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RESOUNDING SOS:

A healthier option for instant emergency food

contents

about the cover

Developed by the University of the Philippines Visayas, the Seafood-on-the-Spot or SOS is an innovative emergency food made from underutilized fish species and local ingredients with its seasoning placed inside a seaweed bioplastic pouch.

COVER PHOTOS: UPV

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Empowering SUCs toward a more strengthened R4D system

JUNEL B. SORIANO, PhD

Recognizing the pivotal role of state universities and colleges (SUCs) in transforming the research for development (R4D) system, the DA-Bureau of Agricultural Research (BAR) actively collaborates with SUCs to advance and implement a diverse range of agri-fisheries R4D interventions. Leveraging the broad spectrum of expertise that these institutions offer, the agri-fisheries sector benefits in areas such as knowledge sharing and innovation; capacity building; extension services and technology transfer; and research for policy development, among others.

Further to this, and with their strategic locations across different regions, these SUCs also enable the bureau to support research that is relevant to the specific agri-fisheries contexts of their respective areas. This enables the development of location-specific technologies, such as crop varieties suited to particular climates or fisheries management practices that align with local ecosystems. These localized solutions ensure that development interventions are more effective and adaptable to regional conditions.

SUCs likewise serve as vital hubs for research, education, and community engagement in agriculture and fisheries. Their role in generating knowledge, building capacity, transferring technology, and shaping policy is fundamental to the success of development interventions. Through their efforts, SUCs contribute to increased agricultural productivity, sustainable fisheries management, and improved livelihoods for rural communities, driving national progress in these key sectors.

In this issue of the DA-BAR R4D Digest, we proudly present an array of success stories from SUC-led programs, projects, and initiatives that have significantly transformed the livelihoods of agri-fisheries communities across the country. These stories highlight the power of R4D in driving agricultural innovation, improving productivity, and promoting sustainable practices.

From the upgrading of greenhouse facilities for high-value crops to the establishment of cutting-edge organic agriculture research centers, these initiatives demonstrate how SUCs are at the forefront of delivering localized solutions to the unique challenges faced by rural communities. Through collaborative efforts with government agencies, private stakeholders, and local farmers, these programs have not only boosted crop yields and improved fisheries management but have also paved the way for the commercialization of value-added products and advanced technologies.

In this edition, we also explore projects that focus on empowering small-scale farmers and fishers through community-driven research and sustainable farming techniques; of which these SUC-led interventions are helping to enhance food security, increase incomes, and improve the overall quality of life in rural areas.

These success stories stand as a testament to the crucial role of SUCs in strengthening the agri-fisheries sectors, proving that R4D can drive innovative and impactful change. As we move forward, DA-BAR remains committed to supporting these efforts, ensuring that research continues to uplift the lives of Filipino farmers and fishers while promoting innovation and sustainability across the nation. ■

RESOUNDING SOS:

A healthier option for instant emergency food

MARIA ELENA M. GARCES

> *The goal is to ensure the widespread accessibility of the product which can be achieved through transfer of technology and its adoption by the private sector in manufacturing these healthy emergency products.*

It was reported that each year approximately 20 typhoons enter the Philippine area of responsibility, including tropical storms. These typhoons and other various natural disasters such as earthquakes, and volcanic eruptions displace communities, disrupt essential services, and then food becomes a crucial necessity, where ready-to-eat items such as instant noodles and canned foods are commonly distributed as "relief goods" to low-income families.

However, the nutritional benefits of these instant food items are not sufficient for the long-term needs of a disaster victim, not to mention the environmental pollution and health risks it creates with the single use of non-biodegradable plastic packaging of these food items.

It was cited that various factors, such as accessibility and affordability of food supplies, have impacts on the choices, amount, and quality of food provided in relief operations. This consequently influenced the nutritional value of the food distributed to communities in need to prevent adverse outcomes on the calamity and disaster victims.

Fish soup is widely recognized and highly regarded food choice due to its nutritional value. Fish is not only a valuable source of protein, but also contains omega-3 fatty acids (which are linked to various health benefits), rich in vitamins and minerals, has antioxidant, anti-inflammation, cardio-protection, among other health benefits.

One known variety of fish soup with ginger infusion and variety of vegetables is the *tinolang isda*. Another traditional Filipino dish, *sinigang na isda*, is a type of sour soup utilizing tamarind juice as its main flavoring and souring component and uses milkfish as the predominant fish species.

Innovative products

From the two traditional fish soups, the team of Professor Encarnacion Emilia S. Yap of the University of the Philippines Visayas, has successfully optimized the standard processes in producing instant Tinolang Isda and Sinigang na Isda (in *batuan*, *sampalok*, and *kamias* variants), using seaweed bioplastic pouch to hold its seasoning. These innovative emergency seafood products are nutritious, shelf-stable, instant, easy-to-prepare, and packed in environment-friendly container.

The products carry the brand name SOS, an acronym for Seafood-on-the-Spot, which also signifies a distress signal employed to urgently request for assistance, especially during emergency scenarios.

"The focus of the project is to revolutionize emergency food aid by providing a convenient

and nutritious option for Filipino families during calamities. By using underutilized fish species and incorporating eco-friendly seaweed-based packaging instead of plastic, the product not only meets the nutritional needs of disaster victims but also promotes sustainability and reduces plastic waste," explained Yap.

The inclusion of locally available ingredients enhances flavor, supports sustainable practices, and benefits local communities. The product also focuses on nutritional and functional characteristics to ensure it meets the needs of its consumers.

Seaweed, known for its benefits such as emulsification, binding, and stabilization in various products across multiple industries, was used in this study as a sustainable raw material for developing environmentally friendly packaging. The packing container is in the form of a cup bowl made of sugarcane. The advantage of using a sugarcane-based cup bowl as a packing container is its biodegradability, which makes it an eco-friendly alternative to traditional plastic, reducing environmental impact.

In this study, the ingredients and soup are dehydrated through a drying process to ensure longer shelf life by eliminating the possibility of spoilage and bacterial growth, thus, ensuring the product's safety and maintaining the quality and nutritional integrity of food. This procedure extends the shelf-life of the product components.

Ways forward

Dr. Yap reiterated, "The Instant Fish Tinola and Sinigang will be positioned in the market as a convenient meal option essential to appeal to busy individuals and those seeking quick and easy solutions, particularly in times of calamities and disasters. The key focus will be on the fact that the product requires minimal preparation, as it only needs to be poured with hot water to rehydrate the fish and vegetables, making it a time-saving and hassle-free choice for consumers."

"The goal is to ensure the widespread accessibility of the product which can be achieved through transfer of technology and its adoption by the private sector in manufacturing these healthy emergency products. Another is through partnerships with government agencies and expansion of distribution channels, not only during emergency situations but also as a convenient meal option for consumers seeking the authentic flavours of traditional Filipino cuisine," concluded Yap. ■

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RENEWED AND REIMAGINED: *Typhoon-resilient smart greenhouse reborn from rubbles*

KRISTINA S. ESTRADA

With the changing climate that threatens the agriculture sector and food security, traditional practices might not be able to deliver any longer. What has worked in the past may not work anymore.

Innovative solutions are essential to improve the system and mitigate the impact of these inevitable challenges and threats that climate change has brought. Among the potential solutions to this is the use of greenhouse in agriculture, which several universities in the country have already utilized.

The Cagayan State University (CSU) has long been engaged in using greenhouses for academics, research, extension, and production activities, until typhoon Lawin hit the region in 2016. The whole campus was ravaged by the calamity, including the greenhouses, that not even its steel structures were spared.

From then, the university pursued to upgrade its greenhouses. "We saw to it that we design it [the greenhouse] in such a way that it [the structure] is typhoon resilient," stated Engr. Roger P. Rumpon, one of the project leaders of the greenhouse facility upgrading titled, Upgrading the Greenhouse Facilities for High Value Commercial Crops at Cagayan State University, Carig Campus.

But more than just reinforcing its steel structure to withstand typhoons in the decades to come, they intended the greenhouse to be a state-of-the-art facility to better cater to high value crops and continue the projects of the campus.

They envisioned their smart greenhouses to support training and demonstration for farmers, students, cooperatives, state universities and colleges, and farmer-leaders of the Department of Agriculture.

