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Carving out a niche

for native crops and livestock

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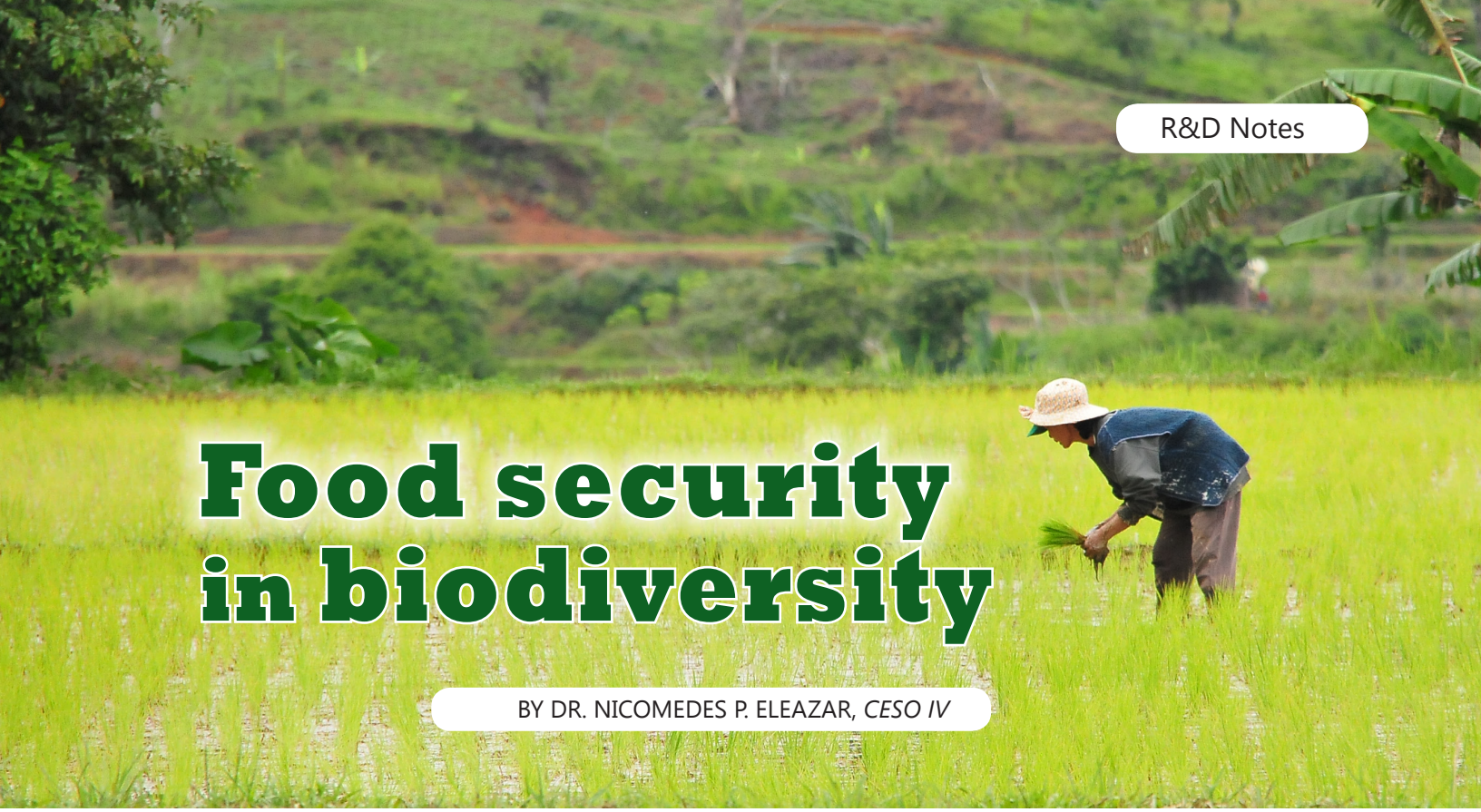

Food security in biodiversity

BY DR. NICOMEDES P. ELEAZAR, *CESO IV*

Biodiversity plays an important role in ensuring food security and substantial income for our small farmers. It is through the different plant and animal species available to us that the country's food demand is being continuously sustained and provided for.

But with the increasing population and the inability of our farmers to meet the demand for more food, the country's per capita food production continues to decrease.

Biodiversity is threatened by the degradation of our natural resources that could globally impact the availability of food. Expanding agricultural productivity to meet food needs in the face of an increasing competition for our natural resources and the declining soil fertility is the real challenge of our time.

Reduction of biodiversity entails an increase in the number of options for ensuring more diverse nutrition, enhancing food production, raising incomes, coping with environmental constraints and managing ecosystems. Recognizing, safeguarding and using the potential and diversity of nature is critical for food security and sustainable agriculture.

Food security, being an important aspect in strengthening the country's biodiversity, must also be focused on the importance of conservation. We need to strike a good balance between food security and environmental protection. This is in relation to the rapid exploitation of our rich resources and natural habitats that provide the proper ecosystems for the existence of our diverse plant and animal species.

The country's food security is affected by the performance of agriculture. The underdevelopment of agriculture could significantly affect food production and prices of agricultural commodities. However, its development should not be done at the expense of biodiversity and our environment. We believe that a loss in biodiversity has serious implications on global food security.

To increase the productivity of our crops and their reliability and nutritional quality—which is the life-line of our food producers—we must make full use of the genetic diversity of our country. Sustainable agriculture can provide solutions to issues arising from conventional agriculture as it works on the premise of enhancing our biodiversity.

In this issue of the BAR R&D Digest we give recognition to our indigenous and endemic crops and livestock species. These encapsulate our efforts in the agriculture and fisheries R&D in recognizing the country as having a mega diverse resource that can both address food security and still guarantee that the next generations will still have enough food to eat and enough natural resources to enjoy. ###

Carving out a niche for native crops and livestock

BY VICTORIANO B. GUIAM

Indigenous and endemic crops and livestock are now beginning to be seen in better light and gaining broad acceptance. There is really a lot more to our native species than today's globally-oriented people think.

By indigenous we mean species or subspecies of wild flora and fauna naturally occurring or have a naturally established population in the country. On the other hand, endemic plant and animal species are those that are found only in the country and nowhere else.

With the Philippines' geological history and it being separate from the rest of Asia and the world, its unique physical conditions have given rise to high species diversity. On a per hectare basis, the country has one of the highest diversity of life on earth. According to the International Union for the Conservation of Nature (IUCN), the Philippines ranks fourth in the world in terms of species diversity and endemism. A total of 39,100 species of flora and fauna have been identified in the country, of which a high 67 percent are endemic. Some 15,000 species of flora have been identified. Of the 8,120 species of flowering plants found here, 40 percent are endemic. More than 3,000 various plant species in the country have been significant to the lives of the Filipino nation as food, medicine, fibers, essential oils, and timber and as ornamentals.

With the diversity in genetic resources useful to food and agriculture, we have a rich source of genetic materials for the improvement of crops and livestock. (Cultivated crops, and their closely related wild species, collectively form part of what is known as plant genetic resources or PGR. PGR together with domesticated and wild animals, to include microorganisms, that provide genetic material and other support to agricultural ecosystems and productivity, are referred to as "agrobiodiversity" which is a subset of biodiversity.) With this resource, yields can be increased along with resistance to pests and diseases and the vagaries of weather and climate. With greater productivity come greater availability of food, higher incomes, and poverty alleviation.

Our resource of indigenous and endemic plants and animals important to agriculture (agrobiodiversity) is under great threat and losses have been high. These have been mainly due to: 1) the introduction and spread of high yielding and new varieties of crops, livestock, and fish species that have displaced indigenous ones; 2) intensification of the agricultural system and establishment of commercial plantations that have made growing habitats less favorable for indigenous plants and animals; 3) overexploitation and excessive gathering of wild plants and animals; 4) inadvertent introduction of pests and diseases; and 3) destruction of the natural environment/ecosystem, including environmental pollution, with urbanization and population pressure. But the biggest threat is in people's neglect and apathy towards the preservation of agrobiodiversity.

Most countries today have found sense in developing appropriate conservation strategies to protect plant and animal genetic materials, ecosystems, and the traditional knowledge associated with them from genetic erosion and loss of agrobiodiversity.

In June 1992, a historic event was held, the United Nations Conference for Environment and Development (UNCED) or Earth Summit. This produced the blueprint for a global environmental agenda,

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Edible *Canna*

POTENTIAL SOURCE OF FLOUR

BY ANNE CAMILE B. BRION

Introduced widely, cultivated in tropical countries, and has been naturalized in regions including Southeast Asia and the Pacific, Canna (*Canna indica* L.) is a flowering herb that grows up to 2.5 meters in height. Abundantly growing throughout the Philippines, Canna is popularly known as *Bandera Española* (Spanish flag) due to the vibrant red and yellow colors of its flowers. Most often, it is used as an ornamental plant – either as potted indoor plant or landscape plant. Its local name includes *balunsaying*, *kukuwintasan*, and *tikas-tikas*.

Many of its parts are found useful in a variety of ways. For instance, young shoots can be eaten as vegetables while its leaves and rhizomes are utilized as animal feed, fodder, and forage for cattle and swine. Canna leaves and stems, when burned, are used in pest management. Seeds are formed into beads and made into accessories, or as part of percussion instruments such as rattles. In traditional medicine, rhizome extracts are believed to be an effective remedy for headaches, diarrhea, nose bleeding, and as a diuretic.

While Canna is mostly recognized for its aesthetic value, it also produces rhizomes underground, which when processed, are turned into edible starch and flour. In Vietnam, it is used in making noodles. On the other hand, it is traded as Queensland arrowroot in Australia and valued for its high-value starch.

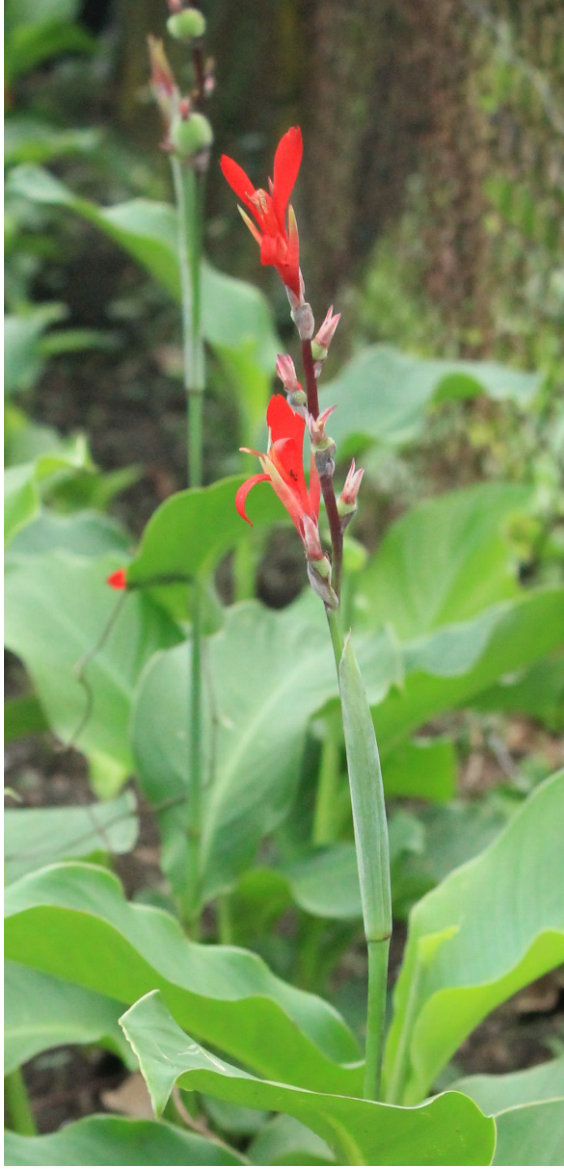
R&D efforts on Canna

Seeing the potential of the Canna plants thriving in the country as a possible source of flour, the Crop Science Cluster of the College of Agriculture, University of the Philippines Los Baños (UPLB) explored on its uses as part of the project, "Utilization and Commercialization of Selected Indigenous and Endemic Plants Found in Region IV with Potential Economic Uses". Funded by the Bureau of Agricultural Research (BAR), the initiative sought to increase public awareness on some of the endemic and indigenous plants that can be found in the region and promote them as potential sources of food and non-food products.

As a component of the project, collected wild species of Canna in some areas in Laguna, Batangas, and Rizal were propagated. These were further cultivated for field reproduction and were harvested five months after planting. The rhizomes were processed into flour and subjected for food composition analysis.

