



RESEARCH FOR DEVELOPMENT BARDIGEST

The official magazine of the Department of Agriculture-Bureau of Agricultural Research

**The real “Masaganang
Ani at Mataas na Kita”
on tilapia nursery rearing**

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ABOUT THE COVER

Aimed to empower and enhance the skills, knowledge, and practices of fish farmers in attaining the Department of Agriculture's (DA) goal of "Masaganang Ani at Mataas na Kita," the DA-National Fisheries Research and Development Institute and the DA-Bureau of Fisheries and Aquatic Resources-National Freshwater Fisheries Technology Center implemented a project that employs different technological advancements on tilapia hatchery and nursery operations like the modified intensive tilapia hatchery and the fry rearing of tilapia; hence, maximizing the reproductive capacity of tilapia breeders.



PHOTO:MPGARCIA/DA-BFAR CAR

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BAR R4D DIGEST is the quarterly magazine of the Department of Agriculture-Bureau of Agricultural Research.

This magazine contains feature stories on the latest technologies and breakthroughs in agriculture and fishery research for development (R4D) based on the studies and researches conducted by the member-institutions of the National Research & Development System for Agriculture and Fisheries.

The bureau was established to lead and coordinate the agriculture and fishery R4D in the country.

The editorial board welcomes comments and suggestions from readers. Reach us via our email kmisd@bar.gov.ph and our social media accounts [f](#) [i](#) [v](#) [t](#) [y](#) DABAROfficial.

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Pulling the R4D rod for a good catch of technologies

by Dr. Vivencio R. Mamaril

Philippines with extensive water resources is parallel to having a rich aquaculture and capture fisheries resources. A Food and Agriculture Organization report in 2020 reflected that Philippines ranked eight as major fish producing country in the world. The Philippine Fisheries Profile 2019 released by the Department of Agriculture-Bureau of Fisheries and Aquatic Resources reported that “fishing industry’s contribution to the country’s Gross Domestic Products were 1.2 percent and 1.3 percent at current and constant 2,000 prices, respectively.”

Research for development programs, activities, and projects would pave the way to generating relevant technologies that can help contribute in ensuring the sustainable production, hence, increasing the livelihood and income of the fisherfolk.

The DA-Bureau of Agricultural Research, one of the staff bureaus of the Department of Agriculture (DA), has been a strong ally together with the DA-Bureau of Fisheries and Aquatic Resources (BFAR) and the DA-National Fisheries Research and Development Institute (NFRDI).

As reflected in the National Research and Development, Extension Agenda and Programs (RDEAP) 2016-2022 aligned with the Comprehensive National Fisheries Industry Development Plan, the developed and supported technologies include cost-effective feeds, culture techniques, post-harvest technologies that focus on by-product utilization and value addition, facilities and equipment upgrading, resource assessments, physiological evaluation, and traceability studies—geared towards improving aquaculture techniques and protocols.

With the global pandemic crisis hitting various sectors in the world, DA and its agencies exerted efforts and initiatives to address and provide the needed support and program interventions to address the challenges, disruption, difficulties, as well as enormous changes to the daily lives of all.

DA crafted the “Ahon Lahat, Pagkaing Sapat (ALPAS) Laban sa COVID-19” Program. Anchored to this is the bureau’s Resiliency Response Research for Development (3R) Program for the New Normal.

The fisheries sector, in particular, is aimed to ensure sustainable quality seed stock of economically important aquaculture commodities by engaging village level

hatcheries/nurseries and increasing fish production through adoption of relevant mature technologies.

Various projects and research studies are further supported to ensure outscaling and upscaling of technologies for extension and food production support.

On this note, the bureau over the years, with or without pandemic, has supported a number of technologies to achieve an increased and sustained food production, and ensure availability and accessibility for the agriculture and fisheries sector.

Featured on this second quarter issue of BAR R4D Digest are research studies on blue swimming crab stock enhancement, *Sargassum* harvest protocol, aquaponics, sardines value chain analysis, and technology business incubation of tilapia best production practices.

Dr. Maria Theresa Mutia, NFRDI chief science research specialist, shared the tilapia production and developed good aquaculture practices. While DA-BFAR-Bicol Region shared how the region introduced cage culture of red tilapia in Lake Bato, Camarines Sur. A glimpse of the community pantries established in Luzon can also be seen which became an additional activity of the project that evaluates the performance of red tilapia cultured in marine and freshwater cages in five regions in Luzon.

Providing readers especially interested investors or budding agripreneurs, a financial viability of the tilapia ice cream developed product and the recipe on crab meat balls can be seen in this issue. The best practices for tilapia hatcheries and nurseries and stock enhancement for blue swimming crab in Visayas regions, respectively, are translated into infographics.

Women’s association processing seaweed and a fisherfolk that dealt on tilapia hatchery and nursery rearing imparted their stories of success upon adoption of postharvest/processing technologies, and best practices. From mere beneficiaries, they now serve as steady partners in achieving a sustainable and resilient fisheries sector.

Hope you find the featured technologies and stories relevant and further encourage us all to continuously swim and rise above in generating, disseminating, and adopting the R4D technologies useful to our fisherfolks, hence, fisheries industry. ###

Future of farming: Putting fishes in farms

by Jireh Alodia R. Laxamana

As tides have been rising and falling, aquaponics is continuously making waves amidst conventional farming. A combination of aquaculture and hydroponics, the aquaponics system is the practice of growing fishes, plants, and bacteria together in one integrated system. In a nutshell, with its name saying it all—“aquaponics” comes from the combination of two culture systems: Aquaculture (aqua) and Hydroponics (ponics).

Comprehensively, aquaculture is the practice of raising aquatic plants and animals, while hydroponics refers to the soilless gardening of plants. Sharing a relationship that is symbiotic and mutual, plants, fishes, and bacteria have important roles to play. Such that, the plants help in the filtration and absorption of nitrates from the water, thereby providing a better quality of water and healthy environment for the fishes; while the fishes provide wastes— which are then converted by bacteria into nitrates—that are needed by the plants to grow and survive.

Aquaponics system as another sustainable and profitable food source

In line with strengthening and intensifying food production, security, and resiliency in the country given the pandemic situation— urban aquaponics is one of the innovative farming system solutions that has been thought of by the Department of Agriculture (DA) in support of its Plant, Plant, Plant Program, which is being spearheaded by the DA-Bureau of Fisheries and Aquatic Resources (BFAR).

Cognizant to this, aquaponics systems not only helped address food sustainability concerns, but have also provided livelihood programs in various urban households and communities.

In the spirit of resiliency and rising all together, the DA-BFAR Cordillera Administrative Region (CAR) shared their harvested fresh produce to an organized community pantry in Brgy. Guisad, Baguio City on 26 April 2021.

With tilapia and lettuce being the fresh produce that were harvested, the DA-BFAR-CAR coordinated with Brgy. Captain Marion Bondad regarding the agricultural products for distribution. Specifically, regional director Dr. Lilibeth Signey led the harvesting of tilapia (10 kilograms) and lettuce (1.75 kilograms) from the aquaponics system setup at the DA-BFAR-CAR.

Not only that, but urban households have also been establishing their own aquaponics systems at the comfort of their homes. As a matter of fact, among those who practice this farming system were mostly residents in Baguio City.

Aside from lettuce and fishes, varieties of fruits and vegetables that can also be harvested include strawberry, tomato, *pakchoy*, upland *kangkong*, and watercress.

Before the pandemic hit, urban households sold their fresh produce in the markets and during agricultural events; however, due to unforeseen events, their neighborhood served as their niche market. Nevertheless, through it,

urban households became capable of making food available, not only for their own families, but for their communities as well; hence, serving as supplementary source of income.

Value Chain Analysis of Aquaponics


If one is thinking of starting up a small-scale aquaponics (domestic backyard) or commercial aquaponics, it is vital to familiarize oneself with regards to different aquaponics types, designs, and respective costs.

First, the basic construction of an aquaponics system includes fish tank, grow beds, water, aeration, filtration systems, shed or greenhouse, and other components like solar power system and lighting. Second, factors such as environmental conditions, enough light and temperature exposure, selected sites, and plant choices must also be considered for an aquaponics setup.

Based on a report presented by DA-BFAR with regards to cost and return analysis, for a capital investment of PhP 16,713, the possible gross sales for tilapia, catfish, and lettuce would yield an estimate of PhP 27,717.12.

