Extension Systems
NARS	National Agriculture Research System
NASA	National Aeronautics and Space Administration
NCBP	National Committee on Biosafety of the Philippines
NCR	National Capital Region
NDVI	Normalized Differential Vegetation Index
NEDA	National Economics and Development Authority
NGA	National government agencies
NGO	Non-government organization
NHLA	National Hardwood Lumber Association
NICER	Niche Centers in the Regions
nm	Nanometer
NOMCAARRD	Northern Mindanao Consortium for Agriculture, Aquatic and Natural Resources Research and Development
NSAARRD	National Symposium on Agriculture and Aquatic Resources Research and Development
NSTW	National Science and Technology Week
NVSU	Nueva Vizcaya State University
NwSSU	Northwest Samar State University
OED-ARMSS	Office of the Deputy Executive Director for Administration, Resource Management and Support Services
OED-RD	Office of the Deputy Executive Director for Research and Development
OHN	Organic herbal nutrient
OIC	Officer-in-Charge
PAC	Policy Advisory Council
PAG	Policy Action Group
PAGRO	Provincial Agriculturists Office of Davao del Norte
PBB	Performance Based Bonus
PCA	Philippine Coconut Authority
PCAR	Philippine Council for Agricultural Research
PCARR	Philippine Council for Agricultural Resources Research
PCARRD	Philippine Council for Agriculture, Forestry and Natural l Resources Research and Development
PCMD	Policy Coordination and Monitoring Division
PCR	Polymerase chain reaction
PCW	Philippine Commission on Women
PES	Payment for ecosystem services
PESO	Public Employment Services Office
PhD	Doctor of Philosophy
PIP	Publication Incentive Program
PNG	Papua New Guinea
POT	Package of technology

PPC	Pascual Pharma Corporation
PPEs	Personal protective equipment
PPSTI	Policy Partnership on Science, Technology and Innovation
PRAISE	Program on Awards and Incentives for Service Excellence
PRRS	Porcine reproductive and respiratory syndrome
PSAU	Pampanga State Agricultural University
PSU	Palawan State University
PWD	Persons with disability
QMS	Quality Management System
QPM	Quality planting materials
QRP	Quick Response Projects
R&D	Research and development
RA	Republic Act
RBME	Results-based monitoring and evaluation
RCP	Regional Collaborative Program
RDA	Rural Development Administration
RDI	Research and Development Institute
rDNA	Recombinant DNA
RDRU	R&D results utilization
ReAARRC	Rebuilding the Agriculture, Aquatic and Natural Resources in Response to COVID-19
RMP	Risk Management Plan
RNA	Ribonucleic Acid; Research in Nutrigenomics of Aquatic Animals
RRDCC	Regional Research and Development Coordinating Council
RSPL	Raja Sikatuna Protected Landscape
RSRDH	Regional Symposium on R&D Highlights
RT-LAMP	Reverse Transcription-Loop Mediated Isothermal Amplification
RT-PCR	Reverse Transcription-Polymerase Chain Reaction
S&T	Science and technology
SAFE	Science and Technology Action Frontline for Emergencies and Hazards
SAFE CAR	Disaster Risk Reduction on Climate Change Impacts on Agricultural Farms in the Cordillera Administrative Region
SAFE-PNADRRHAB	SAFE Project on Philippine Native Animals for Disaster Risk Reduction in Hazard-Prone Areas of Benguet
SARAI	Smarter Approaches to Reinvigorate Agriculture as an Industry
SCB	Sub-Committee on Biotechnology
SciCAT	Science for the Convergence of Agriculture and Tourism
SCoPSA	Sustainable corn production in sloping areas
SeaRDeC	Seaweed R&D Center
SEC	Securities and Exchange Commission
SEI	Science Education Institute
SemEx	Semen extender