Proximate analysis of Canna flour as compared to other flours including cassava, wheat, and bread was conducted. Initial results showed that the Canna flour contains relatively higher crude fiber content, but lower crude fat and crude protein. In addition, it has relatively higher amount of carbohydrates than cassava flour. When compared with other commercial flours, Canna flour was found to have lower total starch. However, when compared to the Australian Canna flour, it was revealed that the Philippine Canna flour has higher starch content. With this, the processed Philippine Canna flour is being evaluated as a raw material in making pastries such as cookies.

Currently, the plant is continuously being propagated



to serve as planting materials for future related researches and product development undertakings. Research and development must be continually tapped to realize the full potentials of indigenous plants that are just waiting to be explored. ###

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Saving the vanishing **silver perch**

BY DARYL LOU A. BATTAD

Considered as the most delicious freshwater fish in the Philippines, the silver perch (*Leiopotherapon plumbeus*), or *Ayungin*, as Filipinos call it, is reported to be in the continuous decline as threats of over exploitation, degradation of habitat, and the rapidly growing number of invasive species thrive in Laguna de Bay, known to be the sanctuary of the silver perch.

An omnivorous silver-colored fish, *Ayungin* is an endemic species in the Philippines. It is known to occur only in the freshwaters of Luzon, particularly in Laguna Lake. The silver perch species was introduced from Laguna de Bay to Sampaloc Lake and Taal Lake in the early 1950s and 1970s.

The silver perch eats a wide variety of organisms including shrimps, zooplankton, snails, aquatic insects, and other vascular plants. Growing to a maximum size of 16 centimeters long, they are said to be "little fighters", being quite aggressive. But despite their small size, they are very tasty, making them a favorite food fish of many Pinoys, including the country's very own national hero, Dr. Jose Rizal.

R&D efforts

In spite of its thinning population, the demand for *Ayungin* remains high. This led to some interest groups to conduct studies on *Ayungin* related to distribution, feeding habit, biology, population genetics, harvest, and general fishery resource. However, studies on raising and producing *Ayungin* from an aquaculture system in the Philippines are very rare.

A team of researchers from the Limnological Research Station (LRS) of the University of the Philippines Los Baños (UPLB) led by Dr. Pablo P. Ocampo responded to this gap through a project on developing a technology to save the declining population of Ayungin. Funded by the Bureau of Agricultural Research (BAR), the project, "Development of Seed Production and Grow-out Culture Techniques for *Ayungin* (*Leiopotherapon plumbeus*) and *Biyang Puti* (*Glossogobius giuris*)" aimed to develop spawning and larval rearing protocols for reasonably effective mass propagation of both *Ayungin* and Biyang Puti seeds, establish grow-out culture techniques, and generate knowledge on growth potentialities of both species under floating cages conditions in shore of Laguna de Bay waters, as well as under closed pond conditions.

Prior to this, a captive breeding project of the UPLB-LRS, under the Department of Science and Technology-Philippine Council for Aquatic and Marine Research and Development (DOST-PCAMRD)

funding, titled "Fish Ark Philippines: Direction for the Conservation of Native and Endemic Philippine Freshwater Fishes" was able to develop techniques in spawning a number of freshwater fishes including *Ayungin* and *Biyang Puti* in captivity. Both species were spawned in the laboratory facilities of UPLB-LRS for conservation and production studies. Simply put, this project targeted to ensure that there will be enough number of species for repopulation through various techniques backed up by hormone intrusions, artificial feeds, flow-through system tanks, and continuous behavioral observation.

Although trials conducted were successful, yields remained unpredictable, compelling the team of Dr. Ocampo to further evaluate and refine drawn techniques for mass propagation of seeds. Initial data indicated the potential of Ayungin to spawn both under semi-natural conditions and hormone intervention, thus this project.

Breeding for repopulating

The first component of the project, seed production and larval rearing for use in aquaculture, was carried out through collecting broodstock directly from the wild, acclimatizing them for a month then conditioned for spawning. Recent laboratory results showed that *Ayungin* successfully spawned with high hatching rate at 1700-3400 IU/kg of HCG (Human Chorionic Gonadotropin), hence the same hormone injection is carried out. Furthermore, the effectiveness of the spawning agent is to be evaluated together with a dopamine antagonist, which is often used to limit the effects of dopamine (neurotransmitter released by the brain). When LHRHa (or luteinizing hormone releasing hormone analog) and a dopamine antagonist are used in conjunction, reproductive success dramatically increases.

During fry stage, which is more than 35 days old, the produced individuals are ready for re-stocking, and are then released to a pre-determined fish sanctuary area of Laguna de Bay, with continuous monitoring and data gathering.

The second component of the project, grow-out culture techniques of *Ayungin* in floating cages at Laguna de Bay waters include three major studies, focusing on evaluating both species as acceptable aquaculture species. Growth rate, survival rate, length of culture period, and profitability levels of the grow-out culture under floating cage conditions, feeding regimes associated with stocking density and culture shock were weighed up. The same experiments were carried out under closed pond conditions.

Today, aquaculture is deemed as one of the fastest growing food production industries. Over the years, more advanced techniques on fish production in controlled environments have been studied and developed which greatly affected the fisheries sector. Furthermore, its significant global economic effects increased both public and private sectors' interest in investing into this enterprise.

For Dr. Ocampo and the rest of the research team, the breakthrough in this study will not only help in reviving one of the country's endemic species, but also in restoring and boosting the economic status of many fishing communities within the region. And for this generation and the coming generations, the chance of having to taste traditional, native fish food. ###

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Balbas bariko: Fruit from heaven

BY DIANA ROSE A. DE LEON

Ever heard of *Balbas bariko*? It sounds like a name of some obscure villain from a comic strip or an odd character from a Pinoy flick when in fact, *Balbas bariko* is actually an indigenous fruit in the Philippines.

In English, it is known as spiny bitter gourd (*Momordica cochinchinensis* Spreng.) — a bristly version of the well-loved vegetable, ampalaya (*Momordica charantia*). These two plants belong to the same family Cucurbitaceae and genus Momordica, and yet they are quite different from one another in terms of appearance, taste, uses, and popularity. *Balbas bariko* is quite unheard of by most Filipinos due to the limited distribution and information about it.

Fruit from heaven

Coming from the family of gourds and climbing vines, *Balbas bariko* is a tendril-climbing, dioecious perennial vine that only bear fruits once a year. Its leaves are broadly ovate with 3-5 deep lobes, pointed tips, and heart-shaped bases. The flowers are pale yellow in color, oblong to oblong-ovate, with a large dark-colored blotch at the base. Its fruits are large and oblong to round in shape. Its outer covering is hard and covered with conical spikes. It is initially green but turns yellow to dark orange when ripe. The interior consists of a yellow to orange, spongy flesh; fleshy and bright red seed pods, and brown seeds that are irregular in shape.

Although not a popular fruit in the country, *Balbas bariko* is highly-prized in some other countries as it is claimed to have exceptional nutritional value and healing properties that promotes longevity, vitality and health. It is for this reason that *Balbas bariko* is dubbed as a "fruit from heaven".

Literatures proven that *Balbas bariko* has high levels of carotenoids particularly beta-carotene and lycopene. Carotenoids are plant pigment, a main source of vitamin A and antioxidants. Vitamin A is important to maintain good vision, healthy immune system, skin health, and cell growth while antioxidants help in removing free radicals from blood. As the human body cannot produce its own Vitamin A, one needs to ingest food that is high in carotenoids including dark leafy vegetables, and orange and red foods including carrots, sweet potatoes, and tomatoes to meet the nutritional requirements. *Balbas bariko* contains beta-carotene that is 10 times the amount in carrots and sweet potatoes, and lycopene that is 70 times more than tomatoes.

The oil extracted from its aril (seed cover) has high levels of Vitamin E, which is a fat-soluble antioxidant that is vital for the protection of cells from damage, and fatty acids, which is essential for the absorption of fat-soluble nutrients in a diet that is low in fat.

Uses of *Balbas bariko*

Aside from its health benefits, the appeal of the fruit is not of its taste, but of its coloring attribute which gives an intense red color to food. Those have tasted the fruit described it as plain and bland, like the cucumber.

In Vietnam, *Balbas bariko* (known as Gac) is prepared as a dish called xoi Gac. It is prepared by mixing the seed and pulp with cooked rice to impart a red color and distinct flavor. The dish is served during festive occasions such as wedding, Lunar New Year, etc.

To capitalize on its nutritive properties, there are already health drinks and supplements made from *Balbas bariko* extracts that are now commercially-available.

The roots, seeds, and leaves also used for its medicinal properties. The roots are used for treating head lice. In India, they make plaster from its roots to promote hair growth. In China, the seeds are used for liver and spleen disorders, wounds, hemorrhoids, bruises and swelling. In Vietnam, the seed membranes are used to relief dry eyes. In the Philippines, seeds are used to treat cough. The oil is used as skin rejuvenating, toning, and youth enhancing.

Propagating *Balbas bariko*

Vitamin A deficiency (VAD) remains one of the public health problems in the country especially among children and pregnant women. With this, *Balbas bariko* is being looked at as a healthy supplement to address the problem since the fruit is rich in Vitamin A. However, the possibility of this happening is low as most Filipinos are not familiar or have not even realized the potential of this crop as evident to its low utilization, insufficient supply, and lack of processing technologies.

Fortunately, a research study funded by the Bureau of Agricultural Research looked into the utilization and commercialization of selected indigenous

plants including *Balbas bariko*. This study is led by the University of Philippines Los Baños-College of Agriculture-Crop Science Cluster (UPLB-CSC).

The project started with the gathering and collecting of planting materials of *Balbas bariko* from various provinces in Region IVA. These were housed at UPLB to serve as mother plants for future propagation studies that would be conducted. Plants were propagated through seeds from mature red fruits and shoot tip cuttings. Promising result had been observed on its propagation. The shoot tip cuttings produced callus and root after two to three weeks submerged in water as compared to shoot tips directly planted in rooting medium.

The project is further looking into the value-adding activities for *Balbas bariko*. The project already started identifying the possible processed products for the crop such as snacks, tea, and food colorant. In fact, the project team had already used it as food colorant in *sinukmani* – a Filipino native delicacy made from glutinous rice and coconut milk. ###

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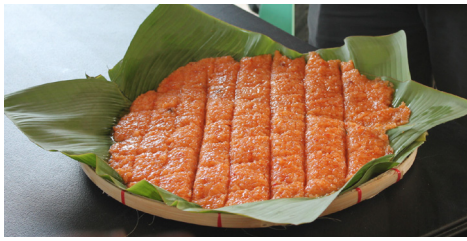
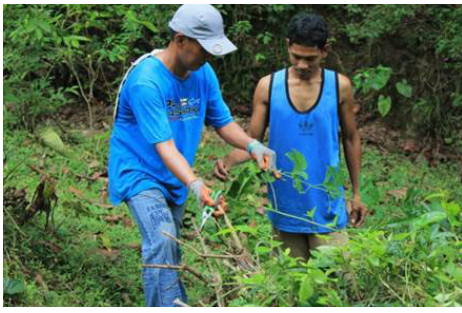




Big things are on its way for BIGNAY

BY EPHRAIM JOHN J. GESTUPA

If someone were to take the entirety of the diverse faces of the Philippine landscape and condense it into one specific area, it would very well be Region 2. This region pretty much has everything from mountains to valleys, shorelines to rivers, farmland to vineyards. Aside from being in the forefront for the country's supply for rice, corn, and banana, Cagayan Valley's diverse panorama is also home to countless native fruits such as guyabano, *lubeg*, *duhat*, and mango. Among these fruits, one stands out as an indigenous edible marvel.

Bignay grows in highly tropical and mountainous areas around the Philippines. With the plant's fruit resembling that of wild berries, *Bignay* grows in clusters and ripens unevenly. "The taste of *Bignay* fruit is both acidic and slightly sweet when fully ripe. Its distinct aroma and smooth flavor make it an excellent substrate for red wine." (Palaje, 2015)

Bignay is rich in antioxidants that help in detoxifying the body from free radicals that may cause premature wrinkles and cancer. A diet that includes *Bignay* helps in regulating blood pressure, treating various health concerns such as syphilis and urinary tract infections, and also in cleansing one's colon. Its detoxifying properties is also seen in the way it keeps metabolism levels healthy and running so that one can be less prone to infections.