With the net income per year resulting to PhP 4,954.08— the return on investment for an aquaponics system is 18.98 percent. Meaning, in 5.27 years (payback period), one would recover, if not more, the cost of their original investment.

Not only these, but business ventures in aquaponics could lead



to a lot of pathways— one of which is being the supplier to different Korean barbecue restaurants where *samgyeopsal* remains as the most preferred meal. Wrapped in fresh lettuce leaf, the grilled pork belly would be incomplete without the former, especially if, demand for unlimited meat comes hand in hand with demand for unlimited lettuce leaf.

Either this or the one mentioned above (i.e., selling fresh produce in the market), there are a lot of ways to earn money through aquaponics.

Given the value chain analysis of the aquaponics system, it is indeed a profitable business considering the advantages of it— such that, it is cost- and resource-efficient, sustainable, adaptable, and it requires less maintenance effort.

Through this urban aquaponics initiative, fishes and vegetables have become more accessible and available among communities. Along with the changing water currents, fishes in farms could be profited as those fishes in seas.

Not only do these fishes are determining the flow of fishing, but they are also changing the landscape of farming— and that is, through aquaponics. ###

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PHOTO COURTESY OF MPGARCIA/DA-BFAR IFAD

Shining, shimmering sardines: Sustainable, healthy, and affordable

by Jireh Alodia R. Laxamana

Comparable to that of a disco ball of the seas and oceans, sardines are like silver glitters— always moving in families, migrating along the coast, and living on feeding vast quantities of plankton.

A good source of protein, omega-3 fatty acids, calcium, selenium, taurine, and vitamin D— one could never go wrong with sardines. Considered as one of the most nutritious food in the country, a school of small sardines shall continue being a sustainable food for all the Filipinos in the years to come.

Despite the fact that they do not have a specific defense mechanism, a family of sardines rely on sticking together in unity. Like a mirror, they also reflect light from all angles through their silvery scales; hence, deflecting the attacks of their predators.

The project that delved into the sardine fishery industry

Funded by the Department of Agriculture-Bureau of Agricultural Research (DA-BAR) in 2017 under its National Technology Commercialization Program, the project “Value Chain Analysis of Sardine Fisheries in the Philippines for Improved Industry Performance” was implemented by the University of the Philippines Visayas (UPV).

With the goal of determining the effectiveness of developed technologies, as well as evaluating the performance of the sardine fishery industry vis-à-vis its

contribution to food security and employment especially in coastal communities—the project has two phases: analysis of the present status of the supply chain of sardines and pilot testing of newly designed interventions. This fisheries research project aimed to boost the country’s top sardine producing regions (i.e., Bicol, Western Visayas, Zamboanga Peninsula, CALABARZON, and MIMAROPA, among others) which were selected as representative sites.

Under the project, series of trainings were also conducted to further promote the utilization of sardines and boost its economic potential. This was also to train the locals on different opportunities and value-adding technologies in order to help increase their income.

Among the topics discussed during the visits of the project team include the general steps in sardine *patis*, sardine *lamayo*, sardine *hamonado*, and bottled sardines processing. Furthermore, in 2020, the UPV College of Fisheries and Ocean Sciences released their online “Sagip Pangisdaan Program: Fish Processing InfoSeries.” This activity featured the posters on different processing steps of the abovementioned sardines-based products that were developed by the project team. The project wanted to ensure that through the online sharing of learning videos and information, education, and communication materials—the flow of learning among its target audience would continue amidst the COVID-19 health crisis.

Value chain analysis of sardine fisheries

Analyzing the value chain networks of the sardine fishery industry is vital in identifying what needs to be improved. Either in the production or marketing system, inefficiencies or inequalities between fishers and community locals could effectively be addressed if the dynamics of the value chain are examined.

Based on the accomplishment report of the VCA Sardine Project, the supply chain map of sardines includes inputs, production, primary trading, processing (i.e., drying, canning, bottling, salting, fermenting, and smoking), distribution or marketing, and consumption. For the project, information or practices on sardines’ food quality and safety, flow of goods, management and conservation, and climate resilience, among others were explored to improve value-adding, which in turn will increase profit among locals.

Since value chain analysis refers to the continuous process of improving activities, products, or services that would better satisfy the demands of the consumers— it is, without a doubt, that the sardine industry continues to be a thriving business. Either canned, dried, or sold fresh in the markets, sardines will continue to be in demand because they are widely considered as safe and abundant sources of nutrients.

Generation of sardine technologies to boost economy

A great opportunity to earn extra money, the “Value Chain Analysis of Sardine Fisheries in the Philippines for Improved Industry Performance” project of the UPV, indeed, gave livelihood opportunities to the locals through production of new sardine products and labor services.

Focusing on capability building activities, this project helped the residents in their pilot community utilize their fish catch through process variations of their sardine products. Once replicated in other areas, sardine processing would be contributing more in boosting the country’s economy.

In retrospect, just like how a disco ball shines and reflects light in all angles, sardines also serve as beacons of hope to the locals—be it families, communities, or fisherfolk in general—who want to improve their lives. ###

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Reseeding *alimasag*

by Rena S. Hermoso

Imagine yourself relaxing on a hot day by the shore. As the sunray intensifies, you are called in for lunch. In a very Filipino custom, you will be eating with your bare hands in a seafood boodle fight. You pick the nearest *alimasag* and crack it open, juice dripping down your hands.

During the peak months of the dry season in our country, before travel restrictions were placed to curb the spread of the COVID-19, most people were either chilling in the cool mountains of the Cordilleras or chilling by the beaches in Visayas. Going on island hopping usually entails having seafood as part of your meal, besides nothing beats eating them fresh.

Alimasag or blue swimming crab (BSC) is perhaps one of the most popular seafood in the Philippines. Its local commercial value is at PhP 150-300 per kilogram. We even export it to countries in East Asia, Europe, and Northern America.

Eleven years ago, according to the Department of Agriculture (DA)-Bureau of Agricultural Statistics, BSC became the fourth major fishery product in the Philippines valued at USD 67.6 million.

Like other commercially important seafood commodities, the BSC industry was beset with limited supply and high risk of overharvesting.

In 2011, a coalition of stakeholders in the crab industry in collaboration with DA-Bureau of Fisheries and Aquatic Resources (BFAR) developed the BSC Management Plan (BSCMP) to address the

need to conserve and protect the resource, Department of Interior and Local Government administrative order no. 1, series of 2014 (JAO).

“Both natural and man-made causes of the degradation of BSC habitats, coupled with the improper management of BSC resources in the country, resulted in the unsteady production of BSC over the last several years,” read The Philippines’ Blue Swimming Crab Fishery Root Cause Analysis Report of the United Nations Development Programme and DA-BFAR.

Published in 2020, the report was an in-depth sector analysis for BSC in the country as well as a review of the implementation of the BSCMP, with activities implemented until 2015.

Despite all these, BSC remains a high-profit industry. The Philippine Statistics Authority (PSA) reported that in 2018, production value of BSC in the country reached an all-time high of PhP 5.47 billion, but this was followed by a drop in 2019 to PhP 4.55 billion. In 2020, gross production value of BSC was PhP 4.45 billion.

Eastern Visayas is one of the major producers of BSC collected from the wild. Its collection is a major source of income of some fisherfolk in the region, specifically in Guian.

With increasing market demand for BSC, DA-BFAR continually conducts stock enhancement activities. The Guian Marine Fisheries and Development Center, the sole BSC hatchery in the region, has been part of the efforts to sustain the stock since 2009.

In July 2020, DA-National Fisheries Research and Development Institute-Marine Fisheries Research and Development Center (NFRDI-MFRDC) implemented the project titled, Stock Enhancement of the Blue Swimming Crab in Easter Samar, to increase the wild stock of BSC towards sustained livelihood opportunities for small-scale fishers.

The project was funded by DA-Bureau of Agricultural Research in response to the call of the Agriculture Secretary to ensure food security amidst the repercussions brought by the pandemic.

“BSC from the wild were conditioned to the breeding techniques of Southeast Asian Fisheries Development Center with minor modifications. Only healthy crab juveniles are selected for reseedling,” said NFRDI-MFRDC chief Nonita S. Cabacaba.