SERD	Socio-Economic Research Division
SIPAG	Strategic Industry S&T Programs for Agri-Aqua Growth
SKSU	Sultan Kudarat State University
SLA	Sustainable Livelihood Approach
SLIMS	Science Library Integrated Management System
SLSU	Southern Luzon State University
SMAARRDEC	Southern Mindanao Agriculture, Aquatic and Natural Resources Research and Development Consortium
SNAP	Simple Nutrient Addition Program
SOXAARRDEC	SOCCSKSARGEN Agriculture, Aquatic and Resources Research and Development Consortium
SSU	Samar State University
STAARRDEC	Southern Tagalog Agriculture, Aquatic and Resources Research, Development and Extension Consortium
STAND	'Science, Technology and Action' Nexus for Development (STAND)
STC4ID	S&T Community-based Program for Inclusive Development
STI	Science, technology and innovation
STVR	Standardized Vegetation Temperature Ratio
SUCs	State universities and colleges
SUSTAIN	Support to the University's Strategies in Technology Acceleration Initiatives by Nurturing
TAC	Technical Advisory Committee
TACDxLAGT	Tacunan Dwarf x Laguna Tall
TARI	Taiwan Agriculture Research Institute
TAU	Tarlac Agricultural University
TBI	Technology business incubator
TC/ha	Ton-cane per hectare
TECO	Taiwan Economic and Cultural Office
TPL	Talibon Protected Landscape
TTPD	Technology Transfer and Promotion Division
TWG	Technical working group
UAVs	Unmanned aerial vehicles
UEP	University of Eastern Philippines
UK	United Kingdom
UKRI	United Kingdom Research and Innovation
UN	United Nations
UNOSSC	United Nations Office for South-South Cooperation
UPD	University of the Philippines Diliman
UP-IESM	UP-Institute of Environmental Science and Meteorology
UPLB	University of the Philippines Los Baños
UPLB-DTRI	UPLB-Dairy Training and Research Institute
UPLB-IPB	UPLB-Institute of Plant Breeding

UP-MSI	UP-Marine Science Institute
UPM	University of the Philippines Manila
UPMin	University of the Philippines Mindanao
UPV	University of the Philippines Visayas
URS	University of Rizal System
USA	United States of America
USB	Universal serial bus
USeP	University of Southeastern Philippines
USM	University of Southern Mindanao
UST	University of Santo Tomas
VCO	Virgin coconut oil
ViCARP	Visayas Consortium for Agriculture, Aquatic and Natural Resources Program
VIP CORALS	Verde Island Passage Center of Oceanographic Research and Aquatic Life Sciences
VSU	Visayas State University
WAISS	Water Advisory for Irrigation Scheduling System
WESMAARRDEC	Western Mindanao Agriculture, Aquatic and Natural Resources Research and Development Consortium
WESVAARRDEC	Western Visayas Agriculture, Aquatic and Resources Research and Development Consortium
WFH	Work from home
WIBI	Weather Index-based Crop Insurance
Wi-Fi	Technology for wireless local area networking with devices based on the IEEE 802.11 standards; Wi-Fi is a trademark of the Wi-Fi Alliance
WMSU	Western Mindanao State University
WPU	Western Philippines University
WSSV	White Spot Syndrome Virus
WVSU	West Visayas State University

Appendices

GOVERNING COUNCIL, CY 2020

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Hon. William D. Dar (Vice-Chair)
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(until June 2019)

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University of the Philippines Los Baños
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November 1 to December 31

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Miag-ao, Iloilo
January 1 to October 31

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November 1 to December 31

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Santeh Feeds Corporation
Quezon City

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(January–August 17)

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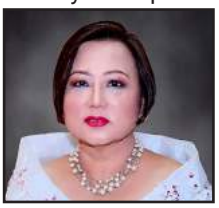
Region/Consortium Base Agency	RRDCC Chairpersons	Consortium Directors
CAR – **CorCAARRD** (Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development) Benguet State University (BSU)	 **Dr. Feliciano G. Calora, Jr.** President, BSU (January 1 to June 5)  **Dr. Eduardo T. Bagtang** President Kalinga State University (KSU) Officer-In-Charge June 6 to November 25  **Dr. Felipe Salaing Comila** President BSU November 26 to December 31	 **Dr. Ruth S. Batani** Vice President (VP) for Research and Extension, BSU
Region I – **ILAARRDEC** Ilocos Agriculture, Aquatic and Resources Research and Development Consortium Mariano Marcos State University (MMSU)	 **Dr. Shirley C. Agrupis** President, MMSU	 **Dr. Epifania O. Agustin** Executive Assistant IV, MMSU
Region II – **CVAARRD** Cagayan Valley Agriculture, Aquatic and Resources Research and Development Consortium Isabela State University (ISU)	 **Dr. Ricmar P. Aquino** President, ISU	 **Dr. Miladis M. Afidchao** Professor V, ISU