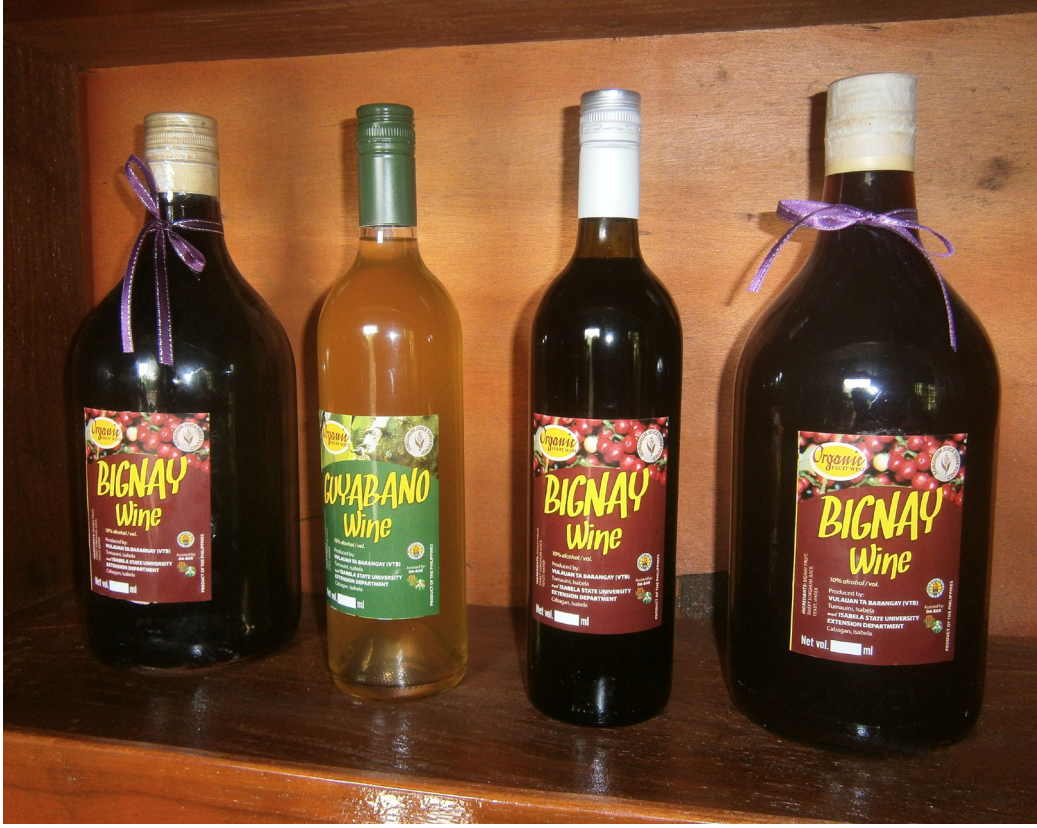
Fruits into wine

The abundance of this crop in Cagayan Valley and Nueva Vizcaya region has made it highly feasible in making wine. Along with *Bignay*, fruit wines are also being made from guyabano, pineapple, duhat, blueberry, citrus, and mango in different places across Region 2. Many project developers, researchers, and farmers are learning how to make wine because it preserves a fruit's use way beyond its deterioration and at the same time, enhances its nutritional value.

For Filipinos who are trying to be health conscious but reluctant to give up alcohol for good, fruit wines are the God-sent products that will both satisfy one's taste buds and build up a healthier body. One can acquire a healthy dose

of calories needed for a day by drinking an entire bottle of fruit wine and in doing so (although highly discouraged), one doesn't even have to worry about gaining weight. Moderate intake of fruit wines has also been proven to reduce cancer risk.

Previous projects may have already jumpstarted a budding wine-making industry in Cagayan Valley, but its path towards becoming sustainable is far from finished.



Quality, competitiveness, sustainability

After holding a number of meetings and group discussions with the Bureau of Agricultural Research (BAR), through its National Technology Commercialization Program, the Isabela State University (ISU) proposed a project that envisioned a sustainable wine enterprise that is competitive and world-class in quality. ISU, led by Raul B. Palaje, technical consultant and agribusiness specialist; and Gerry Aggui, People's Organization manager and president, implemented the project, "One Town-One Product Enterprise (OTOPE): Sustainable Fruit Wine Production and Commercialization in Cagayan Valley".

According to the researchers, "the One Town- One Product concept will encourage participating agencies that already producing fruit wines to adopt a standard processing technology and to improve packaging through retooling techniques and revisiting the quality of fruit wine that they are producing."

With funding from BAR, the project hoped to provide attached agencies across Cagayan Valley the technology and trainings necessary to formulate a standardized processing techniques that will take the region's wine enterprise to new heights.

For this project, ISU is working with partner government agencies enabling it to make huge strides in empowering women across Cagayan's local communities. ISU is partnering with a few women's organizations in involving their members in various stages of the project's implementation from production to marketing. Among these organizations include Vulauan ta Barangay (VTB-Moldero), Integrated San Lorenzo Entrepreneurs of Lallo, Cagayan, Federated Woman Organization of Sta. Rosa, Iguig, and Eastern Rural Improvement Club of Cabagan, Isabela to name a few.

Earlier this year, a revised draft of the research proposal was submitted to BAR and is awaiting for funding support. The authors of the research envisioned to complete the entire project in 2017.

This research initiative of ISU could very well be likened to a small bunch of unevenly-ripe *Bignay* berries ready to be processed as delicious wine. Acknowledging and embracing the diversity that come with each town in the Region through the fruits it could offer for the enterprise, ISU finds greater potential with the establishment of a much more unified wine-making industry. ###

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LATO

Nutritious grapes from the sea

BY RITA T. DELA CRUZ

Have you tasted the sea? If you have tasted fresh *Caulerpa lentillifera*, referred to as *Lato* in the Bicol or *Ar-arosep* in the Ilocos region of the Philippines, then it's (almost) equivalent to tasting the sea.

Caulerpa lentillifera tastes like sea water, slightly salty and refreshing. The harvested *Lato* are washed clean and is usually eaten fresh as a salad. It can be eaten raw as an appetizer, or dipped in lemon juice or vinegar and mixed with onion and other spices. It can also be served as a salad and be eaten as snacks. Other uses include ingredient in sushi, salmon rolls, and others.

Like a true product from the sea, *Lato* is high in minerals, amino acid, and iodine, thus useful for people suffering from thyroid problems. The Seaweed Industry Association (SIA) cited that, *Caulerpa lentillifera* is high in minerals, Vitamins A, C, and several essential unsaturated fatty acids. It is reported to have antibacterial and antifungal properties, and is used to treat high blood pressure and rheumatism. Other studies reported *Lato* to be a good source of magnesium which helps reduce high blood pressure and prevents heart attack.

According to the study of Trono (1988), there are more than 30 species and varieties of *Caulerpa* reported in the Philippines. But the most common is the *Lato* because it is soft and juicy. The spherical beads bursts in the mouth, releasing it's highly nutritious juice.

Lato is called "Sea Grapes'" because it resembles bunches of little grapes. The spherical beads are tightly packed together on vertical stems, which arise from long horizontal stems that creep over the ocean floor like runners. It is also referred to as "Green Caviar" as they are synonymous to a bunch of green roe. The color ranges from bright green to olive green. Physically, a distinctive characteristic of *Lato* compared to other Caulerpa species is that the stalk and spherical beads are both constricted where they meet.

This type of seaweed, according to SIA can thrive in a variety of environments, usually on substrate composed of coral rubble or rocks to over 50 meters deep, but it is also common in shallow, muddy lagoons. It is generally found on sandy to mussy substrates on reef flats that are not exposed during low tides and where the water is generally calm. It may form extensive beds or meadows in exceptionally good habitats.

Indigenous in the Philippines, *Lato* is particularly abundant in Panlatuan Cove in Pilar, Sorsogon, Philippines. According to the Municipal Agriculture Office of Panlatuan, it grows naturally and

Lato is called "Sea Grapes" because it resembles bunches of little grapes. The spherical beads are tightly packed together on vertical stems, which arise from long horizontal stems that creep over the ocean floor like runners.

abundantly in high level of salinity with 28-31 parts per thousand (ppt) and is usually in season from October to May.

Lato is stenohaline which means that is able to live only within a narrow range of saltwater concentrations. It cannot thrive in areas where salinity is less than 25 percent. According to SIA, salinities lower than 30 percent would already result in crop loss. Growth of natural stocks in habitats where water becomes brackish during the rainy season, or those cultured in ponds, is highly seasonal.

Lato has a high potential. It is a highly-demanded sea product both locally and abroad, hence it is now being farmed commercially in the country. As a high-valued ingredients in Sushi, *Lato* is exported to Japan.

Caulerpa lentillifera is best adapted to pond culture. The species is sensitive to changes of salinity, so pond areas must be placed away from any freshwater sources as this will result to great loss crop.

Successful cultivation of *Lato* greatly depends on its water management. Ponds must be designed so that tidal flows can be used to change the water in the ponds every second day.

The SIA recommended that planting of *Lato* is done by hand and are pushed into the soft bottom of muddy aquaculture ponds in mangrove areas at 0.5 - 1 meter intervals. Sometimes broadcasting is used but this is not as efficient as the plants are loose on the bottom and can be moved by water motion induced by wind action on the surface. The depth of pond should be about 0.5 meters, and areas of about 0.5 hectares are usual.

The *Lato* is usually harvested two months after the first planting wherein it is pulled out of the muddy bottom. Some are left as seed for the next harvest. Harvesting can then be done every two weeks depending on growth rates. ###

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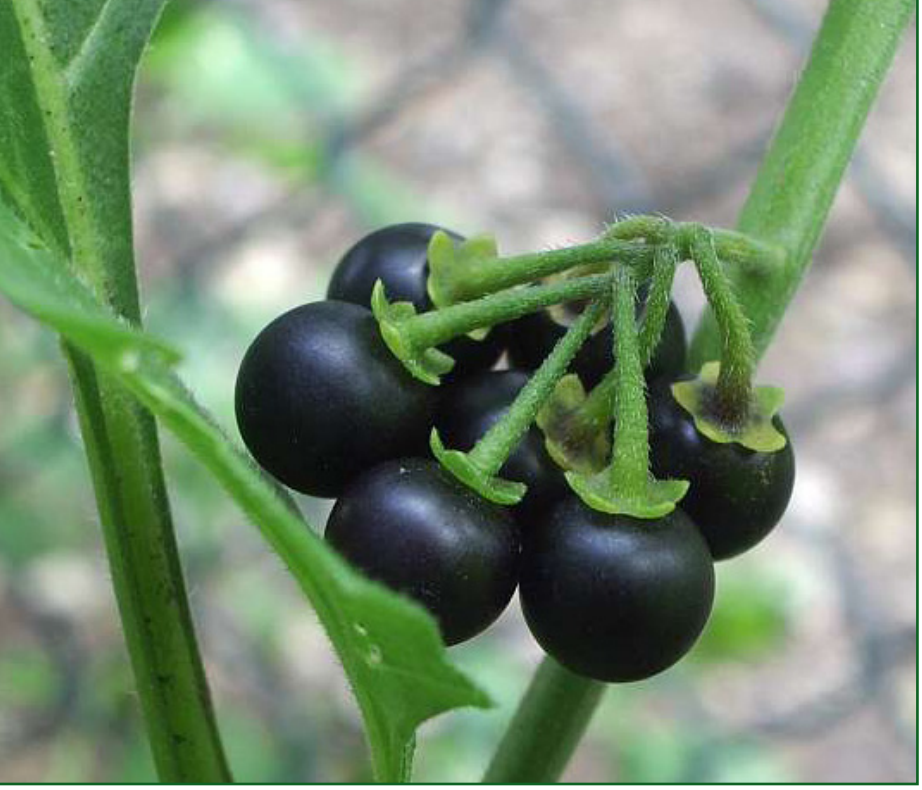

A bright future for the nightshades

BY PATRICK RAYMUND A. LESACA

The Philippines has a wealth of indigenous vegetables that can be tapped, utilized, and promoted. The development and promotion on the use of indigenous vegetables must be packaged in such a way that people will not only be aware of them, but will actually consume them as food source, and be aware of their medicinal and nutraceutical properties. This, however, requires research to support claims on their benefits.