It was through one of the programs of the DA-Bureau of Agricultural Research that the smart greenhouses became possible—through the Agricultural Competitiveness Enhancement Fund (ACEF)—Research Facilities Development Grant Program.

CSU at the Carig Campus has been granted the upgrade of two engineered greenhouses with sensors for nutrient management, temperature, and irrigation to sustain the production of high value crops; the project was implemented from January 2022 until March 2023.

The two units of greenhouses are 240 sqm each, with double-arched roofs, framed with galvanized iron pipes, and equipped with misting, drip, and hydroponic systems with automation consisting of temperature, humidity, and light intensity sensors.

Its operation is made possible by the Long Range Wide Area Network or LoRaWan, which is a communication protocol network designed to wirelessly transmit data over a wide area, ranging as far as 300 kilometers away.

Also integrated into the greenhouse are LoRaWan smart IoT sensors which reduce internet consumption, and as an extension, reduce data charges, power usage, and the maintenance cost of the system, as the smart loT sensors transmit data even at a distance away from a place with internet connectivity.

The LoRaWan system set-up has three main components: the end devices (sensors and actuators), the gateway, and the network server.

The end devices are the sensors (light intensity sensor, temperature and humidity sensor, and pH level sensor) which gather data from the greenhouse

environment and control the actuators such as misting valves, pumps, and exhaust fans.

On the other hand, the gateway acts as an intermediary between the end devices and the network server. It operates on both ethernet and/or cellular data, has low power consumption, and allows for data to be viewed on mobiles and computers.

Currently, the greenhouse is divided into two sectors, each with one unit of temperature, humidity, and light intensity sensors, while the whole greenhouse is monitored by a pH sensor.

The data gathered by the sensors can be viewed and monitored on the dashboard at any time and can be exported for data analysis and further optimization of greenhouse automation.

Apart from the LoRaWan system, the greenhouse has a separate system that can control and automate actuators like nutrient valves, pumps, temperature control, humidity control through heaters and air conditioners, and exhaust fans.

This automation system can then be configured to function on the required preset parameters, depending on the type of crops in the greenhouse, even without internet. It can also be integrated with solar panels. In addition, the system may potentially be used for automatic nutrient mixing once accuracy of controls are further improved.

As Rumpon elaborated, “there is equipment to which sensors for monitoring pH, temperature, and relative humidity are attached such that when the set temperature for the crops and the

> ***What if the solution to food security is indeed just within our reach, and we just have to find and combine them into something that will work?***

Hydroponics has been with us for so long at a time. The technology of the internet, electronic sensors, these are all matured technologies, so we integrate them. We only find ways to apply them in agriculture. We have integrated [them into a] super system.

relative humidity are reached, the automated system for misting, in order to reduce the temperature and the relative humidity, will be activated."

As a challenge to its claim, the university decided to produce lettuce and strawberry, which are commonly grown in temperate areas, through hydroponic technology in a greenhouse in one of the cities with the highest heat index in the whole country.

"We have to continue with the amelioration of the environment. First, when we put growing highland crops in a periurban system, we are actually contributing to the mitigation of carbon dioxide emission. Because we are now cutting the segment of the supply chain of transportation which uses fuel and contributes to the emission. Aside from that, we are bringing to the community [the produce from the greenhouse]. In our campus alone, our produce are bought by our faculty, administrative staff, and students," Rumpon explained.

They calculated that the return of investment on the upgrade of the two greenhouses and its equipment would take 2.5 years and 4.4 years to be recovered by their lettuce and strawberry production incomes respectively, as the greenhouses also supply produce to the local community and local businesses. Meanwhile, the greenhouses are expected to hold a 20-year lifespan.

Because of this bold move of planting highland crops, several have been inspired to adapt the smart greenhouse model in the future, including farmer associations and cooperatives and local business owners. They were also impressed by the greenhouses' productive capability despite its land area.

The greenhouse has always been intended to support training and demonstration for researchers, students, and farmers. As Rumpon added, "to make it [the smart greenhouse] impactful to agriculture, it should be adapted by farmers."

The project offers training on the operation and management of the Greenhouse Automation System, including the functionality of the system, basic installation practices, troubleshooting processes, and safety procedures, and many more. The university has already conducted several trainings for a wide range of partners and participants.

Its intended end-users are farmers and fisherfolk and their associations/cooperatives and students, while its next users are state universities and colleges, DA regional field offices, local government units, and public and private institutions who will benefit from the project as enablers of the said interventions.

"We want to replicate all of these as much as possible, to promote it as a means of contributing to food security, by not giving pressure to the already scarce land area and water resources of the province," Rumpon said.

In line with ACEF's goals, the greenhouse facility increases productivity of the farmers by producing larger quantities of crops while also reducing the workforce needed to produce that same amount of quantity. At the same time, the workforce can be redirected to perform other farming activities such as harvesting, sowing, weed management, and other tasks that require manual labor.

Other countries have also already adapted automated greenhouses and saw other benefits of the system such as the reduction of impact on the environment through the reduction of the use of waste materials and harmful chemicals. The decrease in farm input with the increase in the yield of healthier crops also leads to better marketability and an increase in profit.

In the midst of all the wonders that the smart greenhouses in CSU has brought, the field does not need any more reinvention according to Rumpon. What is rather ideal is to integrate matured technologies into one workable system.

"Hydroponics has been with us for so long a time. The technology of the internet, electronic sensors, these are all matured technologies, so we integrate them. We only find ways to apply them in agriculture. We have integrated [them into a] super system."

Perhaps Engr. Rumpon was right. What if the solution to food security is indeed just within our reach, and we just have to find and combine them into something that will work? ■

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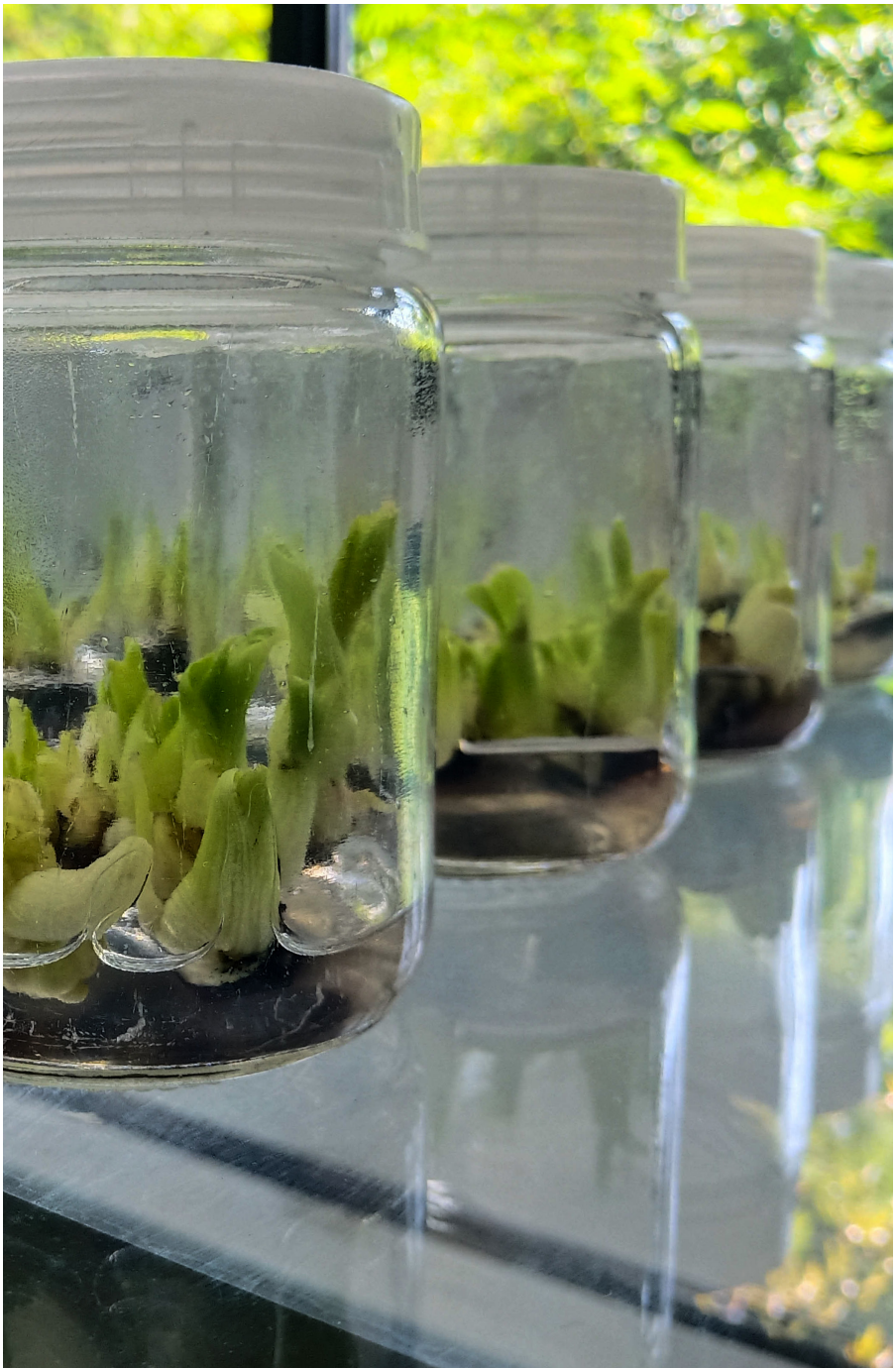
Catalyzing change through disease-free, quality banana plantlets