She added that, “Stock enhancement is a good way to replenish the depleted BSC stock in the wild to ensure the sustainability of the resource. However, its effect could be evident if there is a successive release of crablets every other month and it is conducted in a longer period of time.”

Thus, the project team will continue the reseedling activities until they reach the target number of crablets—150,000. They will also continuously monitor the catches of the crab fishers and reseedling even after the project.

Through the project, 6,913 crablets were successfully released in the

reseeding sites in Guiuan from January to June 2021.

“This brings the total number of crablets dispersed from October 2020 up to June 2021 to 58,250,” of which 51,337 were released in Dinahic reef and 6,913 in Bucaboc Reef, shared Cabacaba.

Before any stock enhancement activities, the project team oriented the fishing communities near the reseeding sites on the proper monitoring and safeguarding of the crablets. They discussed that berried crabs should be allowed to spawn first before it is sold to market as stipulated in the JAO.

“Crab fishers were also oriented on how to handle berried crabs especially those that are used for spawning in the hatchery,” she added.

Meanwhile, the fishers who received lying-in cages were tasked to record the number of berried crabs, to compute estimates on the number of eggs spawned per crab; thus adding natural recruitment. ###

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Saving *Sargassum*

by Rena S. Hermoso

In 2014, the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) banned the collection, harvesting, selling, and export of *Sargassum*.

“The high commercial value and consequently the demand in the global market for seaweeds particularly the brown macroalgae of the genus *Sargassum spp.* and the seagrasses has resulted in uncontrolled harvesting of both resources in the wild,” Fisheries Administrative Order no. 250, series of 2014 read.

“The loss of seagrass and *Sargassum* beds will consequently destroy the balance in the marine ecosystem and result in loss of shelter, and loss of food base to all aquatic organisms dependent on them, thus endangering their survival,” the order further reads.

At that time, a fisherfolk in Pangasinan shared that dried *Sargassum* was priced at only PhP 4 per kilo.

To which, national scientist and expert on seaweeds Dr. Gavino Trono, Jr. commented, “*Sargassum* is used as raw material for many high-priced products like cosmetics and medicine and in textile manufacturing. The fishermen are losing, and we and the environment are paying the high price because the seaweeds are getting depleted [as a result] of overharvesting.”

“*Sargassum* gatherers haphazardly uproot the whole thalli resulting

in their complete removal from the substrate. This practice is destructive to the *Sargassum* bed which leaves nothing for the *Sargassum* to regenerate new floral parts,” explained Dr. Trono.

Fast forward to four years later, DA-BFAR partially lifts the ban; allowing individual fisherfolk to collect, sell, trade, and transport *Sargassum* subject to seasonal restrictions and permit requirements. The amended order still prohibits collecting of naturally growing *Sargassum* and those that are still floating, and exporting fresh, raw dried, and powdered *Sargassum*.

Recognizing the need to strike a balance between exploring the potential of the *Sargassum* industry and conserving its natural stocks in the wild, something has to be done.

Dr. Trono, in collaboration with the Marine Science Institute of the University of the Philippines Diliman and Marine Environment and Resources Foundation Inc., implemented a project that assessed the biomass production capacities of the *Sargassum* beds in Northwestern Luzon and the effects of the proposed managed harvesting strategy on the conservation of the *Sargassum* beds.

Funded by DA-Bureau of Agricultural Research, the project was implemented in 14 municipalities from three provinces in Northwestern Luzon: San Fernando City and Bauan in

La Union; Santiago, San Esteban, Narvacan, Sta. Maria, Sinait, Cabugao, San Juan, Sto. Domingo, and Magsingal in Ilocos Sur; and Currimao, Burgos, and Pagudpod in Ilocos Norte.

Four *Sargassum* species were identified, namely *Sargassum aquifolium*, *Sargassum gracilimum*, *Sargassum ilicifolium*, and *Sargassum turbinariodes*.

“These *Sargassum* beds exhibited seasonal variations in peak biomass production with temperature being the most important driving factor as seen in other studies,” said Dr. Trono.

The sites in La Union peaks in April, Ilocos Sur in July, and Ilocos Norte from January to April.

Dr. Trono recommends “cut[ting] the main axes of *Sargassum* using scissors five to 10 centimeters above the holdfast instead of uprooting. The holdfast on the substrate regenerates new laterals for the next growth and reproductive cycle.”

“Harvesting should not be done during the peak reproductive season since this will diminish the source of propagules of new recruits in the next season,” he added.

He recommends harvesting *Sargassum* two to three months after the peak of biomass which will depend on the seasonal variation observed among *Sargassum* beds.

“

The high commercial value and consequently the demand in the global market for seaweeds particularly the brown macroalgae of the genus *Sargassum spp.* and the seagrasses has resulted in uncontrolled harvesting of both resources in the wild.

One of the outputs of the project is to produce a managed harvesting guideline of *Sargassum*.

Dr. Trono stressed that for the guideline to be effective, it should be specific to a location because of the seasonality differences in biomass peaks and reproductive periodicity. ###

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PHOTOS COURTESY OF GTRONOJR/UP-MSI

Potential of a non-traditional approach to technology business incubation for tilapia farming enterprise

by Salvacion M. Ritual and Marnelie G. Subong

Technology business incubation (TBI) is a venue for nurturing early-stage technology-based ventures that have high growth potential to become competitive businesses. Through this approach, technical and entrepreneurial skills of would-be agripreneurs are developed; and access to programs, facilities, and services from government and private sectors as well as human and financial resources are provided.

As a strategy to promote transfer and diffusion of technologies generated by the research institutions such as the state universities and colleges (SUCs), the Department of Agriculture-Bureau of Agricultural Research (DA-BAR) through its National Technology Commercialization Program, implemented/supported the TBI program to create a better environment for emerging entrepreneurship.

Normally, agriculture-based enterprises engaged in primary

production are not accommodated in traditional TBI set-up given the space requirements of farming. Therefore, there is no one-size-fits all approach that can be applied to all emerging or existing small and medium agri-enterprises.

In 2018, DA-BAR supported a project with the Center for Environmental Law and Policy Advocacy, Inc. to test and document alternative modality for facilitating the transfer and commercialization of technologies in fisheries-based enterprise, specifically small-scale tilapia production. In addition, the project intends to establish a community of practice contributing to a sustainable tilapia industry.

Aware of the challenges, and risks due to the nature of aquaculture, an alternative approach to TBI was employed given the following reasons: space requirement, to which the host institution would be needing at least 2.5 hectare property for 50 incubatees with an average of 500 square meters pond;

investment cost due to relocation of cooperators to the incubator (host university) and access to market, among others. A cost and return analysis showed the significant result of the TBI program on tilapia production compared to traditional farming.

The non-traditional TBI set-up did not provide the usual structure or space, as the farmer-cooperators or incubatees worked directly in their own ponds. The project team, however, ensured that the key elements for a successful TBI operation and management, as well as the needed requirements were documented.

Training, Mentorship, and Handholding

In close collaboration with experts from Central Luzon State University and DA-Bureau of Fisheries and Aquatic Resources (BFAR), the project team mentored small-scale tilapia growers on the best practices/technologies on tilapia production.

Fifty small-scale aqua-entrepreneurs from Nueva Ecija (67 percent), Tarlac (25 percent) and Aurora (8 percent) were selected as cooperators based on the criteria identified. More than 75 percent of the cooperators were owners which is a good indication when it comes to decision making particularly in the adoption of technology to be provided by the project. In addition, all of the cooperators follow cage culture utilizing earthen ponds which is critical in the technical support to be given for pond management.

Following the DA-BFAR-recommended tilapia production, the farmer-cooperators use improved strains in their own ponds with a size ranging from 500 to 3,500 square meters.

Proper coordination of site visits, scheduling, and tracking of production activities, and responding to the immediate concerns were implemented to ensure that technical needs of the cooperators are addressed. The incubator-incubatee hand-holding is an essential factor for TBI, ensuring that the mentoring activities are working, the facilities provided are appropriately utilized, and the interventions will contribute to sustainable enterprise.

Through this project, the incubatees have testified interest and willingness to continue the tilapia venture.

As incubatees, they realized the opportunities made available through TBI, mainly on access to technologies on growing tilapia—as a viable source of income.