One indigenous vegetable that has great potential but is unknown to many is *Kawat* or black nightshades (*Solanum nigrum*) from the Solanaceae family. Known mainly among the settlers of South Cotabato, Sarangani and Sultan Kudarat in Mindanao, *Kawat* is an annual herbaceous plant that can reach up to 100cm in height. The stem is smooth and bears small hairs, and its flowers are usually white. The leaves are alternate and ovate and can reach 10 cm in length and 5cm in width. The fruit is fleshy round and is up to 2 cm in diameter and yellowish when ripe. The seeds are brown and numerous.

It is also believed to be a food crop with medicinal properties. Consumption of its leaves and fruits as food is widespread, particularly in Africa and Southeast Asia, including the Philippines. *Kawat* is also known as annual nightshade, common nightshade, and garden nightshade. In some parts of the country, it's called *onti* and *lubi-lubi*.

As food source, its leaves and tender shoots are widely used as vegetables and can be boiled or stewed and used as a relish. The nutritional value showed that *Kawat*, especially the leaves, can provide rich amounts of protein and amino acids, minerals including calcium, iron and phosphorus, Vitamins A and C, fat and fibre as well as methionine, an amino acid that is scarce in other vegetables. The berries yield high amounts of iron, calcium, and vitamin B and appreciable amounts of vitamin C and carotene. The seeds too contain vitamin C and carotene.

Kawat is often mentioned and illustrated in all of the early herbals. Since then the species has continued to be widely acclaimed for its medicinal benefits in every country where the taxon is found. Freshly prepared extracts of the plant are found effective in the treatment of cirrhosis of the liver

and as antidote to opium poisoning. An alcoholic extract of leaves is active against *Staphylococcus aurens* and *Escherichia coli*. Berries also possess tonic, diuretic, and cathartic properties and are also useful in heart diseases and as a domestic treatment for fevers, diarrhea, ulcers, and eye troubles. The seeds are reportedly used to treat gonorrhoea and dysuria.

The potential of *Kawat* as food source has been explored and documented through a project titled, "Indigenous Vegetables in Regions 1, 4B, and 12" that is being implemented by the Crop Science Cluster-University of the Philippines Los Baños (CSC-UPLB). Funded by the Bureau of Agricultural Research (BAR), the project aimed to help increase vegetable consumption of the country through the collection, development, and promotion of the utilization of indigenous vegetables. Specifically, the project sought to: 1) survey and collect indigenous vegetables in the regions; 2) document the uses and production system; 3) evaluate agronomic and horticultural characters of the collected plants; and 4) study the propagation and pollination methods.

The project dwells on the survey, collection, documentation and characterization of indigenous vegetables and food plants in Region 12, particularly in the provinces of South Cotabato, Sarangani, and Sultan Kudarat. It is also a collaborative effort of researchers from UPLB, Mariano Marcos State University, Palawan Agricultural Center, and the DA-Regional Field Office 12.

Project leader, Dr. Rodel G. Maghirang of UPLB claimed that indigenous vegetables are often compared to the more conventional vegetables in terms of productivity and profitability which could be an unfair comparison since the former have their place in the cropping system not solely as source of nutrition/ food, but also for biodiversity, habitation of natural enemies and other indirect benefits.

Based on the progress report submitted to BAR, researchers were able to survey, collect, document, and characterize indigenous vegetables and food plants in the selected regions. The researchers also obtained information from majority of the respondents, some of them belonging to the B'laan and T'boli tribes, who said that the *Kawat*'s young shoots and leaves are cooked with sardines and can be eaten as vegetables. While the focus of the research project is in Mindanao, *Kawat* can also be found elsewhere in the country.

A total of 52 accessions were collected and 43 species were identified belonging to 20 families. The highest frequency of citation was from the Solanaceae family, which is represented by native tomato (*Lycopersicon esculentum*) and *Kawat* (*Solanum nigrum*) with 94 percent citation as compared to other plant families.

In terms of pollination behaviour, researchers observed that it is more effective to bag the plants and not the flowers. Results showed that flowers not bagged and bagged resulted to 40 percent fruit set, while flowers that were left open resulted to 86.66 percent fruit set. This showed that it has self-pollinated although cross pollination can also happen.

Given the promising potentials of *Kawat*, extensive research and development initiatives can be further undertaken by promoting it as a conventional crop and for other commercial uses since both the leaves and berries are used as a source of dyes. Furthermore, the species can be used as fodder for cattle and goats, just like in some parts of Africa. The plant can also provide economic opportunities as an additional source of income and livelihood among farmers. ###

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Lubeg
underutilized fruit, now Apayao's pride

BY DIANA ROSE A. DE LEON

A tree teeming with fruits. But that all it is. In normal days, it serves as shade for those want to cool off from the scorching heat of the sun, and its fruits, falling from the tree just littered around the ground, left to rot and unconsumed.

This is the usual scenario of most indigenous fruit trees. They abound in a particular area but they remain underutilized not because they have no value but most people do not know their uses. Their potentials are not yet explored and therefore they remain ignored and unappreciated.

Over the years, the campaign of the Philippine government of "Food for All" has been intensified. Many indigenous plants, which were once disregarded have now been explored and more people have discovered their value, thus responding not only to food security but also as source of income especially among rural communities.

One promising indigenous fruit bearing tree is the *Lubeg*, found abundantly in Apayao and some parts of Cagayan. To further study its potentials, the Apayao State College (ASC) led the exploration and commercialization of this particular fruit.

Knowing *Lubeg*

Lubeg (*Syzygium lineatum*), locally known as *Malubeg* and *Alebadu*, belongs to the Myrtaceae family. It is a fruit tree that reaches up to five meters in height and commonly grows in shaded and open areas. Due to its size, the tree is usually used as a shade and live fence. Its leaves are simple attached to the stem oppositely arranged, ovoid to elliptical in shape measuring on about 8-10 cm, and sour in taste. Its flowers have an inferior ovary, regular and complete.

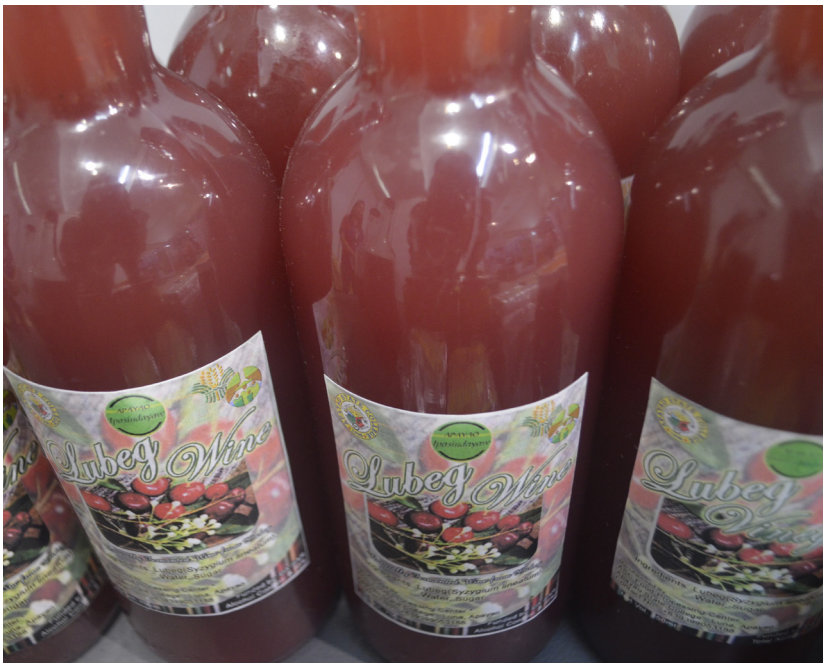
Lubeg fruits appear in cluster, whitish at first but turn red to violet when ripe. It is best described by the locals as cherry-like fruit with thick, fleshy, spongy, and brittle rind with size that can reach up to 13 mm long.

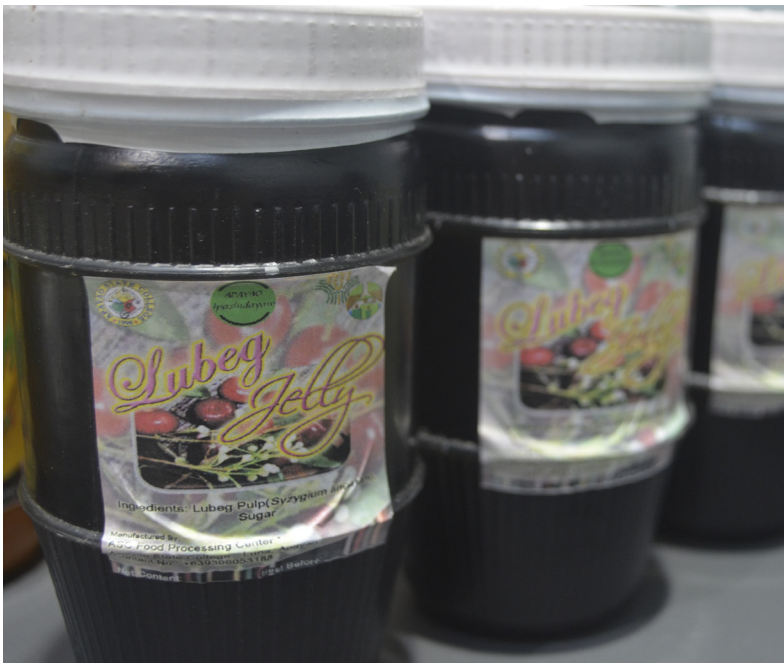
It belongs to the Syzygium genus just like *duhat* (*Syzygium cumini*) and *lipote* (*Syzygium curranii*) and can be eaten fresh. It has a citrusy taste and can be used as a souring agent in dishes like *sinigang*. Various plant species belonging to *Syzygium* genus possess polyphenols, micronutrients found in edible plants. According to literatures, polyphenols prevents acquiring cancer and cardiovascular and neurodegenerative diseases. Commonly, fruits and beverages such as tea and red wine are rich sources of polyphenols.

Adding value to *Lubeg*

Harnessing the health benefits and its potential as a profitable agribusiness enterprise, ASC researchers gave economical value to *Lubeg* and other indigenous fruits in Apayao such as *Bignay kalabaw* and *Balayang* (wild banana). With funding support from the Bureau of Agricultural Research (BAR), ASC implemented a project to develop, promote, and commercialize processing technologies for the Apayao's indigenous fruits.

The research team was able to develop *Lubeg* products including wine, fruit juice and concentrates, jam, jellies and syrups, and vinegar. The *Lubeg* jam and jelly are also used as fillers for baked products such Inipit, custard cake, cupcake, and doughnut. They also tried





making a variety of flavors such as *Lubeg*-pineapple fillings and *Lubeg*-lemongrass juice. A sensory evaluation was done for *Lubeg* wine to see its performance against other fruit wines such as *Bignay* and duhat. Results showed that *Lubeg* is much preferred by consumers that the other two fruits.

As the project is hope to be elevated as an agribusiness enterprise, ASC tapped two people's organizations: Pudtol Agrarian Reform Beneficiaries Multipurpose; and Women's Welfare Organization (WWO)-Luna, to handle the processing and commercialization of the *Lubeg* products. Members were trained on baking, wine-making, and packaging and labelling.

ASC is already able to secure utility models at the Intellectual Property Office for the *Lubeg* wine and fruit preserves.
###

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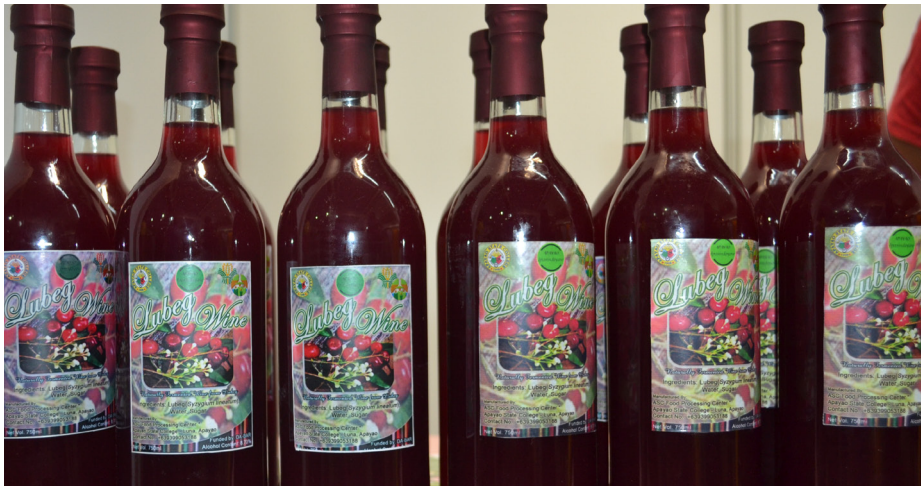

Marbling, unique taste of native pig

BY PATRICK RAYMUND A. LESACA

The Marinduque pig (*Sus domesticus*) is native in the island province of Marinduque. There are three variants of this pig with distinct visual phenotypes such as pure black pig, black with white-feet pig, and multi-color pig.