ANGELO N. PADURA



As an old farming practice, one that has been passed over generations, banana growers utilize suckers or pups as their planting materials to cover up every available corner in their farms. With this practice, farmers cling to a hope of good profit shooting from every single plant they grow. However, this is not the case.

Despite the rising demand and increasing opportunities, top producing regions of banana in the country, like SOCCSKSARGEN region, face problems affecting hectares of their farmlands. These include high incidence of plant diseases, pest infestation, and degrading quality of produce.

“Panama disease, among other plant diseases that affect banana cultivars, can be prevented in the earliest stage of banana propagation. In fact, it is what and how we plant bananas that can prevent the spreading of these diseases,” Mindanao State University (MSU)-General Santos researcher Jaime A. Namocatcat said.

Case like this call for research-proven methods that can aid farmers eradicate farm concerns while improving their productivity

and profit. One of such is the use of tissue-cultured banana planting materials.

Upgrading the MSU-General Santos Tissue Culture Facility

The upgrading of the banana tissue culture laboratory of MSU-General Santos would be a conduit to providing a continuous and accessible supply of planting materials to the local farmers, providing access to an excellent laboratory facility for researchers, undergraduate and graduate students, and a venue for research and development of banana commodities.

To provide a continuous and accessible supply of quality and disease-free banana plantlets to local farmers, the Mindanao State University (MSU)-General Santos (GenSan) upgraded their tissue culture laboratory. Funded through the Agricultural Competitiveness Enhancement Fund, the said facility underwent reconstruction of two rooms transforming it into a tissue culture laboratory, a wet room, and a nursery facility.

"Before the renovation, we barely had any compartmentalized rooms appropriate for micropropagation of banana plantlets. More importantly, our lack of growth room limits us to produce good numbers of plantlets which we can supply our farmers for free," project leader Jaime A. Namocatcat explained.

The tissue culture laboratory is also compartmentalized into a chemical stockroom, media room, two propagation rooms, and relatively huge growth rooms. In addition, a training cum conference room is integrated into the facility to house training and conferences for banana growers and other stakeholders.

Changing old ways to new farming practices

"*Muntik ko na talagang iwanan ang pagsasaka ng saging dahil sa paglaganap ng mga peste. Dumidilaw ang mga dahon at natutuyot hanggang kinalaunan namamatay at di na nakakapag bunga. Wala ng pag-asa*," said Martene Lorenze Uyas, one of the rebel returnees-turned farmer in General Santos.

Due to high incidence of banana plant diseases, farmers' produce, in terms of quantity and quality, in the community were highly declining. This, according to them, is because of the traditional planting methods they are still accustomed to.

This scenario eventually started changing because of the availability of quality and disease-free banana plantlets produced in the upgraded tissue culture laboratory of MSU-GenSan. By initially providing farmer-partners in the area with 10,000 banana plantlets, farmers, especially the small-scale and resource-constrained growers, have witnessed the difference between the research-bred farming practices and the ones that have just been passed from one farmer to another.

Ensuring that the newly introduced banana propagation technique shall be sustained, MSU-General Santos also conducted a series of comprehensive training programs for farmer cooperatives and associations in the selected communities. Through this, farmers underwent discussions covering banana cultivation, cultural management, disease and pest mitigation, and effective practices for maximum yield.

"*Hindi pa man namin inaani lahat ng saging gamit 'yong* plantlets *na binigay sa amin* ng MSU-GenSan, *nakikita na namin ngayon 'yong malaking pagkakaiba. Una, mas malusog at mas maganda ang tubo ng aming mga puno ng saging kaya dahil doon, mas marami at mas magaganda ang bunga na makukuha namin,*" shared Norhuda Laguiale, one of those who adopted the technology introduced by MSU-GenSan.

More than just refurbishing their facility, MSU-GenSan paved the way for banana farmers to improve not just their farming practices, but more importantly, their productivity and profit. Further, it also caters the needs of agri-fishery research, and other farming-related technical training and capacity-building activities.

"Integral to its functions would be the commercial production of tissue-cultured Saba that can eventually expand to other banana cultivars, even other crops like rice and ornamental plants," said Namocatcat. ■

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Panama disease, among other plant diseases that affect banana cultivars, can be prevented in the earliest stage of banana propagation. In fact, it is what and how we plant bananas that can prevent the spreading of these diseases.

Farmers benefit from FREE-RANGE CHICKEN PRODUCTION TECHNOLOGY *in Bataan*

LEA B. CALMADA

When the pandemic struck from 2020 to 2022 and amidst the outbreak of the African Swine Flu (ASF) in 2021, the Bataan Peninsula State University (BPSU) utilized a technology that helped farmers cope with the two-pronged crisis. BPSU adopted the production technology on Free-Range Chicken developed by Tarlac Agricultural University (TAU).

Under the Agricultural Competitiveness Enhancement Fund (ACEF) R&D Grant, BPSU was prompted to develop a project to establish a viable enterprise using Free-Range Chicken Production Technology in Bataan.

"*Ang* technology *na* developed *ng* TAU *ay gagamitin sa pag-aalaga at pag-paparami ng* Free-Range Chicken," according to Abigail G. Abuan, PhD, chairperson of the Research and Development Office, Researcher and Extensionist, and Faculty at BPSU Abucay Campus.

Two farmer cooperators/ associations benefited from the project namely, Tuyo Farmers Agricultural Cooperative in Balanga City, Bataan with 78 total members, of which 44 are males and 34 are females; and Hacienda Agrarian Reform Beneficiaries Cooperative in Abucay, Bataan, with 42 total members, with 21 males and 21 females.

One of the technologies learned and provided to the two associations is the housing of chicken.

"The housing technology established by BPSU is unique because it offers more benefits compared to traditional ones. The management was less labor intensive. The eggs can be picked up at the back of the housing and it is accessible by hand. There is no need to enter inside the housing. This is more convenient and economical," Dr. Abuan said.

"For now, BPSU is planning to innovate the design of the housing from corrugated stainless roofing into Nipa leaves because these are cheaper materials than corrugated," BPSU Engr. Davedsonn C. Fetalvero added.

Aside from housing, other technologies learned by the associations are breeding, brooding, use of incubators, ranging, feeding and health management," Dr. Abuan continued.

"*Ang iba't ibang* technologies *na ginamit ng proyekto ay naka-*focus *sa* housing, breeding, brooding, *paggamit ng* incubator *sa pag-*produce *ng* chicks up to growing and ranging and health management, at the same time sa feeding and use of alternative feeds," Dr. Abuan shared when asked on the technologies provided by BPSU.

Geraldin O. Guanzon, 48 years old, one of the farmer cooperators from Hacienda Gabon, Abucay, Bataan shared, "*ngayon nakakapagbenta na kami ng dalawang* trays *ng itlog araw-araw. Malaking tulong po ito para sa amin. Nakakapagbenta po kami sa mga kapitbahay. Ang*

2 trays *ng itlog ay mula sa bilang na* 100 *ng alaga naming manok.* Ang housing design *na ginawa po ng* BPSU *ay malaking tulong po sa amin sa pag-aalaga.*"

Through the project, chickens are to be distributed to the second batch of farmer-cooperators. BPSU provided technical assistance in planting Madre De Agua and Azolla to be used as alternative sources of feed for the free-range chicken.