Jacqueline Ramos from Tarlac, who is a rice, tilapia, and vegetable farmer in addition to raising cows as source of family income, attested how the extended technology on tilapia farming has helped her family with their everyday expenses. The technology and best practices such as improved tilapia strain, fertilization, feeding, stocking and harvesting as well as postharvest processing were adopted. Meanwhile, her tilapia produce was sold at PhP 90-100 per kilogram and is into online selling platform to reach a wider network of consumer and market

Another farmer-cooperator from Nueva Ecija, Jaime Directo, showed interest in tilapia farming but has no prior knowledge on it. As a cooperator of the project, Directo attended trainings on tilapia farming conducted by DA-BFAR. He applied the knowledge and skills learned from the trainings such as pond preparation, fertilization, feeding and harvesting, among others.

The tilapia produce was sold at PhP 40-80 per kilogram depending on the size. Though some challenges were experienced, he continued to venture into tilapia farming as source of additional income and food for his family.

The positive results of the non-traditional TBI modality for tilapia farming far outweighed the challenges and risks. The network of small-scale tilapia growers, local government units, and technical experts, organized through this project, provides a promising long term venue for exchanges of knowledge and creation of mutually beneficial opportunities.

The project team recommends a verification of the non-traditional TBI approach for other primary production based agri-enterprise. The non-traditional approach still allowed the incubators to equip, strengthen, and empower the incubatees towards committing to a science-based and profitable tilapia business venture. ###

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DA-BFAR-Bicol Region cage culture of in Lake Bato, Cam

Tilapia, an introduced fish brought to the Philippines in the 1950s, has found wide acceptance and popularity among Filipinos. There are several species and strains of tilapia that are being cultured in the country today.

The town of Bato in Camarines Sur is well known in Bicol Region for freshwater cage culture of tilapia since the 1970s. Many among the town's population are engaged either in fishing or fish farming. Thus, tilapia has become a staple in the diet and local economy of Bato. Through the years, the tilapia industry in Bato has experienced ups and downs, including such common problems as heavy lake siltation, seasonal fish kills, domestic and agricultural pollution, etc. Currently, the

tilapia cage culture in Lake Bato is in a moribund state mainly due to overcrowding of fish cages, exceeding the carrying capacity of the lake and resulting in low production and slow growth. It is in dire need of a booster shot in the arm to revive and invigorate the industry.

The Department of Agriculture-Bureau of Fisheries and Aquatic Resources Regional Office (DA-BFAR 5) Bicol Region, through its Regional Fisheries Research and Development Center (RFRDC) introduced and demonstrated the freshwater cage culture of red tilapia through a technology demo project. The said project was funded by the DA-Bureau of Agricultural Research (BAR), in collaboration with the local

government unit (LGU)-Bato, Camarines Sur.

The project team conducted various activities aimed at developing site- and climate-specific protocols for the grow-out culture of red tilapia.

Size #17 red tilapia fingerlings obtained from the region's Regional Freshwater Fisheries Center in Bula, Camarines Sur were stocked in floating net cages measuring at three different stocking densities. The stocks were fed twice daily with commercial tilapia feeds. Monthly sampling and monitoring of stock and water quality parameters were undertaken. The cage structures were also regularly checked and inspected for maintenance and repairs.



Introduces red tilapia Marines Sur

FROM THE REGION

by Ezer L. Quizon, RFT, OIC Research Manager
DA-BFAR 5-Regional Fisheries Research and Development Center

Upon reaching the marketable sizes, the red tilapias were harvested—total of which was 1,430.53 kilogram with an average body weight of 290 grams per piece or 3.5 pieces per kilogram. The overall survival rate was 48.76 percent for this first culture cycle.

About 150 kilograms of the harvested red tilapia were utilized for value-added product development to produce smoked red tilapia and *tapa* (marinated/dried). Some 300 pieces of the harvested stock (about 150 kilograms) were reserved as breeders and were distributed to two sites: DA-BFAR-Bicol Region hatcheries and to LGU-operated Bato Municipal Hatchery. The rest was donated to various recipients for community pantries.

In order to discuss and demonstrate the technology or protocols related to red tilapia culture, the project held a two-day Orientation cum Field Day. This included lectures, presentations, open-forum and free tasting. Participants to this activity included members of fisherfolk organizations, LGU-MAO and extension workers, students, members of the academe, and other stakeholders such as tilapia hatchery operators and fish traders.

The red tilapia has a similar if not better growth and survival compared to the current tilapia strain and species being cultured of in Lake Bato. Its culture has been shown to be technically feasible.

The general public has a positively encouraging reception of red tilapia

as an alternative culture species and food fish. In fact, many local cage operators have shown interest and are already inquiring about source and supply of red tilapia fingerlings. There is now a need to develop and establish private hatcheries for red tilapia to cater this demand.

The results and experience gained from this culture trial will help in refining the technology for freshwater cage culture of tilapia under Type II climate conditions. The addition of red tilapia among the viable culture species for aquaculture should be a welcome development among the various stakeholders of the fishery sector. ###

PHOTO COURTESY OF EQUIZON/DA-BFAR 5



Tilapia farming and farmers' good practices

by Maria Theresa M. Mutia
Chief Science Research Specialist
DA-National Fisheries Research and Development Institute

Nile tilapia (*Oreochromis niloticus*) is the second most important farmed fish in the country next to milkfish. Its total production in 2018 was 277,005 metric tons or 12 percent share from the total fish production (PSA 2019). Central Luzon tops in 2019 production of tilapia from 14,531 hectares freshwater fishpond, while CALABARZON is the major contributor of tilapia in freshwater fish cages from Laguna de Bay and Taal Lake. Next to Pampanga, the provinces of Laguna and Batangas are among the largest producers of tilapia in 2018 (74,645 metric tons) representing 27 percent of tilapia production in the country (PSA 2019).

Although tilapia is a major commodity in aquaculture, there are several challenges that needs to be addressed to achieve its maximum economic potential. One of the major issues is the low fish production, lack of government assistance, poor breed of tilapia, high cost of production, and lack of capital (Guerrero 2019, RDEAP, 2016). Another big challenge this year is the impact of the global health crisis, COVID-19 pandemic, to the agriculture sector. The transport of fingerlings and food supply chain were disrupted, and livelihood of the fish farmers were greatly affected due to the lockdowns in many areas in the country.

One of the identified researchable areas is the refinement of site-specific protocols, with seed

production as one of the aquaculture operation phases that needs to be taken into consideration (RDEAP, 2016). This strategy is seen to increase fingerling production which is needed by the grow-out farms to maximize the potential of the rearing areas.

In the Department of Agriculture-Bureau of Agricultural Research and DA-National Fisheries Research and Development Institute's study on the "Enhanced Fingerling Production through Outscaling of Hatchery and Nursery Tilapia Protocols in Village-Level Farms in Laguna and Batangas," 10 tilapia farmer cooperators were selected (five hatchery and five nursery) as on-farm pilot test areas.

The study aims to increase fish production and income of farmers through the adoption of the tilapia seed production package of technologies (POTs) and strengthen the capacities of the village level hatcheries and nurseries that will provide sufficient fish supply to the grow-out production areas and local market.

Significant results of the study showed that tilapia fry and fingerling production increased by 10 percent and 28 percent, respectively. On the other hand, the net income of the hatchery and nursery cooperators increased by 64 percent and 92 percent, respectively. A linkage among the hatchery and nursery cooperators

has been established to provide continuous supply of fingerlings for grow-out farmers as well as in the market. Cooperators adopted the DA-Bureau of Fisheries and Aquatic Resources and Southeast Asian Fisheries Development Center/Aquaculture Department POTs on tilapia production and developed good aquaculture practices that helped them increase their harvest and income. These are the farmers' good practices based from their experience and the protocols they have learned from the project:

1. The use of power hand tractor in plowing and cultivating pond soil is more cost efficient than the use of the traditional animal drawn plow.
2. Application of organic pesticide such as teaseed had reduced the occurrence of pests in the pond.
3. Following the right dosage of lime and fertilizers improved the pond soil and water quality.
4. Conditioning the breeders in separate *hapas* installed in a free flowing water and selection and pairing of healthy breeders with a one male to three female sex ratio.
5. Fry collection using a big fine mesh scoop net for three times a day (6:00 AM, 2:00 PM, and 4:00 PM).
6. Stocking of fry in nursery ponds early in the morning with proper acclimatization for at least 10-15 minutes or until the fry has adapted to the temperature of the pond water.
7. Harvesting of fingerlings early in the morning (7:00 AM) and packing for dispersal at 1:00 AM on the following day. Harvested fingerlings were properly sorted before packing.
8. Contact the buyers before the setting of breeders to make sure that their harvest will be sold at the right time.
9. Maintaining a good and harmonious relationship with farm workers and buyers.
10. Good record keeping such as daily feeding, fry collection, daily expenses and sales.