This native pig is a small breed having color variations of solid black or brown with white trimmings on its underside. It has a straight face, short snout with large eyes and erect ears. The neck is slightly slender and the shoulders are smooth. Its body conformation is generally having a low back framework and the belly is low and pouchy almost touching the ground. The hindquarters are short.

It has an average litter size of seven piglets. The mature weight can reach 49.58 kilograms. These animals are also perceived to have the ability to grow and reproduce even under adverse conditions and are more resistant to common diseases. They are cost-effective especially for smallscale farmers who cannot afford to buy commercial feeds. Locally-available feed resources like banana trunks and leaves, copra, rice bran, and cooked cassava can also be fed to them.

R&D initiatives on native pig

Concerted efforts on conservation, evaluation, and commercialization of Philippine native pigs are being undertaken by the Bureau of Animal Industry (BAI), Bureau of Agricultural Research (BAR), and other livestock stakeholders. The idea of conserving and utilizing these native pigs was brought about by the implementation of the Philippine Native Animal Development (PNAD) Program, which aimed at highlighting the significant role of native animals in providing food and income-generating activities for the Filipinos.

BAR, as the lead R&D coordinating agency for the program, continues to strengthen the livestock industry by partnering and supporting research and development (R&D) projects and

initiatives, particularly on native swine.

Capitalizing on the "farm-to-table" approach of the Department of Agriculture (DA), BAR collaborated with the BAI-National Swine and Poultry Research and Development Center (NSPRDC) through the project titled "Evaluation and Commercialization of Philippine Native Pigs". The project aimed to: 1) establish a production system that will commercialize native pig raising under small-hold farmers level; 2) conserve, evaluate, and propagate the native pig; 3) determine the performance of native pigs in small-hold farmers level; 4) identify and improve the feeding and management practices as well as to determine the cost and return in raising native pigs.

Dr. Rene C. Santiago, center chief of BAI-NSPRDC, also the project leader, has collected three different strains of native pigs, namely: Marinduque, Benguet, and Bundok Peninsula to study further their phenotypic and genetic characteristics as well as to determine the population size and distribution, breeding structure, effective population ratio, among others. These endemic pigs are called and known by their province of origin. For instance, in the province of Marinduque it is called Marinduque pig.

Dr. Santiago said, native pigs can be organically-grown as well. Raised without the use of antibiotics, only naturally-available feeds since they are highly-adaptable to the environment. They can tolerate heat and cold better than imported pig breeds. Their small size ranges from 30 to 50 kilos for mature weight, and 10 to 30 kgs of grower stocks makes them ideal for lechon. The marbling and unique taste of the meat of native pigs makes it mouth-watering for the consumers.

A BAR-funded project on the value chain analysis of native pigs in Luzon, conducted by the Center for Environmental Law and Policy Advocacy (CELPA), Inc., indicated that native pigs dominated the swine industry by as high as 85 percent compared to the hybrids with 15 percent of the total pig population in the province. Native pig production under backyard farming in Marinduque is a micro family enterprise.

Other than the conservation, promotion, and utilization of native pigs, the project explores other market potentials for native pigs aside from lechon, such as processed meat and leather, among others. The identification of uses and trait preferences for native animals, enhancement of enterprise development, and commercialization of developed technologies, profitability and viability as well as the conduct of market studies were consulted with the stakeholders as part of its continuing R&D endeavors. ###

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Healthy and flavorful NATIVE CHICKENS

BY VICTORIANO B. GUIAM

In Philippine rural areas, one invariably encounters native chickens. Raising native chickens is one of the common activities of Filipino farm families which are reared in the traditional way - known otherwise as free-range. Native chickens are flighty and are uneasy around people. But being the hardy and resilient creatures that they are, they need little human care. They are moderately prolific and are a ready source of inexpensive meat and eggs for home consumption and can provide cash for the family when needed.

Native chickens are inferior to other chicken breeds in terms of egg and meat production. A female can produce only 40-60 eggs per year while commercial layer breeds, such as White Leg Horn, can produce more than 200 eggs. However, what they lack in quantity, they more than make up for in healthy food value and flavor. The eggs and meat of native meat are lower in cholesterol.

Given its distinct taste, leanness, and pigmentation compared to broilers there is a demand for native chicken. Its meat is preferred by discerning Filipino consumers. Traditional chicken recipes like *tinola* and *inasal* came into being with native chicken meat in mind, the taste quality of which commercial broilers cannot hope to match.

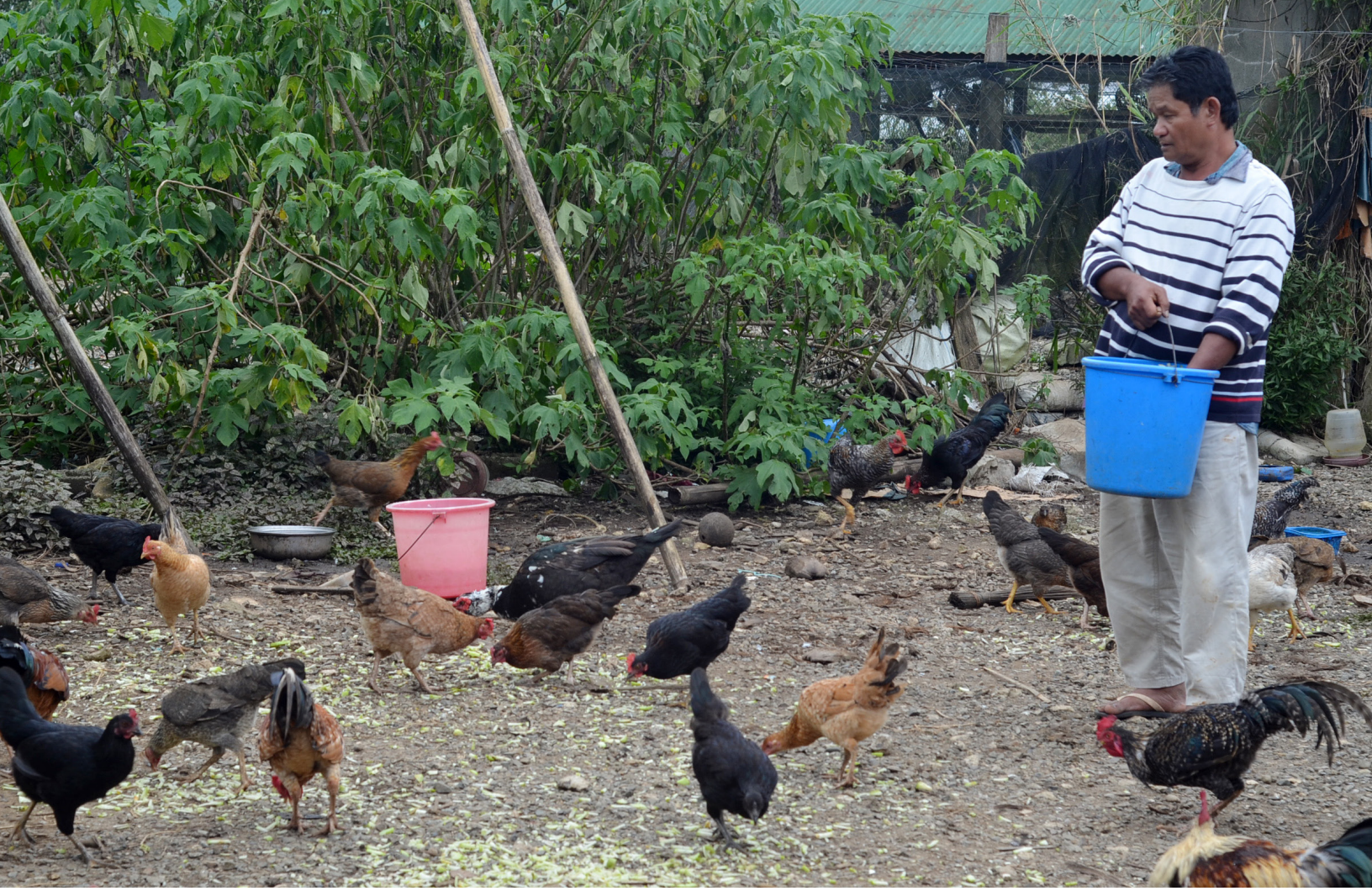
The native chicken has developed in such a way that it can survive and multiply under marginal conditions, requiring minimal management. They are more economical to raise than commercial chicken as they require less feed. As a practice, native chickens are allowed to roam the farm where they can feed on a variety of greens and insects. They are fed twice a day with farm by-products such as crack corn, rice bran, and unmilled rice.

With the launching in 2011 of the Philippine Native Animals Development (PNAD) program by the Department of Agriculture (DA) through the leadership of the Bureau of Animal Industry (BAI), the Department is moving to maximize the socio-economic impact of native animals to help address concerns on economic growth, health, and poverty in the country. The program seeks to develop policies and initiatives for sustainable conservation, production and marketing of native animals, including native chickens, both locally and abroad. Agriculture Secretary Proceso J. Alcala wants the native chicken industry to take advantage of the fact that Philippines has remained free of the avian influenza that brought havoc on the poultry industries of neighboring Asian countries and is therefore a good source of poultry products.

Native animals are those that are indigenous to a given region or ecosystem which have developed unique features for successful survival and reproduction under their natural environments. It is said that most of the animals that survived Typhoon Yolanda were native animals. The Food and Agriculture Organization defines native animals as species or breeds found in a particular place and which have propagated there for the last 50 years. As of 2013, there were 78,460,000 native chickens out of a total of 176,850,000 population nationwide.

Intensification of native chicken production is one way to maximize the benefits that may be gained from them particularly if done with a community-based approach involving the farmers in a given locality. With this view, DA RFO-4B and DA RFO-5 collaborated on a project titled, "Comparative Performance and Community-based Production of Native Chicken in Luzon". Funded by the Bureau of Agricultural Research (BAR), the project was led by Dr. Elena B. delos Santos, regional technical director of DA RFO-5. It aimed to provide farmers with information on what native chicken breed to raise depending on their purpose and objectives.

For characterization, four



strains of native chicken present in Luzon were used in the project. These were: *Banaba* of Batangas, *Bolinao* of Pangasinan, *Camarines* of Bicol, and *Paraoakan* of Palawan for characterization. Samples of the strains were gathered and compared in terms of performance in physique (meat) and eggs. The results of the comparison showed that the *Paraoakan* chicken is the tallest, heaviest, has the longest body length and shank length, has the widest average chest girth, and is the fastest grower at 20 and 25 weeks of age. It also has the heaviest and largest eggs among the four major native chicken strains in Luzon. The *Camarines* native chicken strain was the second in height and growth performance. These make *Paraoakan* chicken the best strain to use in improving the growth performance of native chickens for Luzon growers.

The researchers remind poultry breeders to keep close to the PNAD principles in the utilization and conservation of domesticated native animals. Breeding programs have to be limited to specific purposes and precaution taken so as not to dilute the genetic resources in the indigenous animal population within their areas. ###

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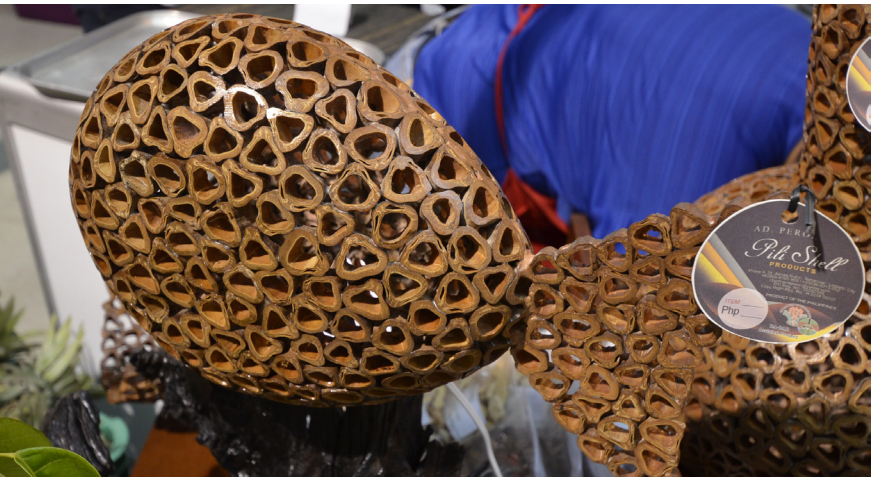
Cracking product lines

BY DARYL LOU A. BATTAD



Consider simple home decors and fixtures made out of *Pili*. Sounds good? Markets have to watch out for this soon.