"This was to lessen the cost of feeding," Dr. Abuan said.

Currently, "we have four farmer cooperators for the first batch and five for the second batch that are fully capacitated by the BPSU Abucay team on the management and production of free-range chicken and how to operate and maintain the egg incubator machine. They are able to be exposed to the actual conduct of different concoctions during the said training and actual visit to the farm of BPSU," shared Dr. Abuan.

Meanwhile, the first batch received housing support with a fence, including stocks, feeds, and planting materials for Madre De Agua and other technical support in producing free-range chicken,

As a way forward, BPSU is planning to produce more free-range chicken and distribute the technologies to other municipalities in the province.

The project ended in June 2024 and BPSU is planning to continue this project by sharing the technologies with interested farmers of Bataan and nearby provinces by continuing "*sa* Free-Range Chicken, *malayang manukan, malayang hanapbuhay!*" ■

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BOOSTING ROBUSTA COFFEE PRODUCTION IN MINDANAO

RENA S. HERMOSO

Imagine this.

The air is cooler and the sun has yet to rise. You walk toward the ticketing office of the provincial bus liner going to Metro Manila. Through the window, you can see a small cup of rich, dark liquid, placed near the monitor and keyboard. The steam is moving up, carrying with it the earthy and mildly burnt scent. After your transaction, you approach the bus driver and conductor—each holding the same small cup—to ask if the parked vehicle is your ride. It is. Before going in, you went to the nearest store to buy yourself a hot drink—instant coffee.

If you can relate to the ticketing agent, bus driver, conductor, or imagined self and their reasons for drinking coffee—to stay awake or start the day, or maybe it's just your preferred beverage—early in the morning, chances are you belong to the majority of our population who drink coffee. On average, eight out of ten Filipino adults drink 2.5 cups of coffee per day. Nine out of ten households have coffee in their pantries. We come second to Japan as the second largest consumer of coffee in Asia.

Demand for coffee is rising as supported by the proliferation of local coffee stores (think But First, Coffee; Figaro Coffee; Bo's Coffee; and Pickup Coffee) and foreign ones (the likes of Starbucks, Coffee Bean & Tea Leaf, Tim Hortons, and Dunkin'), as well as neighborhood coffee shops—which flourished after the pandemic and serves as a "third place" or a public space outside one's home and work where people gather to socialize.

Domestic production, however, could not keep up.

"Self-sufficiency for coffee in the Philippines is only at 27%.

The project helped coffee growers to practice **science-based cultural management** such as applying fertilizer—based on the nutritional demand of the plant—at the right rate and time, as well as the proper pruning and harvesting of coffee.

The rest has to be imported," said Donnel Jun M. Tiedra, Government and Industry Affairs executive at Nestlé Philippines.

"In Nestlé alone, only 15% of our yearly requirement for Robusta is locally sourced," he added.

Robusta, the coffee species usually used to produce instant coffee and a popular choice for coffee blends, accounts for 58.7% of the country's total production in 2023.

"The coffee industry in the Philippines faces a big challenge. Our coffee farmers are only producing 400-500 kilograms per hectare, while Vietnam produces 2 tons per hectare," shared Tiedra in a mix of Filipino and English.

In March 2023, the Department of Agriculture (DA) and Nestlé Philippines forged the Mindanao Robusta Coffee Project that aims to grow the local coffee industry and to improve the sustainability of Robusta coffee farming in the country. This public-private partnership has five components: research, fertilizer support, upskilling of farmers, establishment of coffee centers, and logistics and marketing.

The University of Southern Mindanao (USM) through funding support from DA-Bureau of Agricultural Research undertook the research component of the partnership. To identify how coffee farmers can optimize the existing hectarage, USM conducted fertilization trials using different rates and combinations of organic and inorganic fertilizers in Senator Ninoy Aquino, Sultan Kudarat; USM Kabacan, North Cotabato; and Maramag, Bukidnon.

The yield of Robusta coffee varied across the experimental sites in the first phase.

The fertilization program for coffee was tailored based on the soil limitations and constraints identified in the first phase and is currently being optimized and validated. Soil test-based fertilization was one of the treatments being employed during the second phase of the project to address the site-specific nutrient requirement of Robusta coffee.

"The project helped coffee growers to practice science-based cultural management such as applying fertilizer—based on the nutritional demand of the plant—at the right rate and time, as well as the proper pruning and harvesting of coffee," said project leader Leandreux D. Ocasion in a mix of English and Filipino.

Ocasion and the farmer-partners of the project observed that the coffee flowers are abundant after applying the fertilizer treatments—an indicator for good harvest.

To complement these efforts, Nestlé Philippines through the Nescafé Plan introduced integrated pest management to the coffee growers.

"We teach them cultural management practices, how to control the pests and diseases, and if necessary the correct use of synthetic pesticide. We emphasized to them to only use pesticides that have green label or those that are safe to use," said Tiedra.

Edwin Batilo, coffee grower and president of the Tinalon Farmers Association, is among the farmer-partners who participated in the fertilization trials. He saw improvements in his coffee farm after applying the technology interventions introduced by USM and Nestlé.

"When we received the help from Nestlé, DA, and USM, our production improved and our harvest increased," he shared.

Batilo expressed willingness to continue using these technologies even after the support from the project ends. He committed to sharing his learning with other coffee growers and the members of his association, as he envisions upliftment of the lives of his fellow coffee growers.

"Once validated, the resulting technology from this partnership, as well as the cultural management practices will be disseminated to our coffee farmers and stakeholders to improve the coffee production," Ocasion assured. ■

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Beyond the acad

Role of CLSU in increa and cultivating stakeholders' allia

EDGAR A. OR
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Central Luzo

The Central Luzon State University, one of the most renowned and prestigious state-institutions of higher learning in the country, is nationally recognized center of excellence in agriculture, agricultural engineering, biology, fisheries, teacher education and veterinary medicine. More so, it is one of the foremost research-oriented universities in the country with rapidly expanding international visibility and recognition (www.clsu.edu.ph), making it 10th among HEIs in the country for Research Productivity in Science and Health by the University Research Rankings.

For over a century, the university has been at the frontier of producing competent human resources, generating technologies, and providing quality services to support the country's sustainable development.

As the research and extension arm of the university, the University Research and Extension Program has 15 specialized centers engaged in developing technologies that address the pressing issues on increasing productivity, efficiency and profit in crop, livestock and fishery production, and thus, to contribute in the attainment of the sustainable development goals (SDG).

Through this program, CLSU has been known for developing various technologies in agriculture composed of products, processes and information that are ready for dissemination, commercialization and adoption to complement or change the farmers' traditional practices in agricultural production and value adding (Orden et al., 2024).

In fact, as of 2023, there are 112 significant technologies in the university, serving as CLSU's contribution to S&T. In the past two decades, nine new varieties of special purpose rice, two hybrid rice, nano fertilizer, inorganic foliar fertilizer, improved management practices for onion, soybean, sunflower and legumes, tropical mushroom, smart agriculture, farm machinery, diagnostic kits for crop and animal disease pathogens, dairy products, and processed rice, tilapia and soybean food products are among the different technologies developed. In addition, important information from various impact assessments and socio-economic studies were also generated to provide an empirical basis to further improve R&D implementation.

As indicated in the CLSU's bibliometrics for the past years, 976 scientific papers published in peer-reviewed and refereed journals, and 7,827 citations recorded from 2020 to 2024, CLSU was able to produce three faculty researchers in the list of top most cited in scientific publications by 2022 AD Scientific Index (www.clsu.edu.ph). Additionally, a total of 91 generated technologies were granted IP protection, including nine plant variety protection (PVP) for special purpose rice, and 39 copyright protection through the operationalization of the Intellectual Property Management and Commercialization Office (IPOCOM).