From the study, the tilapia POTs were found to be technically and economically feasible when farmers diligently follow the protocols. Since the farmers have no formal trainings, they need to have a continuous learnings via webinars and hands-on trainings. Strengthen the linkages among the tilapia supply chain key players from hatchery, nursery, grow-out, traders and market.

The promotion of the technology through the village-level strategy would ensure the availability of fingerlings for stocking to grow-out culture in the local community. This will level up the village-level set-up and will ensure the supply of tilapia fry/fingerling in the province. ###

PHOTOS COURTESY OF MTMUTIA/DA-NFRDI

Women's groups afloat into seaweed

by Ma. Eloisa H. Aquino

“Ngayon masaya dahil may kita na. May kooperasyon din at nagkakaisa ang mga kababaihan at bawat isa ay natutulungan,” Fedela Zeth C. Conde, Tiwi Food Processor Association, Inc. president said.

Conde, who joined the association in 2010 is eager to share that they now have 35 women-members based in Tiwi, Albay. A Securities and Exchange Commission and Department of Labor and Employment-registered, the said association started in making seaweed *pansit* and seaweed cracklings.

As early as 2003, the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR)-Bicol Region conducted an on-farm research on seaweed nursery and production through the Community-based Participatory Action Research of the DA-Bureau of Agricultural Research (BAR). As an offshoot, a number of projects followed that focused on product development, improvement and commercialization of seaweed and other fishery products in the Bicol Region.

The Tiwi Food Processor Association, Inc. together with the Tabaco Faith International Church (TFIC) Ladies Association based in Tabaco City, Albay were among the established women's groups that are now sharing success in seaweed processing.

“Una, natutuhan namin na magpahalaga sa bawat oras. Nagkaroon kami nang pinagkakitaan na nakatulong sa aming pangangailangan. Lumaki ang aming kita na naging pang tustos sa aming mga kagamitan

at transportasyon. Dumami din an aming mga kaibigan na nakilala at nakasalamuha,” Maria Salome B. Ebuenga, TFIC Ladies Association secretary said.

Aida S. Andayog, project leader and retired DA-BFAR-Bicol Region-Regional Fisheries Research and Development Center (RFRDC) manager shared that various activities were conducted which started with the conduct of Participatory Rural Appraisal to series of training orientation and seminar on seaweed production and processing, product development and improvement of seaweeds and value adding products, commercialization, technology enhancement and utilization of seaweeds and other fishery products.

“Seaweed, being abundant in Bicol Region, became a promising fisheries commodity because of its various livelihood opportunities. Raw material (seaweed) is always available for processing. With growing interest on the venture, patience, and creativity, one can succeed,” Andayog added.

The DA-BFAR Bicol Region provided technical assistance and assist in market matching or marketing their seaweed products. Further, she is glad to share that the processing technology has created job opportunities to housewives and out-of-school youth.

“Malaking tulong po dahil kikita ang mga miyembro na kababaihan. [May] pambili ng bigas, pamasaha, gamit ng mga anak sa pagpasok sa eskuwelahan, at pagpapalaral, at pambili ng ulam at mga pangangailangan ng pamilya sa

araw-araw. Nakakapagpundar [na kami] ng mga gamit sa bahay,” Conde shared.

DA-BFAR-RFRDC has formulated and developed 20 seaweed products—seaweed noodles, *nata de* seaweeds, pickled seaweeds, seaweed morcon, seaweed juice, seaweed chocolate bar, tuna and beans with seaweeds, seaweed dip, seaweed jam, seaweed *lumpia*, seaweed *longganisa*, seaweed candies, seaweed chips, seaweed tart, seaweed cocktail, seaweed kropeck, seaweed cracknels, seaweed *yema*, seaweed *leche flan*, and seaweed macaroon. To which some are still undergoing product and processing improvements.

In the preparation of these products, it was noted that cooperation of the members of the association is a must.

“Ang bawat isa mayroong naaangkop na gawain para madali ang paggawa. Nahihikayat namin ang miyembro sa paraan na open record kami sa lahat na miyembro at mayroon kaming konting sahod para sa pangangailangan ng pamilya. Bukas kami sa isa't isa kung may problema ang miyembro, nagtutulungan kami,” Conde shared.

Aside to profitability gains and capability improvements in women and the community, seaweed is deemed to have several health benefits—a rich source of iodine, vitamins and essential minerals, very low in fats, contains omega-3 fatty acids, among others.

“Ang masasabi po namin ay masaya at malaki ang naitutulong nito sa amin hindi lamang sa pang araw-

ed processing

araw na pangangailangan namin kundi maging sa health benefits nito kasi ito ay mayaman sa iodine,” Ebuenga said

Ebuenga shared that TFIC processes five to 10 kilos of seaweed in a week to process seaweed pickles, *nata de* seaweeds, seaweed *leche flan*, and seaweed morcon.

Though both associations are still in need of a processing plant, they follow their respective regular processing schedules for their products. A processing plant is needed in the commercialization of the food products to cope with orders of consumers/buyers and traders.

For those who want to venture on agribusiness particularly on seaweed processing and further gain information on seaweed products, DA-BAR and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture produced a monograph titled, “Technology and Investment Profile of Seaweed Products.” This is a major output of the conducted training program on financial viability and profitability analysis for agricultural technologies and enterprises. ###

For more information:

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trust in
the Lord
with all
thine heart



PHOTO COURTESY OF DA-BFAR-RFRDC

The real “Masaganang Ani at Mataas

by Maria Ele



PHOTOS COURTESY OF MPGARCIA/DA-BFAR CAR

The COVID-19 highlights the importance of the agriculture sector in ensuring food security especially during times of crisis. Decrease in labor force and limited access to essential aquaculture farm inputs due to travel limitations brought about by the pandemic, can cause potential food fish shortage and disruption in the food supply chain.

Because of the wide range of restrictions, hatcheries and grow-out farm operators may find it difficult to trade their produced seed stock, for hatchery and grow

out production, that could cause a sharp decline in the supply of food fish in the market.

The availability and accessibility of a community-based hatchery and nursery facilities with the capacity of providing sufficient supply of quality fry and fingerlings will therefore improve aquaculture production in the community level. Strengthening the existing hatcheries and establishing nursery facilities, could also improve production and provide livelihood opportunities in the community.

Such is the case of Lym Gaano Pait of Manabo, Abra, who has been a fisherfolk beneficiary since 2018. With the help of the Provincial Fisheries Office (PFO) of Abra, he was provided with tilapia fry for his 100 square meter grow out fish pond. He has been depending only on tilapia fry being distributed by the PFO his grow-out operation.

In 2020, amidst the pandemic, the Department of Agriculture - National Fisheries Research and Development Institute (DA-NFRDI) and the DA-Bureau of Fisheries and Aquatic Resources-National Freshwater Fisheries Technology Center (BFAR-NFFTC) implemented a project, “Adoption of Modified Intensive Fry Production and Nursery Rearing of *Oreochromis niloticus* for Village Level Production in the Northern Luzon,” that would empower and enhance the skills, knowledge and practices of fish farmers in attaining DA’s goal of “Masaganang Ani at Mataas na Kita” thus, making food available and accessible to all.



s na Kita” on tilapia nursery rearing

na M. Garces

According to Manong Lym, *“Inaasahan kong makakatulong sa akin at sa kapwa ko fisherfolk na maragdagan ang supply ng tilapia fry dito sa Manabo at sa kanaig na munisipyo.”*

The BFAR-NFFTC employs different technological advancements on tilapia hatchery and nursery operations to ensure efficient use of the production area/facility and to maximize reproductive capacity of tilapia breeders like the modified intensive tilapia hatchery (MITH) and the fry rearing of tilapia, using the improved design of artificial incubation facility, to advanced fingerling stage.

As beneficiary of the project, Manong Lym adopted the technologies on MITH and fry rearing to advanced fingerling stage in his bigger and more productive 1,701 square meter total pond area.