Pili nut, an indigenous crop home to the Bicol region, is a slowly prevailing commodity, joining its globally-known counterparts, almonds and macadamia nuts. *Pili* is considered a high value crop and is valued not only of its wide variety of food uses, but also of its sensibly acquired good merit in the local furniture and handicraft business.

Extensive uses

Scientifically-known as *Canarium ovatum*, *Pili* ranks second to cashew in terms of economic value. A flagship commodity of the Bicol region, pili nut has a share of 85 percent in domestic production, the region being the country's major producer. In 2011, regional production reached to approximately 23,221 metric tons.

The *Pili* fruit is technically a drupe which consists of pulp (68 percent by weight), shell (25 percent by weight), and seed (7 percent by weight). The seed is covered with a papery seed coat or testa primarily of moisture (8 percent), protein (14.2 percent dry weight), and fat (68.5 percent dry weight).

Popularly valued mainly for its nuts, *Pili* has been explored to have other beneficial domestic and economic uses. Several researches from the region revealed that *Pili* pulp can also be used as chicken and animal feed. The *Pili* pulp oil, comparable to that of coconut oil, can be used for cooking. It can also be used as fuel for lighting, and just recently, for cosmetic and pharmaceutical products including soaps and perfumes.

In the Philippines, *Pili* nut is widely used as snacks and desserts such as cakes, tarts, and ice cream. It has also been explored as base for sauces, toppings as in salads, garnish, and stuffing. Its food uses have been modernized, elevating into special mid- to high-end cuisines. In Asia, Hongkong, and Taiwan are said to be the biggest buyers of *Pili* nut, consuming it in their traditional mooncakes. Still, nothing beats the glazed and honey or garlic roasted *Pili* nuts that Filipinos, especially the Bicolanos love.

Pili nuts also offer excellent health benefits. The kernel, which is considered the most important part of the *Pili* nut, is rich in manganese, potassium, calcium, fats, protein, and phosphorus. The kernel oil is said to improve the body's lipid profile as it is rich in antioxidants. Moreover, *Pili* nuts are rich in heart-healthy omega fatty acids, aiding in reducing risks of known cardiovascular diseases.

Going nuts with *Pili*

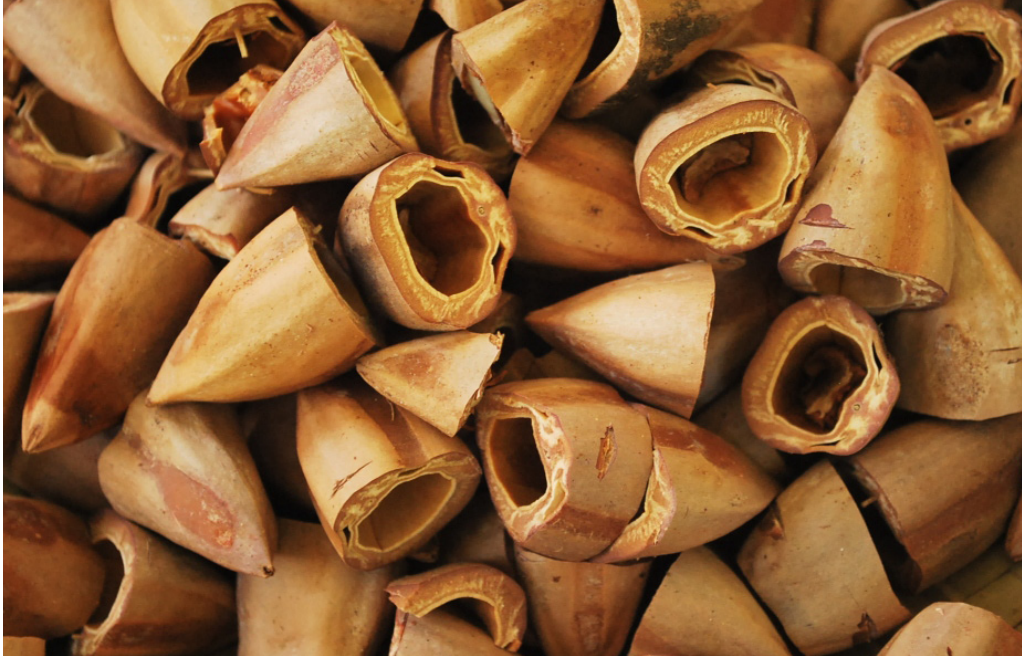
With all its beneficial uses, who would have thought that some 60 years ago, *Pili* was considered as of no commercial value and was only used as bets in traditional street games?

Thank goodness for researchers who took notice and went nuts in the many potentials of this crop.

The Bicol region, through the efforts of its local government units and the Department of Agriculture Regional Field Office (DA-RFO) 5, has taken the lead in the production of *Pili* nuts especially for entrepreneurial purposes. In fact, in the provinces of Albay and Sorsogon, the provincial government gives tax incentives to those who grow *Pili* trees. Owing to the highly assessed export-potentials, the government has elected the *Pili* nut as flagship-product of the impoverished province of Bicol and has promised supports to farmers, processors, and dealers with regard to its commercial exploitation.

In the field of research and development, DA-RFO 5 conducted various researches to contribute to the expansion of the *Pili* industry. These involve studies on promoting diversified and integrated *Pili*-based

from Pili



farming systems geared towards the improvement of resources base and the upliftment of the socio-economic condition of smallscale *Pili* farmers. In general, the region's R&D sector hopes to strengthen and advance the *Pili* industry of the Philippines through its parallel efforts in constantly intensifying production to meet its growing demand in both local and international markets.

A recent project titled, "Product Development and Commercialization of *Pili* by-products in Region 5" led by a team of researchers led by Dr. Abelardo Bragas, OIC-Regional Executive Director and Ms. Luz Marcelino, chief of the Research Division of DA-RFO 5, is targeting to conduct commercial processing of *Pili*, showcasing its food and non-food products.

Funded by the Bureau of Agricultural Research, the project is set to introduce new products developed from pili shells, among others. Food products from *Pili* have reached the commercial level, having established Pasalubong Centers and institutional buyers such as SM, Market Market! and Rustan's where assorted *Pili* products are distributed.

Currently, DA-RFO 5, together with other stakeholders, sees more potentials of *Pili* using its shells, developing home decors and furniture. Venturing into this rather unlikely by-product that came as a surprise, the research team is seeing a positive response from consumers.

Market watch: *Pili* shells home accents

The concept and development of *Pili* shells into home decors and furniture started way back in 2012, in which the experimental phase lasted for nearly two years. Mr. A.D. Perol from Tamaoyan, Legazpi City, started this business and had it officially registered with the Department of Trade and Industry (DTI) in January 2014. They were also granted a certificate of copyright registration in that same year by the Intellectual Property Office of the Philippines (IPOPhil).

A.D. Perol Pili and Coco Shell Products is a small home-based Industry, located at Tamaoyan, Legazpi City, Albay. It is primarily engaged in the production of *Pili* shells as home decors and furniture. Their area of operation is within Legazpi City only, but with occasional demand outside the area. The business is basically a family enterprise run purely by the members of the family. Their raw materials are sourced out from the waste materials of local *Pili* processors in Albay, Camarines Sur, and Sorsogon. Home decors vary from accents to furniture, wall decors, trays, novelty items, bags, placemats, and lamp shades among others.

However, the limited resources and lack of some machinery is the most challenging part of their operation. But this small business' vision to create high end products out of *Pili* shells and employment in the community, along with its mission to promote the *Pili* shell products to the national level and be recognized as one of the best and unique products of the Philippines are their driving force to continuously strengthen and expand their business.

In this regard, the DA-RFO 5 partners with A. D. Perol and Coco Shell Products through this project to create a way to help farmers in providing a sure market of their produce, thus an increase in their incomes. With this project, the technology commercialization of *Pili* products will promote more opportunities for *Pili* entrepreneurs to gain more knowledge to improve their products. It also intends to develop state of the art products, nature inspired accessories, innovative fashion jewelries, and home decors as their best exportable biodegradable products. ###

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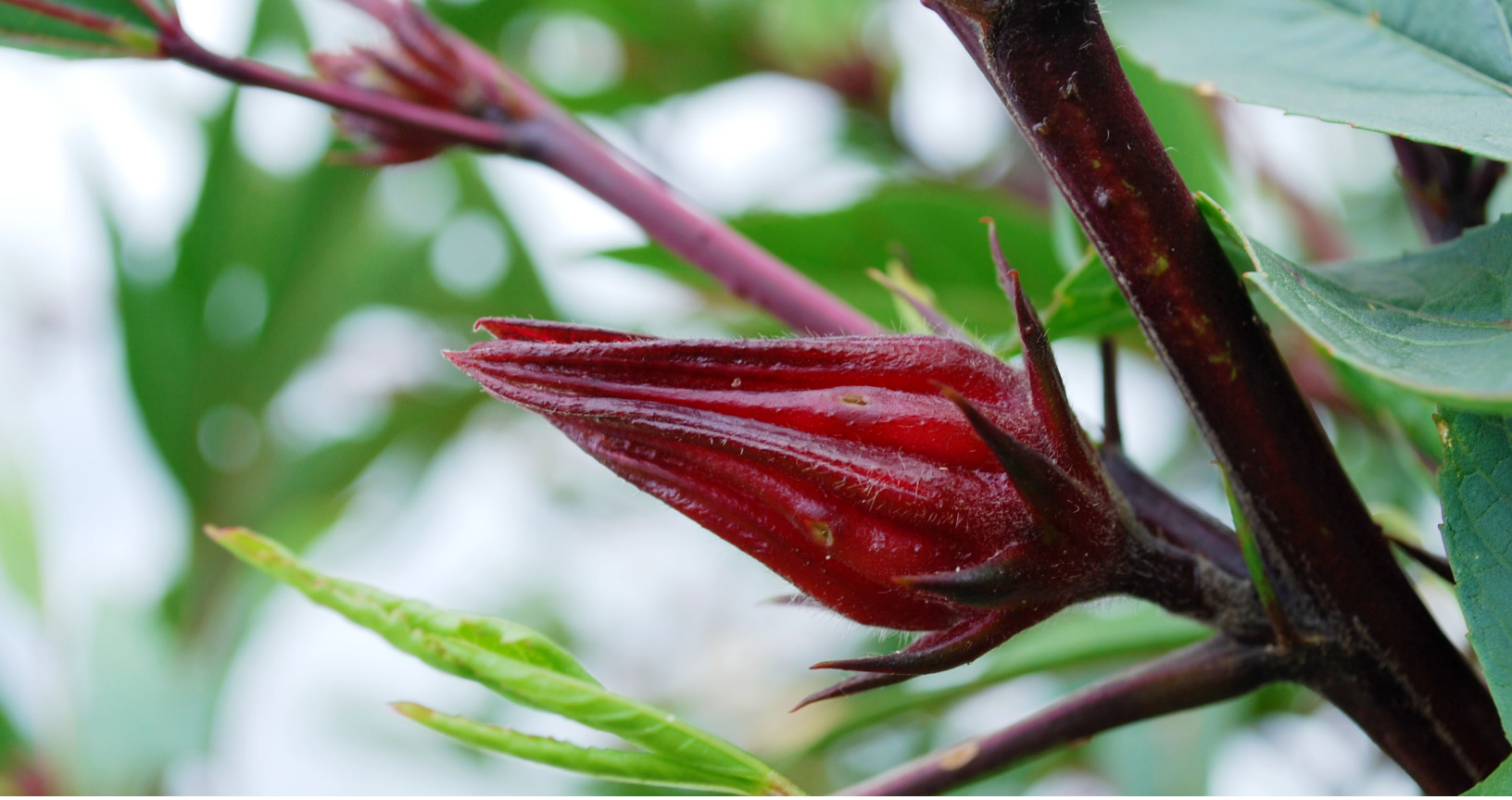

Blooming potentials from the unexpected Roselle

BY EPHRAIM JOHN J. GESTUPA

Flowers are admired, mostly for its beauty. But there are those that go beyond their aesthetic value and people have discovered their uses extending as food source.