With a common goal of developing technologies to further develop the agricultural sector, such technologies are products of research projects implemented by researchers from the University Research Program Office (URPO) and the Academic Program. In some cases, they were developed in collaboration with other SUCs and research institutions from CLAARRDEC and other consortia and agencies in the country including the Department of Agriculture (DA) and its attached agencies such as the Bureau of Agricultural Research (BAR), Philippine Council for Agriculture and Fisheries (PCAF), Special Area for Agricultural Development (SAAD), and DA-Central Luzon.

demic boundaries:

sing R&D productivity
nces for countryside development

RDEN, PhD
t for Research and Extension
n State University

For the holistic utilization of these generated technologies, CLSU spearheads their commercialization through the Technology Business Incubation (TBI). Currently, 41 technologies are being utilized by various clients. These technologies include goat, pelletized feeds and portable pelletizing machine, mushroom, tilapia, dairy products, and other value-added food products to name a few.

Moreover, 10 technologies were commercialized, which provide additional income to the university through sales and royalty. Further, several technologies have spin-off companies, producing and trading new products in the market that gave rise to creation of new enterprises.

However, the impact of CLSU can only be realized when the generated technologies are adopted by the target clients. With this, the dissemination and promotion of the CLSU-developed technologies are made possible through the University Extension Program Office (UEPO), which uses the traditional extension modalities such as training, techno demo farms, field days, IEC materials, and farm visits, among others.

Because it is gaining popularity and is more appropriate among farmers, social media is also being capitalized in extension activities under the new normal. With about 40,000 clients, composed of farmers, animal raisers, cooperative members, R&D workers, faculty members, students, and other stakeholders, served by the university through these modalities from 2018 to 2021, the University's extension activities were duly recognized by the Commission on Higher Education (CHED) Region III.

As the Top 1 in Best Practices in Extension and Productivity in the region in 2021 in view of its proactive action and significant impact to the people in the community, despite the challenges of the pandemic during the period.

CLSU is yet to gain higher adoption of its developed technologies to make agricultural production a more viable enterprise, hence creating more impacts in the countryside.

Responding to this challenge, the university launched two extension projects in the past years under the leadership of the former president Dr. Edgar A. Orden, to showcase the University's significant outputs in R&D.

First is the Kamalig (Keeping a Modern Agricultural Landscape through Integrating CLSU Generated Technologies) model farm, which was launched in 2022 (www.clsu.edu.ph). Kamalig is a two-hectare agricultural park in campus with science and agriculture-themed areas showcasing technologies on goat production, biogas digester, hybrid and special purpose rice, other crop production under hydroponics, conventional and organic farming, rice-tilapia farming, mango nursery, various breeds of chicken, and apiculture (beekeeping), among others.

Through the concerted efforts of researchers and support staff from the different programs of the University, with the R&E program providing the lead, the making of Kamalig was turned into a reality and a successful avenue for technology dissemination.

Second to Kamalig is the biggest five-year extension program launched in Nueva Ecija in October 2020 titled "Techno Village Development Program (TVDP)", which aims to transform communities into a hub where CLSU generated technologies are utilized to help families attain far-reaching socio-economic development (UEP Facebook page).

To date, a total of 29 farmers from Science City of Munoz,

Kamalig is a two-hectare agricultural park in campus with science and agriculture-themed areas showcasing technologies on goat production, biogas digester, hybrid and special purpose rice, other crop production under hydrophonics, conventional and organic farming, rice-tilapia farming, mango nursery, various breeds of chicken, and apiculture.

Guimba, Lupao, and Aliaga in Nueva Ecija are involved in the program involving different CLSU-developed technologies such as tilapia grow-out, aquashade, ITIK-PINAS, mushroom spawn production, special purpose rice production, and dairy goat production.

The ongoing success of the TVDP accrues to the strong partnership of the different Local Government Units (LGUs) of Talavera, Science City of Muñoz, Guimba, Lupao, and Aliaga, the farmer-partners and cooperatives, NGO, and the University.

With their commitment, it is expected that through the TVDP, technology dissemination and utilization for countryside development will be accelerated, and will bring CLSU into the heart of the community (UEP Facebook page) to create significant impacts on the lives of the people CLSU serves. In the future, CLSU envisions to empower the community toward socio-economic upliftment, effective local governance, rational and responsible use of resources, and sustainable development.

To attain this vision, CLSU fosters an enabling environment through various strategies. One is the development of the University Harmonized R&D Agenda, which serves as the roadmap for prioritization and conduct of the university's R&D plans and programs based on the university's mandate to generate, disseminate and apply knowledge and technologies to alleviate poverty, protect the environment, and anchored on the different sustainable development goals.

Another is building the capacity of human resources by sending faculty and staff to degree and non-degree programs in the country and abroad to provide a stronger and globally competitive workforce to ensure quality academic and R&D programs upon completion.

Also, CLSU is aggressive in pursuit of improvement of R&D facilities as CLSU is home to state-of-the-art facilities to help improve R&D implementation. Additionally, the university implements vigorous resource generation by organizing multi-disciplinary R&D teams to prepare and submit R&D proposals to national and international funding agencies by conducting workshops to speed up the development of the proposals.

To capitalize on its human resources to sustain the culture of academic and R&D excellence, and to make them more effective and efficient, the university provides promotion and other incentives for R&D productivity.

From 2021-2022, 241 employees were promoted through institutional promotion by virtue of the board-approved Merit System in the absence of NBC reclassification promotion cycle which has not been implemented since 2016. Moreover, CLSU continues to provide recognition and monetary reward to R&D personnel in the form of honoraria, travel grants for paper presentation, and incentives for publication and IP certification, subject to accounting rules and regulations. Furthermore, another strategy taken by the university to strengthen human resources is by building strong collaboration with international and national agencies for research collaborations and technical assistance.

As a reciprocal effect, all these efforts of CLSU to reinforce its R&D strength also illuminate in the university's program offerings. Recently, seven programs achieved the prestigious AUN-QA Certification (www.clsu.edu.ph) for their efforts and commitment to providing quality education, R&D productivity, and quality services which made them eligible for such certification. Indeed, R&D defines the big role of the university in transforming the target communities, and justifies CLSU's ranking with other prestigious universities in Asia and the world. ■

Growing green:

DA-BAR'S COMMITMENT TO ORGANIC AGRICULTURE

LARA ABEGAIL S. ESPIRITU

In the heart of Los Baños, an innovative center focuses on promoting sustainable agriculture through the use of organic inputs. The University of the Philippines Los Baños-Organic Agriculture Research, Development and Extension Center (UPLB-OARDEC) stands as a testament to the unwavering commitment and support by the Department of Agriculture-Bureau of Agricultural Research (DA-BAR) in organic agriculture research for development and extension (R4DE) endeavors.

Organic agriculture represents a paradigm shift toward ecological balance by abstaining from synthetic fertilizers and pesticides. This holistic approach not only enhances soil fertility but also upholds the health and safety of farmers, consumers, and the environment (Smith, 2002). Underpinning these efforts are principles championed by the Organic Agriculture Act of 2010, ensuring that biotechnological advancements remain aligned with the meaning of sustainability, explicitly excluding genetically modified organisms (GMOs).

The 7-hectare learning laboratory in organic agriculture is managed by the College of Agriculture and Food Science-Agricultural Systems Institute, College of Agriculture and Food Science (CAFS-ASI) at UPLB.

The establishment of the building was funded by the DA-BAR aimed to provide R4DE services in support of the implementation of the Organic Agriculture Act of 2010.

Nearing its 5th anniversary, the UPLB-OARDEC has been accredited as a Learning Site for Agriculture by DA-Agricultural Training Institute (ATI) Calabarzon in May 2022. Further to this, it was considered as one of the project sites of Promoting Agroforest Stewardship & Ecological Observations (PASEO) through Edutourism—a Commission on Higher Education (CHED) funded project also being implemented by UPLB.

This accreditation not only enhances the institution's credibility and reputation within the agricultural community but also opens doors to access government programs, funding opportunities, and collaborative initiatives aimed at advancing agricultural innovation and sustainable practices, especially in the field of organic agriculture, according to the project leader Dr. Blesilda M. Calub.

It ensures that students and organic agriculture practitioners receive high-quality training materials that meet industry standards, preparing them effectively for careers in agriculture as well as dissemination of best practices in farming and rural development.

Dr. Calub, former program coordinator of the organic agriculture program of CAFS-ASI said that: "[...]students and organic agriculture practitioners from various schools across Laguna and neighboring regions at OARDEC have been incredibly enriching. It's inspiring to witness their enthusiasm for organic agriculture and their eagerness to learn sustainable farming practices."