“Nakatulong ang technology sa pag-unlad ng aking farm dahil sa nadagdagan ng bagong kaalaman at karanasan sa pagpapalago ng tilapia. Ito ang nagbibigay

ng pangtustos sa araw-araw na pangangailangan at bumubuhay sa aking pamilya na nagmula sa kinita ko sa pagbebenta ng pinalaking tilapia fry into fingerling at tamang pagpapalaki ng tilapia sa grow out.”

With the adoption of the technology, the project targets a 30 percent increase in profit per cooperators, but in the case of Manong Lym, it was noted that he achieved a 100 percent

increase in profit, with an income of PhP 80,000-90,000 per cycle, as compared to the PhP 7,000-8,000 per cycle in his grow out pond before the intervention.

“Pangarap ko pang maragdagan ang area ng aking fish pond, at mapalawak pa ang aking kaalaman sa improved technology upang hindi lamang mapaunlad pa ang aking farm kundi makatulong din sa ibang fisherfolk at sa komunidad sa pamamagitan ng pagbigay

“Pangarap ko pang maragdagan ang area ng aking fish pond, at mapalawak pa ang aking kaalaman sa improved technology upang hindi lamang mapaunlad pa ang aking farm kundi makatulong din sa ibang fisherfolk at sa komunidad sa pamamagitan ng pagbigay kaalaman, pagtuturo ng tamang proseso sa pagpapadami at pagpapalaki ng tilapia.”

turn to page 29



Red tilapia serves communities for food on their tables

by Ma. Eloisa H. Aquino



In line with the Department of Agriculture's (DA) initiative of "Ahon Lahat, Pagkaing Sapat (ALPAS) Laban sa COVID-19" Program, the DA-Bureau of Agricultural Research has refocused in 2020 its programs, activities, and projects further to ensuring a stable, secured, and accessible food for every Filipino especially in the time of pandemic.

Further to this, the bureau, under its 3R Program (Resiliency Response Research for Development) supported a project to demonstrate and evaluate the performance of red tilapia cultured in marine cages, brackishwater ponds, and freshwater cages in five regions in Luzon.

DA regional offices in Luzon, specifically Cordillera Administrative Region, Ilocos Region, Cagayan Valley Region, Central Luzon Region, and Bicol Region are expected to develop technologies on grow out culture of red tilapia (*Oreochromis niloticus* x *O. mossambicus* strain) in different culture methods, and at different agroclimatic conditions.

The five regions reported initial results based on the first harvest season. In particular, DA-Bicol Region shared that through the improved production technology in brackishwater pond culture, there is an improved growth, survival and production of red tilapia with an optimum stocking of five fish per square meter and survival of 80 percent.

In brackish water pond in Cabid-an, Sorsogon City, Sorsogon, red tilapia recorded an average body weight of 176 grams that have five pieces per kilo with the survival rate of 80 percent.

PHOTOS COURTESY OF DA-BFAR 1, 3, 5, AND C

But aside from addressing the refinement of site-specific protocols for improved fish productivity, the project teams distributed a portion of their harvest to local government units (LGUs) as part of the LGUs community pantry initiatives. Also, frontliners, senior citizens, and affected families were among the recipients.

This is one clear testament that DA and its offices can provide food on our tables on top of generating and supporting development of technologies.

DA-BFAR CAR

The 105 kilograms of harvested red tilapia were distributed to the senior citizens and other residents of Mountain Province.

DA-BFAR 1

As support to affected communities and families from the COVID-19 situation, the Provincial Government of Ilocos Norte through the Provincial Social Welfare and Development Office and the Bugnay SWIP Irrigators Association received over 300 kilograms of red tilapia, while LGUs Sual, Anda, Bani, and Bolinao

through their fishery coordinators received a total of 120 kilograms of red tilapia. On the other hand, the Alaminos City through the City Administrator and Liga ng mga Barangay received over 175 kilograms of red tilapia. The said red tilapia were also distributed to community pantries, quarantine facilities, and checkpoint personnel.

DA-BFAR 3

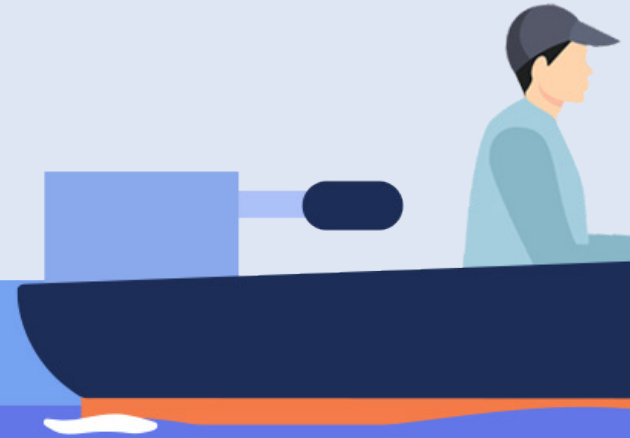
A total of 400 kilograms of its red tilapia harvest were distributed to the local government officials of the province of Aurora, project cooperators, COVID-19 frontliners (border patrol, MDRRMO, PNP and BFP), indigenous people and senior citizens of Brgy. Galintuja, Ma. Aurora.

DA-BFAR 5

Community pantries organized by LGU-Bato, Camarines Sur, MOR Radio Station 91.3 FM One Radio in Tabaco City, Albay, and Brgy. Tayhi, Tabaco City, Albay, Brgy. Pawa in Tabaco City, LGU-Bacacay, Albay received 200, 100, 70, 150, 150/185 kilograms of the harvests, respectively. ###



BEST PRACTICES OF TILAPIA IN BATANGAS



Proper pond preparation

Use hand tractor for faster and cost-efficient levelling of ponds, proper use of pesticide to eradicate pests, and liming to stabilize soil pH and fertilization to allow growth of natural food in the pond.

Collection of fry

Collection of fry should be done using a fine mesh scoop/seine net. After the pairing of breeders, fry collection can be done 3 to 4 times a day.



Stocking of fry

Acclimatization of tilapia fry bags should be done for 10-15 minutes in the morning.



Others



Record keeping. Record daily feeding, fish growth, mortality, farm activities, and expenses.



Marketing. Before stock already be contacted to

HATCHERIES AND NURSERIES AND LAGUNA



Conditioning of breeders

Harvesting of breeders should be done early in the morning. Breeders should be stocked in the conditioning hapas for 10-14 days prior to pairing.



Selection and pairing of breeders

Select breeders without diseases and deformities. Good breeders have good finnage and is black (female) or green (male) in color. Ratio should be 1 male to 3 females. Wait 10-11 days before fry collection.



Harvesting of fingerlings

Harvesting should be done in the early morning or late in the afternoon. The harvested fingerlings must be properly sorted before packing.



ing, potential buyers should sell produce at the right time.



Management of Co-Farm Workers. Establish good relationship with co-workers. Arrange percentage profit from sales.

Seed Production of the

BLUE SWIMMING CRAB

(*Portunus pelagicus*)

P. pelagicus is a type of portunid crab that naturally inhabits sandy and muddy substrates found throughout the Indo-pacific region, such as in the Philippines, Tahiti, Australia, Japan, and east coast of Africa.

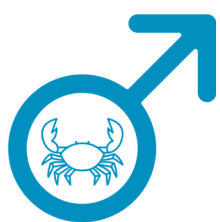
Its life expectancy is about 2.5 to 3 years. They weigh up to one kilogram and reach a width of about 20 cm depending on sex and region of origin.

It is a highly important commercial crab species in the Philippines. However, due to overexploitation, its wild population has been significantly reduced.

The development of reliable seed production technology is important for the sustainable growth of the crab industry in the country.