Roselle (*Hibiscus sabdariffa* L.), is an indigenous plant grown in some parts of Mindanao whose entire anatomy can be used for a variety of culinary purposes.

Originally from West Africa where the plant's bloom is used to make tea, Roselle was introduced in Asia during the 17th century. Its origin within the Asian region is attributed to its function as raw material for the fiber used to make sugar sacks in Indonesia.

In the 20th century, Roselle has already been growing in Sri Lanka, Thailand, Malaysia, and Indonesia. For it to thrive, the crop must be planted in very specific conditions. It only grows in tropical places that are warm, humid, and without any occurrence frost and mist. They grow best at 25 degrees Celsius and 900 meters above sea level. The only place in the Philippines that has managed to grow Roselle in large amounts is Northern Mindanao.

A majority of products, including tea, wine, syrup, and jellies have been made out of Roselle, mainly from its calyx, a protective layer that encloses the part of the plant that where the petals and seeds grow out of. Its calyces make the plant look like its budding small fruit. This fruit-like part can be dried and used to make tea. It could also be used as juices after the fresh calyces are boiled. Aside from making drinks, "jellies, sauces, chutneys, wines, preserves and...natural food colorants" can also be derived from the plants, according to the study report of the Department of Agriculture-Regional Field Office (DA-RFO) 10. Salads and cooked meat can also be integrated with Roselle leaves and tender shoots. In the Philippines, Roselle is used an as a souring ingredient in making *tinola* and *sinigang* through its calyces and stems.

Considered to have antihypertensive properties, Roselle contains helpful antioxidants that help prevent the accumulation of fatty particles within the bloodstream. It is very rich in vitamin C and calcium which makes it a perfect herbal remedy to coughs and colds. For those who are trying to lose weight, drinking tea derived from Roselle helps in regulating the processing of too many carbohydrates that cause excess weight. The tea can also serve as a

diuretic that aids in getting rid of the body's excess fluids.

According to Juanita Salvani of DA-RFO 10, in the Philippines, research done on Roselle was only limited to the exploratory planting of the variety along with indigenous vegetables cultivars in regions 10, 4A, and 5. In an effort to boost the crop's marketability in the industry of selling agricultural products, DA-RFO 10 implemented a research on the value-adding and product development of Roselle.

In 2014, the DA-RFO 10 initiated a project titled, "Development of Production, Post Production and Utilization Technologies of Roselle (*Hibiscus sabdariff* L.) in Region 10" to develop the production of Roselle in the plantations across the Philippines, the way it is planted along with other crops, and the harvest and postharvest methods used by the farmers. Specifically, the research aimed to develop value-adding technologies, and fine tune product quality, labelling and packaging. "Part of the research efforts of adding value to Roselle products is also an assessment of the "antioxidant activity and health wellness components of [the] developed products," Salvani added.

In finding ways to improve the yield, both in quality and in quantity, DA-RFO 10's research involved testing the effects of organic and inorganic fertilizers on growth. Other factors were examined included planting distance and intercropping methods. For the latter variable, the research center has been monitoring a number of plantation sites around Mindanao that have Roselle intercropped with a different plant such as coffee, cacao, coconut, lanzones, and rubber. These sites included farms in Camuigin, Bukidnon, Misamis Occidental, and Misamis Oriental.

Part of improving the plant production systems was also preparing harvest and postharvest methods that at par with the yield. The research involved the identification of an ideal harvest index for the Roselle. Harvest index is the proportion of a plants yield to the overall size of the plant. Yield performances of Roselle being harvested as calyces and as seeds were also assessed. Finally, the research is looking into the storability of harvested Roselle calyces of under normal room temperature and under cool storage.

To prompt greater demand for Roselle products, DA-RFO 10 is adding a promotional and marketing aspect to their research. This is done by building displays in different forums and commercialization centers where survey questionnaires could be handed out and answered by average consumers. It also plans on selling their Roselle products in Pasalubung Centers all over Mindanao.

To intensify the product's competitiveness in both local and international market, Roselle products are not only limited to tea and beverage. Roselle is flexible in terms of the many ways one can prepare its calyces, leaves, and seeds and turn them into products like perfume, food powder, and food colouring. DA-RFO 10 is still on the process of developing the quality of these Roselle products, taking into account improving the packaging of each product to optimize the consumer's experience. It is also working closely with partner agencies such as the Department of Science and Technology in conducting tests to analyze the nutritional content of each Roselle product.

Salvani, project leader, said that "[the research center] will be exploring other products like Roselle capsule. Trials on intercropping with other identified crops in the provinces is programmed this year and is hoped to be completed in 2017. Microbial and nutrient analysis of all products will be done once we can come up with the best treatment of each products."

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Roselle (Hibiscus sabdariffa L.), is an indigenous plant grown in some parts of Mindanao whose entire anatomy can be used for a variety of culinary purposes.

Sustaining the rare **Tikod Amo**

BY RITA T. DELA CRUZ

Given the geographic features and the favorable tropical location of the Philippines, it is not surprising to know that the country has an exceptionally high rate of endemism or the prevalence of particular species exclusively within the country's geographic boundaries. The abundance of its coral reef life makes the Philippines regarded by international marine scientists as the "Center of Marine Biodiversity" in the world, surpassing the Great Barrier Reef of Australia.

With such rich biodiversity in our midst, it's not surprising that one in awhile, scientists and researchers discover new species. One endemic species recently discovered is a marine bivalve mollusk, locally known as *Tikod Amo*.

Tikod Amo is an oyster species which can only be found in the coastal municipalities of Barobo, Lianga Bay in Surigao del Sur. The name originated from Kamayo, language of people living in the central eastern coast of Mindanao, which was derived from the external appearance of the oyster which means 'ankle of an ape' (adductor muscle). Physically, the meat of *Tikod Amo* is aesthetically attractive having multi-colors in its internal parts.

"This species seems to be unknown in the international species nomenclature database. We found no information that describes its biological features, so we assumed *Tikod Amo* is a new species," said Ms. Gemma A. Asufre, researcher from the Surigao del Sur State University (SDSSU).

Based on a related study of the molecular biology of *Tikod Amo* that was conducted at the University of the Philippines Los

Baños, report indicated that "there was a five percent difference of the DNA of *Tikod Amo* from the DNA of Spondylus squamosos." Although the difference will still have to be verified, the researchers are certain that *Tikod Amo* can be "considered as a new species of Spondylus (group of marine bivalve mollusk).

According to the study, *Tikod Amo* oysters were observed attaching into rocks, hard corals, logs, shell substrates, bamboo poles, and old tires. Others were found in hard surface bottoms. These observations served as bases for the researchers to prove that this endemic oyster has higher potential for culture which addresses its declining population in the coastal areas of Barobo.

Seafood delicacy

A seafood delicacy, *Tikod Amo* is an instant hit, not only among the locals, but also to those who have heard about it and have tried its unique and delicious taste.

Harvesting *Tikod Amo* has also become a good source of income among the marginalized fishers in the coastal areas of Surigao del Sur. Given its high demand, the price of *Tikod Amo* is higher than the price of any ordinary oyster meat available in the market. Its current price in the local market is about P400 per kilo for the unshelled meat. With such demand, production cannot adequately supply the local hotels and restaurants.

Internationally, it is also gaining popularity. Among the foreigners who came to know about this rare oyster species, *Tikod Amo* has become a hit following curiosity about its distinct taste. In fact, Asufre revealed that "Koreans and Chinese who come to the Philippines to buy sea cucumber for export are also willing to import *Tikod Amo* if there's a supply. One interested supplier wanted to buy at least 300 kilos per week."

Polyculturing Tikod Amo

With the increasing demand for *Tikod Amo* and the constant harvest, the natural stock of this oyster in the wild is now being threatened. Also, the practice among gatherers of collecting spat (baby oysters) from the wilds is not sustainable and it poses a threat, not only to the diversity of oyster species in the area, but also to the hard coral substrates where these species naturally dwell. As a result, the oyster catch has declined by 40 to 60 percent between 2006 and 2008.

Knowing its species identification is crucial in the culture of this endemic species. This provided the rationale for DSSSU, led by Asufre, to probe further into the taxonomy of *Tikod Amo* and to look into the specific methods and systems to address its declining population. The two-year study titled, "Preliminary Study of *Tikod Amo* on its Potential as an Oyster Culture Species" was funded by the Bureau of Agricultural Research (BAR).

The study, which serves as a pioneering research for this endemic oyster, specifically aimed to determine the anatomical features and other biological features of *Tikod Amo* that is abundant in in Barobo, Lianga Bay; and know its spatfall (spawning season). The study also looked into the survival rate of *Tikod Amo* from transplanting to harvesting; and determine its yields using different culture systems and methods.

Polyculture is the practice of raising more than one species of aquatic organism in the same pond. The principle behind this approach is that fish production can be maximized by raising a combination of species having different food habits. The mixture of different fishes gives better utilization of available natural food produced in a pond.

Compared with monoculture system of fish production, the possibilities of increasing fish yield per unit area through polyculture is considerably higher and more profitable. Also, combining different species in a polyculture system effectively improves the pond environment.

One recommended culture technique for *Tikod Amo* is the bottom polyculture wherein oysters are grown together with seaweeds and fishes like milkfish and siganid in the mariculture areas of Barobo Bay. As recommended in the study, integrating oysters in a polyculture system may be applied on 146 hectares of fishpens in the mariculture zone.

This kind of culture system will not only increase the production of *Tikod Amo*, together with other species, but it will also expand employment among both mariculture fishermen and oyster gatherers. Culturing of the *Tikod Amo* is seen to boost Philippines' 15,000-20,000 metric ton (MT) yearly oyster production which has prospective export markets in China and South Korea.

With the culture technology, environment-friendly systems can be employed. Also, the culture of these endemic oyster species will not only create an alternative livelihood for oyster gatherers but will make them collaborators in a sustainable farming system that will preserve our coastal resources. ###

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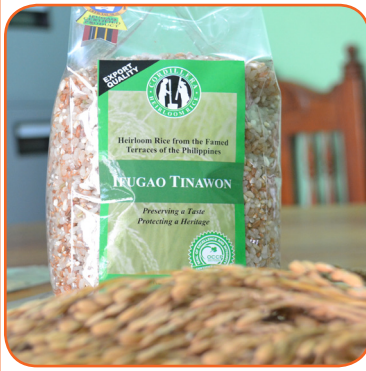
Tinawon heirloom rice is saving Ifugao Rice Terraces

BY VICTORIANO B. GUIAM



Of the rice terraces in the provinces of Benguet, Kalinga, Apayao, Mountain Province and Ifugao in the Cordillera Autonomous Region (CAR), the more popularly ones are in Ifugao which were recognized as a World Heritage Cultural Landscape in 1994. Four clusters of rice terraces, Banaue (Batad and Bangaan), Mayoyao (Mayoyao Central), Kiangan (Nagacadan), and Hungduan were cited for being "outstanding examples of living cultural landscapes devoted to one of the world's most important staple crops – rice" (Nozawa et al., 2008). The rice terraces are regarded as a place where the interaction of people with nature over time has developed it into an area of distinct character with significant aesthetic, ecological and/or cultural value which is often with high biological diversity.

According to Acabado (2010), the Ifugao Rice Terraces (IRTs) have the function of an agricultural system and are not simply "relics of the past" for they continue to produce agricultural products for the Ifugaos. The Cordillera region is home to a large number of native heirloom rice, a special kind of indigenous rice that have been planted by the ancestors of the Ifugaos and other upland tribes from antiquity. Over 500 known highland varieties of rice have been collected by the International Rice Research Institute (IRRI) but many more may still be in the hands of farmers.

But what exactly is heirloom rice and how do they connect with the future of the rice terraces? According to IRRI, these are traditional rice cultivars passed down through generations and are grown mainly in small family farms.

In the Philippines, heirloom rice varieties are grown in the Cordillera and in certain areas of Mindanao such as the Arakan Valley Complex and Lake Sebu in Cotabato. Typically, true heirlooms have adapted over time to the climate and soil they have been grown in. Due to their genetics, they are often resistant to local pests, diseases, and extremes of weather.

The heirloom rice of the Cordilleras are a special kind of indigenous rice. These are colored rice that possess outstanding quality, aroma, texture, color (red/purple/violet), taste, and nutritional value. Examples are Tinawon fancy (*Imbuucan*), Tinawon white (*Inawi*), *Ingudpur* (*Diket*), *Minaanga* and *Ulikan* red of Banaue and Hungduan in Ifugao. Tinawon, the best known of the heritage rices which means "once-a-year", is said to be one of the first rice varieties grown widely in the rice terraces.