"These visits promote knowledge exchange and reinforce our commitment to nurturing the next generation of agriculturists who will champion environmental stewardship and food security in their communities." she added.

Beginning in 2023, the center conducts its Organic Agriculture Fair. This annual event serves as a platform to showcase organic products, innovations, and sustainable agricultural practices to a wide audience, including farmers, students, researchers, and the general public.

The Organic Agriculture Fair is more than just an exhibition; it represents a convergence of ideas, experiences, and advancements in organic farming. Participants not only have the opportunity to view and sample a variety of organic products ranging from fruits and vegetables to herbs and processed goods but also engaged in guided tours that highlight the center's research and development efforts in organic agriculture modules, including visits to the aromatic garden, medicinal garden, organic vegetable garden, organic soil amendments, integrated crop-animal system, agroforestry, and kids' garden. These tours provide valuable insights into the techniques and technologies being employed to enhance soil fertility, crop diversity, and pest management without resorting to synthetic inputs. On 17 May 2024, the First Organic Agriculture Camp was held at the center which was attended by senior high school students and alumni of the 2023 Teachers' Capability-Building on Organic Agriculture (TEACH-OA). The event showcased demonstration setups on agriculture, food technology, and agripreneurship.

The DA-BAR funded OARDEC at UPLB has made a profound impact on sustainable agriculture in the Philippines through numerous training, educational tours and accreditation from DA-ATI as a learning site. This facility serves as a beacon of innovation and education, pioneering research and development in organic farming practices. Through its outreach programs, workshops, and trainings, OARDEC fosters community engagement and knowledge sharing, catalyzing a shift toward more sustainable farming methods that benefit farmers, consumers, and the environment alike. ■

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> *These visits promote knowledge exchange and reinforce our commitment to nurturing the next generation of agriculturists who will champion environmental stewardship and food security in their communities.*

Expanding a cooperative's gain THROUGH MUSCOVADO SUGAR

MA. ELOISA H. AQUINO

What comes to mind when the province of Isabela rings a bell? One can yell for *pasalubong* of pancit Cabagan, pancit Batil Patong, corn, *longganisa*, pastillas, among others. But interesting to note that sugarcane products including muscovado sugar now include the list.

Isabela State University (ISU)-Echague Campus introduced the production, processing and commercialization of muscovado sugar in the region because of greater potential in the market reflective of the increasing trend of consumers' awareness and health-conscious individuals.

Aimed to establish a small-hold village-type enterprise, ISU assisted in the establishment and registration of Pangkaunlaran Venture Agriculture Cooperative (PVAC) formerly known as Pangkaunlaran Development Association, Inc. (PDAI), an implementing arm of the World Vision Philippines.

"Backyard muscovado sugar processing can be easily adopted by small farmers for their livelihood activity to provide additional income," Dr. Diosdado Cañete, project team leader, said.

In support of the production of muscovado sugar, small-scale sugarcane production was introduced to the farmers including proper establishment of a sugarcane plantation starting from field preparation such as plowing, harrowing, planting,

and proper cultural management, care and maintenance of plants specifically on nutrients, pest, and diseases management.

"They do value-adding activities on sugarcane during their spare time and lean months' time. Thus, due to the potential of this village-type livelihood activity for replications to other farmers," Dr. Cañete added.

PVAC, an established cooperative, was initially engaged in organic fertilizer and vegetable production, swine and poultry raising, and meat processing on a backyard scale as additional sources of income. Funded under the Agriculture and Fisheries Competitiveness Enhancement Fund R&D Grant, farmer members were capacitated to produce and process muscovado sugar in Isabela.

With 48 active members composed of families from the municipalities of Isabela such as Cordon, Santiago City, San Isidro, and Gamu, PVAC adopted the package of technology (POT) on muscovado production from the ISU team to improve their conventional practices. Members are directly involved in the sugarcane production operation and processing to produce muscovado, wine, vinegar, and other by-products—enabling the members to operate the machine on their own for juice extraction, cooking, packing, and marketing.

"The technology is not difficult to follow, providing the cooperative a new venture for income generation initiative as well as additional income to the members in terms of paid labor," BOD and Management of PVAC said.

Members were also immersed in Lakbay-aral at Hacienda Viena and Sugar Regulatory Authority at La Granja, La Carlota City, Negros Occidental; and hands-on training in Central Philippines State University processing facility in Kabankalan City, Negros Occidental. Further to this are various trainings from the different government and non-government organizations.

The production and processing are applicable to small farmholders with a minimum of 2500 square meters of farmland per cooperative member to continuously provide all-year-round production of sugarcane that serves as the source of raw materials for muscovado production.

Established in May 2022, PVAC members source their raw materials in a 0.8-hectare sugarcane plantation at Capirpiriwan, Cordon, Isabela owned by one of its members.

In terms of value-adding activities, ISU tapped the Santiago City muscovado processing facility to exercise the actual production of the product. With the arrival of the squeezing machine, PVAC was able to produce "pulitiput" products, a sugarcane syrup that can be pulverized to become granules.

"The percent turnover of stalks to extracted juice and juice products (muscovado, wine, vinegar, and molasses) were 34.75% and 57.15%, respectively," Dr. Cañete shared.

Based on the computed cost and return analysis on sugarcane production, the 0.8 hectare of sugarcane operated by PVAC during the project can be considered a favorable and profitable venture for the cooperative members. With a yield of 12 tons of sugarcane stalks and gross income of PhP 36,000, a net income of PhP 6,825.75 can be derived which is 23.40% return above the cost of operation.

"Combine gross income of processed products of PhP 180,000.00 less operating expenses of PhP 92,438.17 with a net income of Php 87,560.83 and obtained with return above costs of 94.72%." Dr. Cañete shared in terms of the developed products (muscovado sugar, sugarcane wine and vinegar, spiced vinegar, and papaya pickle).

"The production is continuous to supply the demand in the local market PVAC outlets like the display area in Cordon Municipal Hall Kadiwa Center, members' needs, surrounding households, and other cooperatives engaged in re-selling the products." Dr. Cañete added. ■

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"Backyard muscovado sugar processing can be easily adopted by small farmers for their livelihood activity to provide additional income.

LEVEL OF AGRICULTURAL MECHANIZATION IN SOUTHERN TAGALOG REGIONS:

Crucial to improving rice and corn production systems in the Philippines

LEA B. CALMADA

Defining the level of agricultural mechanization in Southern Tagalog Regions is crucial to improving rice and corn production systems in the Philippines. To effectively provide appropriate mechanization interventions, the government needs to assess the level of agricultural mechanization in various areas of the country planted to rice and corn.

It is in this context that the University of the Philippines Los Baños (UPLB) developed the project entitled "Assessment of the Level of Mechanization of the Rice and Corn Production and Post-Production Systems in Region IV", with funding support from the DA-Bureau of Agricultural Research (BAR) and implemented by the Agribiosystems Machinery and Power Engineering Division, Institute of Agricultural and Biosystems Engineering, College of Engineering and Agro-Industrial Technology (CEAT),UPLB for the period of January 2019 to December 2021.

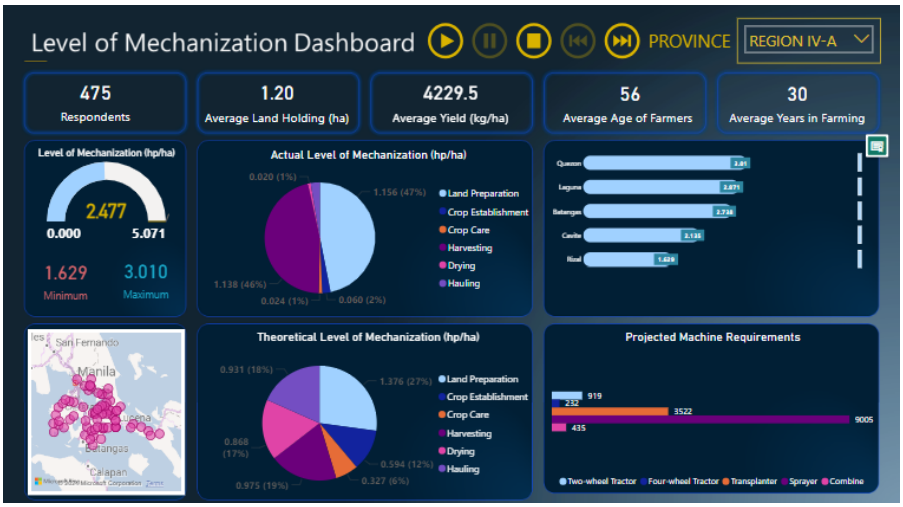
The DA-BAR project was an off-shoot of the policy study conducted in March 2016 to May 2017 titled, Operational Policy for the Development of the Philippine Agricultural and Fisheries Mechanization Index which was funded by the DA-Philippine Council for Agriculture and Fisheries (PCAF) and was implemented by the Center for Agri-Fisheries Mechanization and Biosystems Mechanization (BIOMECH), CEAT, UPLB. This UPLB and DA-PCAF project formulated the methodology/ procedure for the computation of the level of mechanization for rice and corn production systems. Consequently, the methodology of the computation of the level of mechanization was adopted by DA through DA Memo No. 17-076, 077 and 078, S. 2017.