Region III – **CLAARRDEC** Central Luzon Agriculture, Aquatic and Resources Research and Development Consortium Central Luzon State University (CLSU)	 **Dr. Honorio M. Soriano, Jr.** President, Pampanga State Agricultural University (PSAU)	 **Dr. Fe L. Porciuncula** VP for Research, Extension and Training (RET), CLSU
Region IV-A – **STAARRDEC** Southern Tagalog Agriculture, Aquatic and Resources Research, Development and Extension Consortium Cavite State University (CvSU)	 **Dr. Hernando D. Robles** President, CvSU	 **Dr. Marilyn M. Escobar** Dean, CvSU
Region IV-B – **MAARRDEC** MIMAROPA Agriculture, Aquatic and Natural Resources Research and Development Consortium Mindoro State College of Agriculture and Technology (MinSCAT)	 **Dr. Levy B. Arago, Jr.** President MinSCAT	 **Dr. Maria Concepcion L. Mores** Vice President for Research, Development and Extension, MinSCAT
Region V – **BCAARRD** Bicol Consortium for Agriculture, Aquatic and Natural Resources Research and Development Bicol University-College of Agriculture and Forestry (BUCAF)	 **Dr. Arnulfo M. Mascariñas** President, Bicol University	 **Dr. Marissa N. Estrella** Professor, BUCAF
Region VI – **WESVAARRDEC** Western Visayas Agriculture, Aquatic and Resources Research and Development Consortium West Visayas State University (WVSU)	 **Dr. Raul F. Muyong** President, Iloilo Science and Technology University (ISAT-U)	 **Dr. Pastor Jones T. Denusta** Associate Professor, VSU
Region VII – **CVAARRDEC** Central Visayas Agriculture, Aquatic and Natural Resources Research and Development Consortium Bohol Island State University (BISU)	 **Dr. Regucivilla A. Pobar** President, BISU	 **Dr. Zina D. Sayson** VP for Research Development and Extension, BISU

Region VIII – **VICARP** Visayas Consortium for Agriculture, Aquatic and Natural Resources Program Visayas State University (VSU)	 **Dr. Edgardo E. Tulin** President, VSU	 **Dr. Othello B. Capuno** VP for Research, Extension and Innovation, VSU
Region IX – **WESMAARRDEC** Western Mindanao Agriculture, Aquatic and Natural Resources Research and Development Consortium Western Mindanao State University (WMSU)	 **Dr. Milabel E. Ho** President, WMSU January 1 to April 16  **Dr. Ma. Carla A. Ochotorena** President WMSU September 3 to December 31	 **Dr. Teresita A. Narvaez** Vice President for Resource Generation and Professor, WMSU *also assumed as OIC-President and RRDCC Chairperson April 17 to September 2
Region X – **NOMCAARRD** (Northern Mindanao Consortium for Agriculture, Aquatic and Natural Resources Research and Development) Central Mindanao University (CMU)	 **Dr. Jesus Antonio G. Derije** President, CMU	 **Dr. Agnes S. Riñon** Associate Professor III, CMU January 1 to January 12  **Dr. Emmanuel P. Leaño** Professor V CMU January 13 to December 31

Region XI – **SMAARRDEC** Southern Mindanao Agriculture, Aquatic and Natural Resources Research and Development Consortium University of Southeastern Philippines (USeP)	 **Dr. Anthony C. Sales** Regional Director (DOST-Region XI) (January 1 to December 7)  **Dr. Lourdes C. Generalao** President University of Southeastern Philippines (USeP) December 8 to 31	 **Dr. Gilbert A. Importante** Dean, College of Applied Economics USeP
Region XII – **SOXAARRDEC** (SOCCSKSARGEN Agriculture, Aquatic and Resources Research and Development Consortium) formerly CAARRDEC	 **Dr. Rolando F. Hechanova** President, Sultan Kudarat State University (SKSU)	 **Dr. Elizabeth C. Molina** Professor VI, USM
Region XIII – **CCAARRD** (Caraga Consortium for Agriculture, Aquatic, Forestry and Natural Resources Research and Development) Caraga State University (CarSU)	 **Dr. Anthony M. Penaso** President, CarSU	 **Dr. Raquel M. Balanay** Professor V, CarSU

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The PCAARRD Logo

The basic figure in DOST-PCAARRD's logo is from its mother agency's (the Department of Science and Technology) logo, which consists of four circles joined together side by side to form a square. The circles symbolize unit particles, the building blocks of nature which are the subject and substance of science and technology. The circle design represents movement signifying progress through Science and Technology (S&T). The center square represents DOST-PCAARRD and is composed of a human figure carrying an oversized headgear or 'salakot.' The human figure with extended arms represents the research and development (R&D) community fused into a world-class research enterprise working towards enhancing productivity, innovative capacity, and global competitiveness in agriculture, aquatic, and natural resources (AANR) sectors.

The salakot, a traditional Filipino wide-brimmed hat depicts the Council's commitment to protect and improve the lives and well-being of the common farmers and fisherfolk by enabling the national agriculture, aquatic, and resources research and development system (NAARRDS) to respond to the challenges and impact of a constantly changing environment.

The brims in the salakot symbolize the joint efforts and collaborative S&T interventions for the AANR sectors. The upper green brim depicts the agriculture and natural resources while the lower blue brim represents the aquatic and marine resources sectors, which all require sustainable use and management.

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