Great challenges exist in the rice terraces: environmental ones; decline of traditional practices in local community life; and issues arising from tourism and the continued relevance of the local communities' heritage. Of critical importance is the abandonment

of many of the terraces. Poverty is widespread among local farmers.

Younger generations of Ifugaos have opted to migrate to the capital for non-agriculture work instead of the traditional farming tradition as they have little interest in agriculture. While tourism has increased, it has not been developed adequately and so has not provided more jobs.

The Ifugaos' Tinawon rice is rather low-yielding, is labor intensive, and can be cultivated only once a year. Most of the time, farmers can produce just enough rice for household consumption. If a surplus is produced, it usually fetches a low price in a market dominated by high-yielding rice. Also, with the high cost of repairing and maintaining the irrigation systems, its deterioration has lowered the rice yield, further decreasing the farmers' income.

A number of interventions put forward target the youth, land tenure, governance, and development of livelihoods. What is clear is the need to increase household incomes in the IRT communities which could be met by either increasing their farm income or by providing them with other income-generating opportunities.

A significant shift started with the export of Cordillera heirloom rice varieties to consumers abroad in 2007 by a social enterprise called Eighth Wonder, Inc as a pioneering venture. In 2013 this increased to 29 tons of Cordillera heirloom rice shipped to the United States valued at $38,000. Tinawon rice is leading heirloom rice exports to the United States where demand is still rising. Ifugao has the biggest area with 5,141 hectares producing 16,060 metric tons of Tinawon rice.

In 2011 the Bureau of Agricultural Research (BAR) supported a project of DA Regional Field Office (RFO)-CAR under its Community-based Participatory Action Research (CPAR) program that aims to increase the production of Tinawon. Through the project, farmers were taught the use of bio-organic and foliar fertilizers, early transplanting, and proper distancing. According to Dr. Catherine Buenaventura, supervising agriculturist at the Ifugao's Provincial Agriculture Environment and Natural Resources Office (PAENRO), "interventions have led to a five percent increase in the production of Tinawon rice during the first cycle".

Based on economic analysis by the Provincial Agriculture Office of Mountain Province, heirloom farmers can get a return on investment of 12-43 percent at a yield of 3.5 mt/ha at a farmgate price of Php 60.00- Php 80.00 per kilogram of good quality rice. The Rice Terraces Farmers' Cooperative (RTFC), which serves as a market for the harvest and production of Tinawon, was able to export 11 tons of heirloom rice to US in 2014. The facility also started to cater to the local market earlier in 2009.

With the development of the export market, opportunities have opened for Tinawon rice farmers to make a profit from their labors. Many have been encouraged to rehabilitate abandoned rice terraces and bring back the sustainable indigenous organic farming cultures of rice production. Rare heirloom varieties of Filipino rice are thus preserved as these are kept in production.

On 16 April 2015, during the groundbreaking ceremony for a new DA-financed P6.5-million Regional Heirloom Rice Processing Center (RHRPC) in Barangay Ucab, Kiangan, Ifugao, which will provide services for the processing, storing and marketing of Ifugao native rice, Governor Denis Habawel of the Province of Ifugao said that having the Regional Center for Heirloom Rice is "historical for Ifugaos as it will have a part in keeping their unique identity alive". ###

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Getting to know Huani mango

BY ANNE CAMILE B. BRION

Among the mango family, the most familiar to us is the *Mangifera indica*, which is highly valued for its economic importance both in the domestic and international markets. Little do we know that a lesser popular mango variety exists called *Huani* (*Mangifera odorata*). It is reported to be native in Indonesia, Malaysia, Philippines, Thailand, and Vietnam. While many of us have not seen, tasted, or even heard of the fruit, *Huani* has long been growing in the south coast of Mindanao, particularly in the Zamboanga Peninsula region.

Growing on an average of 10-15 meters in height, this indigenous fruit tree bears green, oval-shaped fruits. Its flesh, which is firm and orange-yellowish in color, is slightly fibrous yet quite juicy and sweet. What makes it unique from the other kinds of mangoes is its resinous odor, thus some tend to associate it with the durian fruit. Most often, *Huani* is eaten raw and consumed as a table fruit. Others use it in the preparation of delicacies, chutneys, and pickles. In folkloric medicine, the bark of the *Huani* tree is used in the treatment of hystero-epilepsy, a form of hysteria showing signs of epileptic convulsions.

With its ability to thrive in tropical areas having fairly heavy rainfall, *Huani* has found economic significance as a substitute to *Mangifera indica* especially where the latter cannot thrive due to wet climate. In the country, *Huani* bears fruits twice a year wherein peak season occurs from March to May. During these months, the price of huani becomes very cheap, leaving some of the matured fruits rotten and wasted.

Huani products

In an effort to help *Huani* mango growers in the region increase the crop's market price and reduce postharvest losses due to deterioration, the Department of Agriculture-Zamboanga Peninsula Integrated Agricultural Research Center (DA-ZAMPIARC) embarked on the project, "Product Development of *Huani* Mango in Zamboanga Peninsula." Funded under the National Technology Commercialization Program of the Bureau of Agricultural Research, the initiative aimed to develop value-adding technologies and undertake product development activities for huani.

Part of the project is the procurement of equipment and processing materials, and establishment of a Product Development Laboratory. Just like most fruits, *Huani* was developed into different types of products such as wine, puree, powder, candies, and pickles. Sensory evaluation in terms of color, taste, and aroma was conducted to determine what type of product samples were preferred most by the consumers. Products which gathered promising responses will be standardized and submitted to the Department of Science and Technology for complete product testing and analysis.

As of writing, the second phase of the project will be carried out focusing on the marketing research aspect. This includes details on how the products will be priced, promoted, and distributed to wholesalers, bulk buyers, and retailers. While the developed products have already been exhibited during trade fairs and exhibits, the succeeding phase will further push for the promotion and commercialization of *Huani* products.

More than just being a substitute for the more recognized mangoes, *Huani* has a lot to offer with its firm texture, unique taste, and ability to prosper in areas where the others cannot. *Huani* may be one of the lesser known fruits today, but with research and development, may become one of the highly-valued, economically-important fruits of tomorrow. ###

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Carving out....*from page 4*

now known as Agenda 21, which called for all nations to establish national mechanisms, and formulate and implement their respective agenda of actions for sustainable development.

In 1996, the country came up with its Philippine Agenda (PA 21). Another outcome of the Earth Summit was the Convention on Biological Diversity (CBD) which emphasized the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits derived from the utilization of genetic resources.

For biodiversity conservation to succeed there is a need for sustainable development programs for indigenous species to be integrated with development plans and policies. For the Bureau of Agricultural Research (BAR) and the R&D system, agrobiodiversity conservation is best approached through utilization. In exploring the untapped potentials of the country's indigenous plants, BAR launched its Indigenous Plants for Health and Wellness Program (IPHWP). With the program, it is hoped that indigenous plants in the Philippines can be utilized, promoted and developed as food and/or sources of materials for the nutraceutical, pharmaceutical and cosmeceutical industries.

BAR has also found common ground with Bureau of Animal Industry (BAI) in its Philippine Native Animal Development program, the Department of Agriculture (DA) and International Rice Research Institute in the Heirloom Rice Project, the World Vegetable Center for the local promotion of indigenous vegetables, and with the United Nations Development Program, Department of Environment and Natural Resources and other Philippine organizations for the on-going "Partnerships for Biodiversity Conservation". BAR has funded initiatives of its R&D partners on indigenous plants, livestock and fish through its programs such as the Community-based Participatory Action Research, National Technology Commercialization Program, Organic Agriculture, and other funding windows.

In DA, various agencies have been involved in the sustainable development of native plant and animal species/varieties for food and other economic uses such as Philippine Coconut Authority, Philippine Rice Research Institute, Philippine Fiber Industry Development Authority, Bureau of Fisheries and Aquatic Resources, Bureau of Plant and Industry, and DA regional field offices.

With BAR's involvement in agrobiodiversity conservation, we have committed to the task of "meeting the needs of the present generation without compromising the ability of the future generations to meet their own needs". ###

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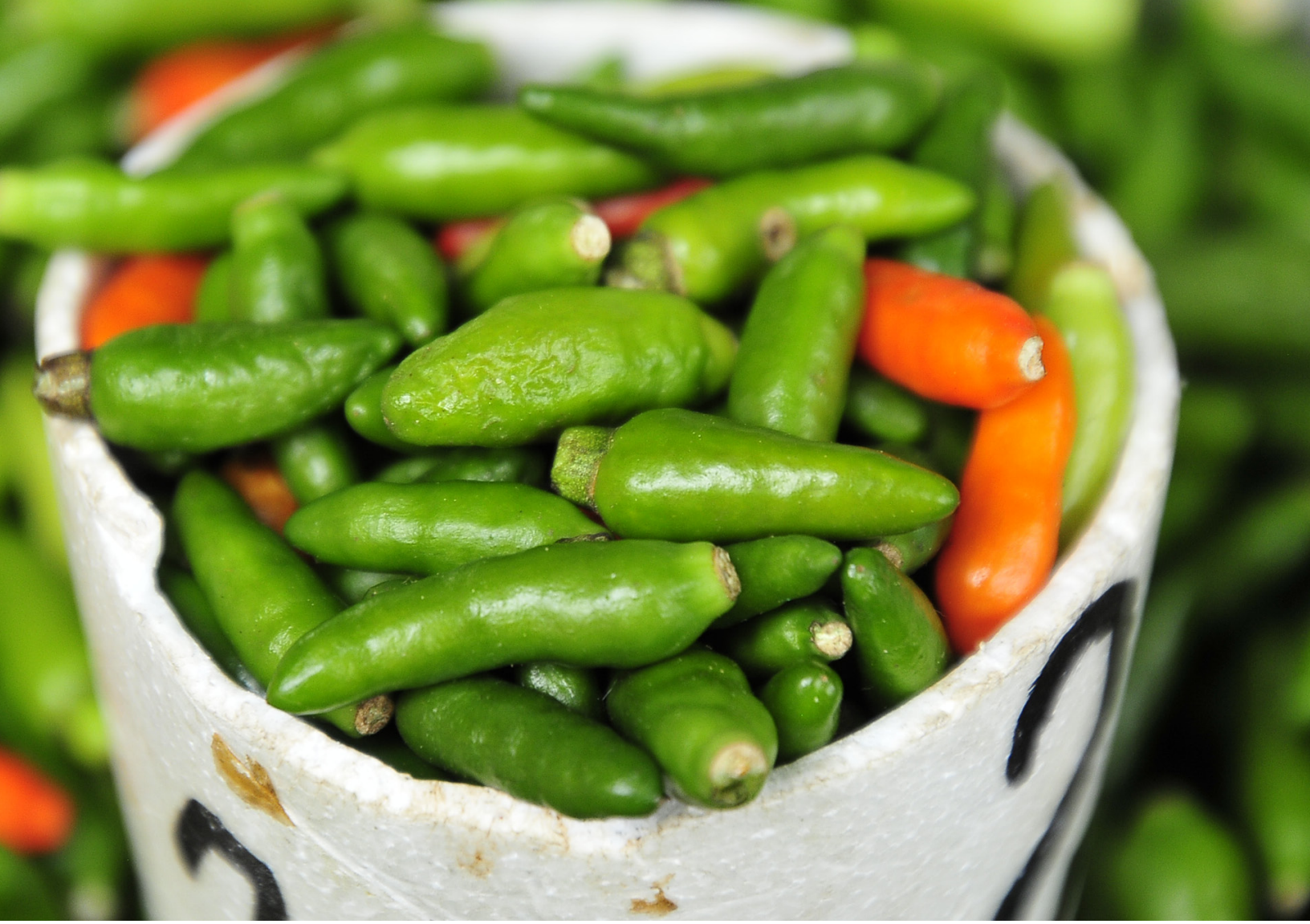

Siling labuyo (*Capsicum frutescens*) is popularly used as a spicy and chili condiment while its leaves are usually consumed as vegetables. Also known as the chili pepper, it is among the indigenous plants that the Department of Agriculture (DA) promotes through the Indigenous Plants for Health and Wellness RDE Program of BAR. The program aims to promote and highlight the importance of indigenous plants and its products. *(Photo by Rita dela Cruz)*

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