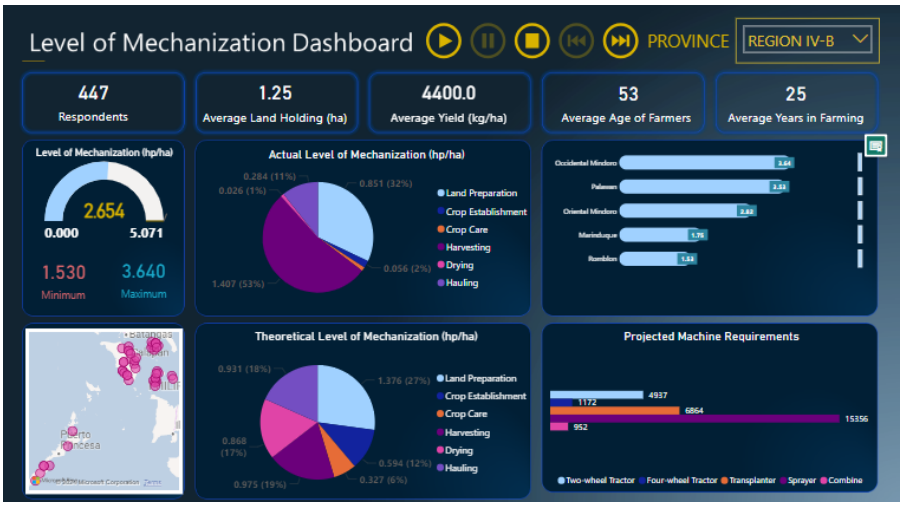
When the policy and procedure for the computation of the level of mechanization for the rice and corn production systems were already in place, DA-BAR conducted the assessment of the level of mechanization of the rice and corn production and post-production systems in Region IV to establish data on the ideal level of mechanization.

Results of the study showed that the computed levels of mechanization in regions IV-A and IV-B are still below the ideal level of mechanization. Using the Modified Agricultural Modernization Index (MAMI), the level of mechanization in Region IV-A (covering five provinces) for rice and corn production systems is found to be 2.48 hp/ha (ranging from 1.62-3.01 hp/ha) and 1.93 hp/ha (ranging from 1.40 to 2.50 hp/ha), respectively. Meanwhile, Region IV-B has an average level of mechanization of 2.67 hp/ha for rice (ranging from 1.53 to 3.66hp/ha for the provinces surveyed) and 2.64 hp/ha (ranging from 0.51 to 5.26 hp/ha for the provinces surveyed) for corn production systems. The computed values were way below the target levels of mechanization, that is, 5.071 hp/ha for rice and 6.541 hp/ha for corn. The study indicated that the regional levels of mechanization should be presented as a range to present the minimum and maximum mechanization levels, so as not to leave out the provinces with lower level of mechanization, which is not reflected when the level is presented as an average. The average value is presented to convey the indicative level of mechanization within the region.

Moreover, a Database Management Information System (DBMIS) was developed by the project for data encoding, processing, and analytics. The collected data from the survey were first verified and then were encoded into the DBMIS for data processing, analytics, and data generation for interpretation. The

A Database Management Information System (DBMIS) was developed by the project for data encoding, processing, and analytics. The collected data from the survey were first verified then were encoded into the DBMIS for data processing, analytics, and data generation for interpretation. The DBMIS automatically computed the level of mechanization for the rice and corn production systems for each province.





DBMIS automatically computed the level of mechanization for the rice and corn production systems for each province. Other demographic, socio-economic, and mechanization information of the respondents could be derived from the DBMIS.

Based on the results and findings of the study, five major policy recommendations were formulated, namely: the MAMI procedure and methodology shall be used in calculating the level of mechanization; the lowest and highest levels of mechanization are represented in terms of hp/ha among the regions in the country; each region will set a target level of mechanization achievable within a given period and this will be computed through the MAMI procedure; the Regional Field Offices (RFOs) shall determine the current/actual power of the distributed machines in the region following the technical protocol of the MAMI; and the administrative protocol for the determination of the level of mechanization formulated by the study shall be followed and implemented for efficient collection of data and information.

The study identified DA-BAFE as having a crucial role for the level of mechanization determination, updating, and monitoring. For their part, RFOs shall determine the machinery requirements to achieve the ideal mechanization level in their respective regions and administer and maintain the Agri-Fisheries Mechanization Database Information System.

Meanwhile, the level of mechanization of the AFMDIS of the regions shall be included or integrated in the Agricultural Mechanization Engineering Resource Network of the Agricultural and Fisheries Mechanization Law Law of 2013 or Republic Act 10601. ■

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Minimizing turmeric postharvest losses

RENA S. HERMOSO

In recent years, more Filipinos are making a deliberate effort to better manage their health. They watch what they eat and drink, stay physically active, and get enough rest. They are usually the ones on the lookout for organic foods, plant-based products, functional foods and beverages, and herbal and nutritional supplements.

The shift to a healthier lifestyle drives the demand for certain commodities like organic fruits and vegetables, superfoods like moringa and turmeric, and legumes—popular meat substitutes.

Among the superfoods cultivated in the Philippines, turmeric is arguably one of the less popular ones—underutilized—with little to no published data on its production and consumption. Native to Southeast Asia, turmeric is extensively cultivated in India—which contributes 80% to global production—and has long been used in their traditional medicine. Curcumin, the bioactive compound that gives turmeric its bright yellow-orange hue, was found to have anti-inflammatory, antioxidant, anti-carcinogenic, and antimicrobial properties.

Postharvest storage technologies are required to provide buyers with a stable supply of rhizomes in fresh and processed forms. To help farmers capitalize on the demand for turmeric, the Postharvest Horticulture Training and Research Center, UPLB (PHTRC-UPLB) implemented a project funded by DA-Bureau of Agricultural Research, to develop storage techniques of turmeric rhizomes intended for fresh market and industrial processing and as planting materials. Due to the unavailability of published data on postharvest handling and losses in the supply chain of fresh turmeric in the country, the research team interviewed farmers, traders and processors and visited markets in Pagbilao, Quezon and Santa Fe, Nueva Vizcaya. They traced the product flow from the farm to retail market, determined the extent of losses and identified the causes at each handling step. They also conducted weekly quality evaluations of the turmeric rhizomes during storage and retail marketing until they reached the unmarketable stage.

Turmeric, usually grown in a multi-cropping system, is solely rainfed and cultivated without

fertilizers and pesticides. The research team found that farmers in Quezon and Nueva Vizcaya practice similar cultural management practices. The farmers, however, raised concerns about the lack of sure buyers and the unstable price and demand.

Rejects at the farm level were mostly mother rhizomes, a few were due to the diseased ones. Losses at the retail level are primarily due to loss in quality due to shriveling and disease which result in downgrading of the product and reduction in the price. Traders incur additional costs for washing and repacking of the rhizomes if not sold immediately. Postharvest interventions were thus recommended at the retail market level where monetary losses were incurred.

Based on the results of their study, the PHTRC-UPLB research team formulated the postharvest handling operations of turmeric. They recommend harvesting at nine months from planting if the rhizomes will be stored. The 9-month-old rhizomes had longer storage life due to delayed onset of shriveling, sprouting and disease development compared to the 12- and 24-month-old. The curcumin and phenolic content and, antioxidant activity of the latter are comparable to the 9-month-old rhizomes.