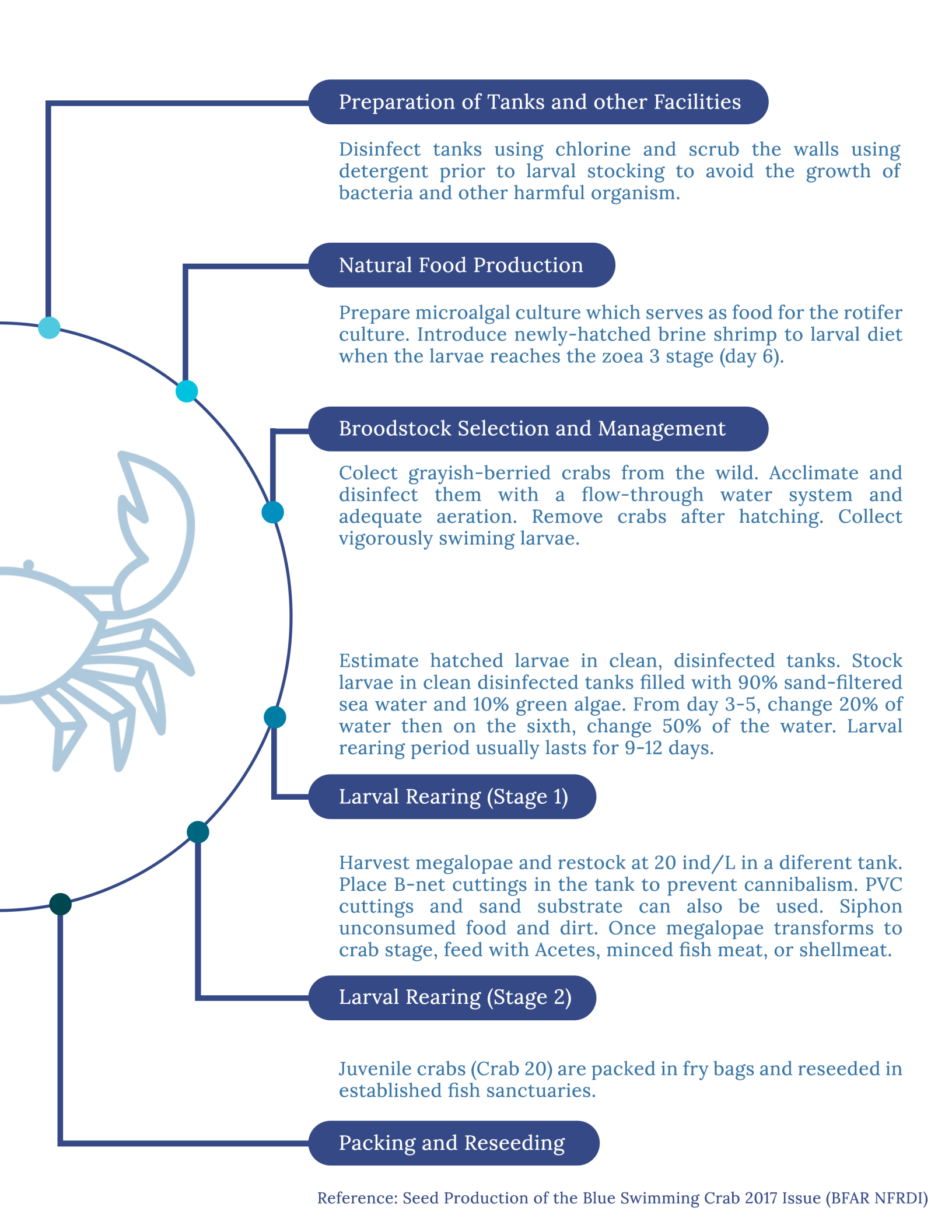
Sexual Characteristics



- bigger
- dark blue carapace, legs, and claws
- narrow and angular abdominal flaps



- smaller
- dull brown to gray carapace, legs, and claws
- broad and rounded abdominal flaps



Why did you join the MAYA Program for Fisheries?

“As a son of a fisherfolk, I want to earn and to also find out what really is the status of our marine resources.”

– **John Alex Morales**
(DA-NFRDI-National Stock Assessment Program (NSAP) Region 5)

What are your expectations before joining the program? Three months into the internship, were your expectations met when you joined the program?

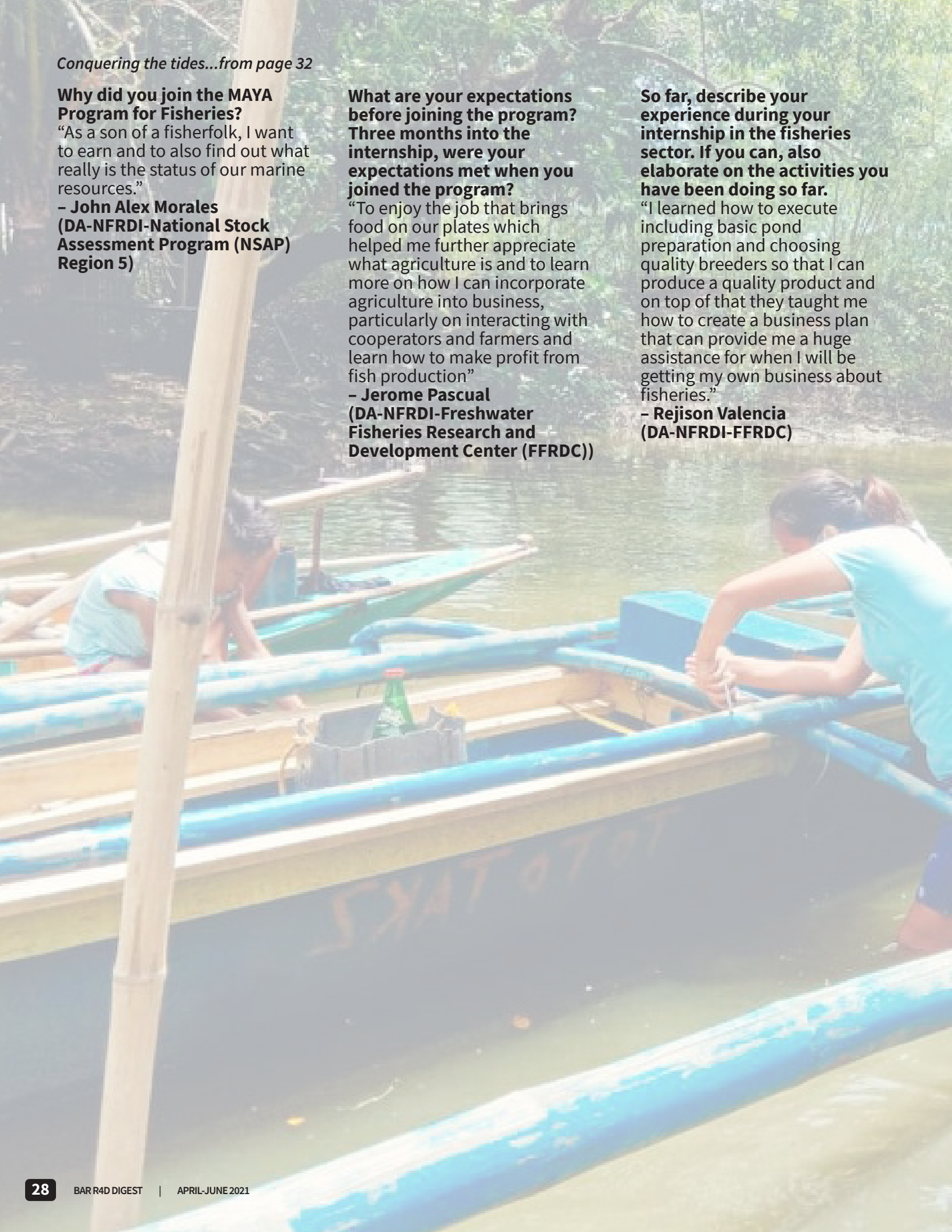
“To enjoy the job that brings food on our plates which helped me further appreciate what agriculture is and to learn more on how I can incorporate agriculture into business, particularly on interacting with cooperators and farmers and learn how to make profit from fish production”

– **Jerome Pascual**
(DA-NFRDI-Freshwater Fisheries Research and Development Center (FFRDC))

So far, describe your experience during your internship in the fisheries sector. If you can, also elaborate on the activities you have been doing so far.

“I learned how to execute including basic pond preparation and choosing quality breeders so that I can produce a quality product and on top of that they taught me how to create a business plan that can provide me a huge assistance for when I will be getting my own business about fisheries.”

– **Rejison Valencia**
(DA-NFRDI-FFRDC)



What are your takeaways from this experience?

“I learned how to communicate with fisherfolk professionally and how to manage your time in terms of working.”

– **Jemson Vego**
(DA-NFRDI-NSAP-Region 6)

From your perspective, what are some agricultural issues on the ground that must be prioritized in terms of policy decisions and budgetary allocations?