During harvest, the rhizomes are shaken to remove the adhering soil particles. Field sorting is done to remove the unmarketable rhizomes while the marketable ones are hauled to the farmer's house where cleaning is done. The rhizomes are brushed, trimmed of extra roots and washed in running water. Washed rhizomes are placed in a raised slanted platform to air dry and then packed in plastic bags (30 kg capacity) for transport to the market or to the processing plant. If the rhizomes are still wet, pack them in plastic crates to prevent the build-up of moisture which promotes disease development and sprouting. Plastic crates also prevent mechanical injury.

At the processing plant, the rhizomes are inspected, sorted and washed. Only good quality rhizomes of suitable size are processed. It is recommended that rhizomes for processing be boiled for 30 minutes then thinly sliced and dried. This process improves the color and increases the curcumin and phenolic content, and antioxidant activity.

The team strongly recommended washing only the rhizomes, preferably with a power sprayer, when they are to be immediately marketed or consumed. The team noted that unwashed rhizomes have a lesser probability of developing disease. The team found that washed turmeric had higher disease incidence during storage, than its unwashed counterpart. Seed rhizomes can be stored at ambient temperature for up to eight weeks only to ensure good seedling vigor. The growth rate of seedlings slowed down as storage duration of the planting material was prolonged.

The postharvest handling technology for turmeric will be included in the regular training courses offered by the PHTRC-UPLB under its Extension Program. The researchers will also collaborate with other government agencies, local and national, to promote the said technology. ■

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AN ALTERNATIVE SUGAR

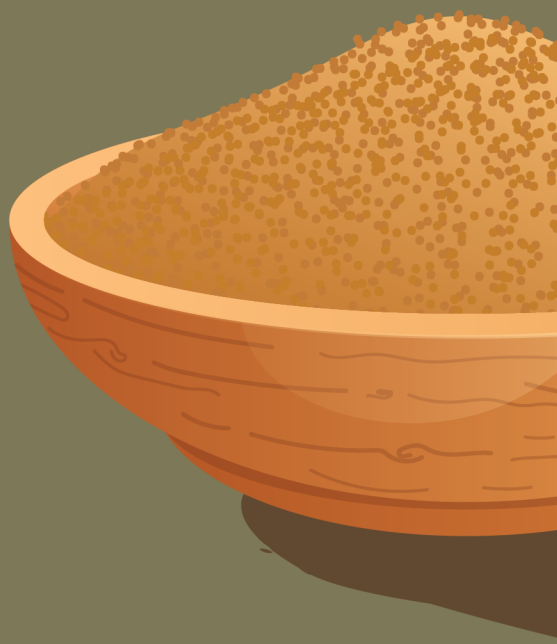
Muscovado sugar, also known as red or black sugar, is a natural sugar produced by extracting, purifying, and crystallizing the juice from sugar cane.

It retains a higher concentration of molasses, giving it a stickier texture compared to most other sugars.

Rich in minerals, vitamins, and other biochemicals naturally found in a sugar cane plant.

It is more nutritious than refined sugar due to its higher mineral content.

It contains potassium, iron, calcium, and magnesium, all of which are beneficial for health.



Muscovado by-products

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Prepared by Alexis B. del Mar

MANAGING R&D IN AGRICULTURE:

Lessons learned from benchmarking of selected Asian countries

SALVACION M.RITUAL

Agriculture faces unprecedented developmental challenges not only locally but globally. Similarly, modern advances in research and development (R&D), offer vast opportunities in improving agricultural production and productivity levels, as well as improving performance of the whole agricultural value chain.

DA-BAR, as the lead coordinating agency in agriculture, has long been investing in R&D. Long-standing investments by the bureau have shown significant contributions to help farmers improve their agricultural productivity through technology and innovation; this despite low budgetary requirements given to R&D compared to other government spending. However, stimulating research spending alone is not enough to solve the low budgetary concern. Improving priority setting, implementation and evaluation process of R&D system are of parallel importance.

This requires a clear understanding of the overall R&D system particularly identifying the gaps and priorities for actions as one strategy in strategically managing research considering the limited resources at the moment.

Benchmarking: Lessons learned

Benchmarking of R&D indicators and policies from selected Asian countries was conducted to gain overview and insights into how these countries manage their R&D system to including approval and funding of projects, monitoring and evaluation, technology transfer and commercialization, intellectual property, public-private partnerships, and information systems among others.

Drawing from the secondary data and information, the benchmarking activity provides additional knowledge on how selected countries are placing themselves to address global challenges in food security and tap opportunities for long-term agricultural growth and prosperity through R&D support. Specifically, this activity visited the following countries: Thailand, Malaysia, South Korea, Japan, Vietnam, Indonesia and Taiwan and featured some institutions considered as prime movers of research implementation in their countries. Highlighted during the benchmarking activities were some of the best practices, policies, and models for managing research and innovations to contribute to agricultural development objectives.

Overall, agricultural research activities in these countries as well as government funding process have been guided by institutional mechanisms and policies which have been set based on the national goals or plans. Also, current research directions are basically geared toward food security, adding value to agricultural products, and technology transfer and commercialization. Emphasis has also been placed on stimulating R&D spending, capacitating research personnel, increasing collaboration with private sector as well as international partners. It can be noted though that R&D policies and implementation are at varying levels of development and successes.

In terms of innovation policies, most of the countries are institutionalizing intellectual property and technology transfer strategies to accelerate commercialization of research-generated technologies/products and promote strong public-private partnerships.

Each country, through the various institutions visited, has more or less similar institutional mechanisms and policies when it comes to project approval, monitoring and evaluation, and management of research outputs. Overall, the national agricultural R&D systems of South Korea, Japan, Indonesia, Vietnam and Taiwan are more developed with additional oversight or governance for agricultural innovation provided by the Ministries of Science and Technology or their equivalent.

For carrying out different R&D activities, it is worth mentioning that in countries like South Korea, Japan, and Indonesia, centralized information systems are well-established to support efficient approval of projects, monitoring and evaluation as well as feedback mechanisms. This also serves as an effective decision support tool in planning, funding, and implementation of R&D activities.

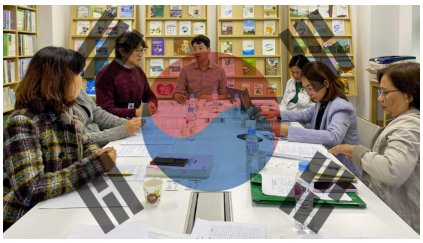
Partnerships also play a critical role in R&D activities among these countries, building on existing efforts to partner with national organizations, state and local governments, private sector and trade associations, and leading universities and research institutions.

What lessons, then, can the DA-BAR learn from this benchmarking – particularly in bringing useful insights and aspirations to further enhance its R&D processes and policies? While some of the identified mechanisms are already in place at DA-BAR such as agenda setting and prioritization, as well as monitoring and evaluation, what is needed maybe is to further strengthen its R&D management processes and implementation. With limited resources, it is critical that in setting R&D priorities, it must consider following a process that is equitable, involving key stakeholders, and uses evidence-based approaches to identify areas of greatest needs.

Crucial to effective and efficient R&D planning and management, which the bureau should strongly consider, is bridging the data disconnect and building a strong database, not to mention a centralized information system to ensure seamless flow of information within and outside the bureau. The operation on one single platform, which everybody has access to, significantly facilitates every transaction from approval of proposal, funding, evaluation of reports and feedback mechanism.

In this era of globalization, maximizing the use of information and communication technology tools and decision support systems in managing research and innovation will also facilitate integration of existing knowledge and technologies in the planning of priority research programs, dissemination of research outputs and technology adoption, data reporting, and identification of strategic collaborations with R&D partners both local and international.

Another important lesson is that massive investment support is vital in translating research results into usable outputs that meet the needs of stakeholders and have impact in the lives of small farmers. The leading countries feature an integrated, multi-faceted approach toward supporting their technology transfer and commercialization with robust funding. The focus is not only on fostering technology uptake and use, but also on facilitating innovation and growth through new products and processes. Hence, supporting policy reforms offers further potential that benefits of R&D translate into usable results. ■



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