“There must be resolutions and mitigations for farmers’ and fisherfolks’ problems through qualitative and quantitative research for more competitive farming in the Philippines. The research will pave the way for new policy recommendations making the work of the fisherfolks easier and more convenient.”

– **Nehemiah Joseph Manalo**
(NFRDI-Central Office)

If you were to choose an agricultural/fisheries product to promote in your community, what would it be? How would this be profitable?

“I will choose oyster since oyster farming is the dominant livelihood in our community. After six months of culture, you can gather it and sell it. After two harvests, you can be able to cover your overhead expenses.”

– **Mary Claire Babayen-on**
(DA-NFRDI-NSAP-Region 6)

From what you have experienced so far, how can you convince your fellow youth to engage or get involved in the fisheries sector? What is your message to them?

“Let us venture into fisheries through innovation and technologies. Only then can the industry attract youth and change their mindset if they see that there are many opportunities in fisheries. Let us instill our appreciation, admiration, and dedication on this field.”

– **Muriel Tindugan**
(DA-NFRDI-FFRDC)

With the promising experiences and dreams of the youth, there is no doubt that there really is a bright future that awaits not just in the agriculture sector, but also in fisheries. With the Philippines being a well-known archipelago gifted with rich aquatic resources, the country is assured that there are young folks who will take the lead and responsibility to protect it through engaging in this sector as competent individuals and entrepreneurs.

The MAYA Program officially concluded on 29 June 2021, recognizing its interns’ as well as the handling offices’ hard work in the program. DA and DA-BAR are happy to be part of this opportunity to share its opportunities with Filipinos, especially the youth. ###

The real... from page 21

kaalaman, pagtuturo ng tamang proseso sa pagpapadami at pagpapalaki ng tilapia,” Manong Lym seriously added.

The project’s nursery cooperators were able to strengthen their linkage serving 226 small scale grow out operators in the region.

“Dahil sa proyekto, nadagdagan ang tilapia fry supply dito sa Abra, at nabigyang halaga ang tilapia culture.”

The promotion, implementation, and adoption of improved technologies in tilapia hatchery and nursery coupled with the use of high-quality tilapia seed stocks are initial steps in creating a mechanism to increase the production of tilapia fingerlings for use in grow-out culture not only on the community level but rather would improve food sufficiency of the country as a whole, thereby, empowering people and communities to take control of their own food security while augmenting family income.

“Lubos akong nagpapasalamat sa mga ahensya ng pamahalaan na tumulong sa akin, ang PFO, BFAR-NFFTC, BFAR-Cordillera Administrative Region, lalo na sa DA-Bureau of Agricultural Research na siyang nagbigay ng pondo upang maisagawa ang proyektong nasalihan ko, at sa Panginoon,” he said.

“Nais kong mahikayat ang ibang fish farmers na subukan ang technology sa pamamagitan ng paggamit ng makabagong pamamaraan ng pag-aalaga ng isda upang dumami ang ani at kumita ng mataas,” Manong Lym ended smiling brightly. ###

Cost and Returns Analysis of **Daerrys** Tilapia Ice Cream and Tilapia Cookies (One Year Operation)

Putting a twist on your regular flavored ice creams, Central Luzon State University developed and packaged ice cream using tilapia as its base flavor and ingredient.

Marketed under the trademark Daerrys, the developed product lines include tilapia ice cream with tilapia praline, tilapia ice cream sandwich and tilapia cookies, among others.

In 2015, the Department of Agriculture-Bureau of Agricultural Research under its National Technology Commercialization Program provided support in the technology enhancement and commercialization of tilapia ice cream.

Now, Daerrys tilapia ice cream gained positive feedbacks and even received prestigious awards locally and internationally. In the Philippines, products are currently marketed by various distributors and resellers.

Interested? Here's a cost and returns analysis for a one year operation.

For more information:

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Item	Amount (PhP)
Gross Income	6,656,895.00
Variable Costs^a:	
Raw material and ingredients ice cream	2,709,460.32
Primary packaging materials ice cream	581,727.36
Raw packaging materials ice cream	140,928.00
Primary packaging materials cookies	40,800.00
Hired labor	1,329,446.40
Water and electricity	15,000.00
Fuel and oil	48,000.00
Other laboratory/office and plant supplies	30,000.00
Interest on variable costs ^a	391,628.97
Total Variable Costs	5,286,991.0
Fixed Costs:	
Business license/permits	9,460.00
Repairs & maintenance	45,750.00
Depreciation	295,020.00
Total Fixed Costs	350,230.00
Total Cost	5,637,221.05
Gross Margin	1,369,903.95
Net Income	1,019,673.95
Net income/piece	17.70
Adjusted Net Income	1,411,302.92
Return to Capital	1,411,302.92
Rate of Return to Capital (%)	53.59

^a8% interest on variable cost

Break-even Analysis

Break-even price (PHP/pc):

69.37

Break-even yield (pcs/year):

-

Break-even yield (pcs/day)

-



Appetizing Crab Meat Balls

by Maria Elena M. Garces

Not the usual bottled product you can find in your favorite grocery shelves, this product recipe was developed by Southern Luzon State University-Judge Guillermo Eleazar in Tagkawayan, Quezon, as part of the value-added product development project funded by the Department of Agriculture-Bureau of Agricultural Research, titled, "Promotion of Mud Crab Fattening and Crab Meat Processing Technologies." This product can be eaten as starter or part of the main course. And when tasted, will be loved by both young and not so young people alike.

Ingredients

- ½ kilo steamed crabmeat
- 2 tablespoon Worcestershire sauce
- 1 clove minced garlic
- 1 teaspoon calamansi juice
- 2 cups bread crumbs
- 1 slightly beaten egg
- 1 cup shredded cheese
- ¼ tablespoon ground black pepper
- 2 tablespoon mayonnaise
- 1 liter palm oil

Procedure

Cooking

1. In a large bowl, combine crab meat, cheese, mayonnaise, egg, calamansi juice, Worcestershire sauce and garlic. Mix thoroughly until all ingredients are well blended. Season with pepper.
2. Roll mixture into small balls (about 1 inch diameter). Freeze for about 30 minutes or until firm.
3. In a large, high-sided skillet over medium heat, add half of the palm oil.
4. Working in batches, fry crab meat balls until golden brown, gently turning about 3 minutes per side and drain in a metal strainer.

Bottling:

1. Sterilize glass bottles to be used.
2. Arrange crab meat balls in the bottle.
3. Pour in enough palm oil to cover meat balls, leaving an inch empty space on top.
4. Put the covered bottles in the pressure cooker and cook for 90 minutes at 22°C.
5. When done, rinse the bottles under running water to remove adhering oil. To test for leaks, place bottles upside down to make sure caps are not properly sealed.
6. Label and store at room temperature.

Serving Size: 40g		
Number of serving per bottle: 6 servings		
	Amount per serving	% RENI
Calories (kcal)	140	5
Total fat (g)	13	
Saturated fat (g)	2.5	
Trans fat (g)	0	
Cholesterol (mg)	15	
Sodium (mg)	210	
Total carbohydrates (g)	2	
Dietary fiber (g)	0	
Sugar (g)	1	
Total protein (g)	5	7

*RENI (Recommended Energy and Nutrient Intake)



Conquering the tides, forwarding agri-fishery knowledge through the youth

by Clarisse Mae N. Abao

Filled with stories of dreams and inspiration, the 808 youth interns were engaged by the Department of Agriculture (DA) and the DA-Bureau of Agricultural Research (BAR) to undergo the internship which aims to improve the pool of R4D personnel through engaging the youth.

On the previous issue of the BAR R4D Digest, selected Mentoring and Attracting Youth in Agribusiness (MAYA) Program interns who graced the program's ceremonial launch on March 2021 were featured. Inspirations, expectations, and insights were gathered from aspiring youth who will then start with the three-month-long journey where they will have firsthand experience in fieldwork and expand their knowledge on agriculture and fisheries.

DA-BAR has documented the valuable experiences from the interns. For this issue, we will again feature MAYA interns, but this time, those who were engaged in the field of fisheries and aquaculture. Below are the stories from seven out of the 277 MAYA interns of the DA-National Fisheries Research and Development Institute (NFRDI).

[Read full story on page 28](#)

RESEARCH FOR DEVELOPMENT BAR DIGEST

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