



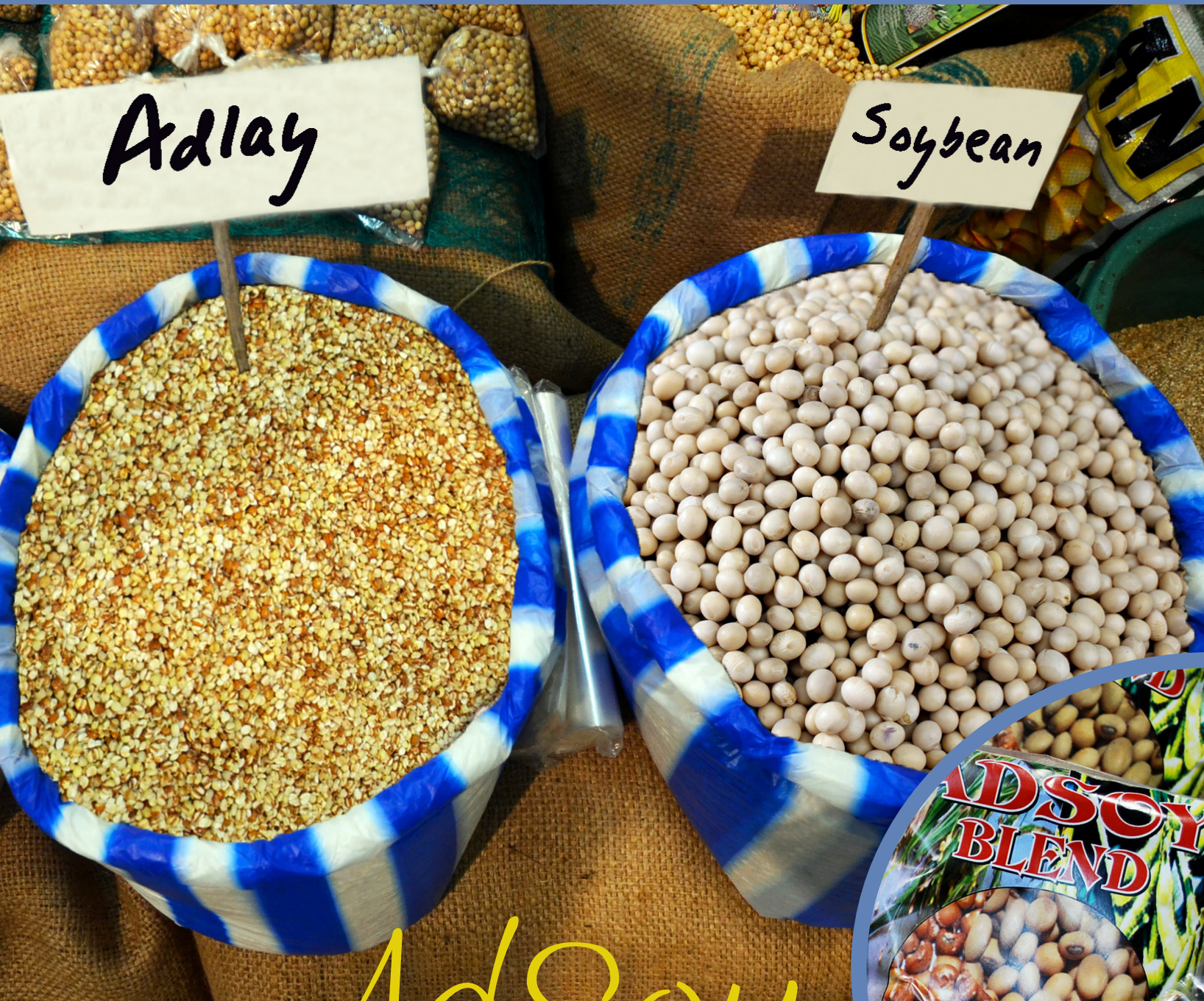
BAR DIGEST

Research and Development

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AdSoy:

Cereal meal and hot beverage in one nutritious blend





BAR Research and Development DIGEST

BAR R&D Digest is published quarterly by the Department of Agriculture-Bureau of Agricultural Research (DA-BAR). As the staff bureau of the Department, BAR was established to lead and coordinate the agriculture and fisheries research and development (R&D) in the country. Specifically, BAR is tasked to consolidate, strengthen, and develop the R&D system to improve its effectiveness and efficiency by ensuring customer satisfaction and continuous improvement through work excellence, teamwork and networking, accountability and innovation.

This publication contains articles on the latest technologies, research results, updates, and breakthroughs in agriculture and fisheries R&D based from the studies and researches conducted by the National Research & Development System for Agriculture and Fisheries (NaRDSAF).

BAR R&D Digest welcomes comments and suggestions from readers.

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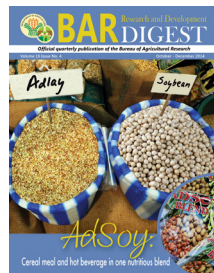
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ABOUT THE COVER:

As Adlay R&D is now heading towards market development, different product lines have been developed by various R&D institutions. One of which is the AdSoy of CIARC. This issue features new and different agricultural and fisheries products from R&D.



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R&D NOTES

by DR. NICOMEDES P. ELEAZAR, CESO IV

New agriculture and fisheries products emerge from the R&D cocoon

One thing universally accepted as a constant is change. Nothing in the world is ever static. In biology, striking developmental change could take place in an animal's form or structure, accompanied by physiological, biochemical, and behavioral changes. This is best seen among insects such as butterflies and amphibians like frogs in the phenomenon called metamorphosis.

Even in the physical world, nothing sits still as external forces, such as gravity, moisture in the air, sunlight, temperature, microorganisms, etc., are always at work to subtly transform objects, rocks, quiet bodies of water, and so on into something else.

The Merriam-Webster dictionary defines metamorphosis as "a major change in the appearance or character of someone or something." While it is more associated with biology, it also describes everyday things and even people as the definition also refers to "striking alteration in appearance, character, or circumstances".

Another dictionary definition of metamorphosis that is certainly "striking" for us is "change of physical form, structure, or substance especially by supernatural means". The ability of our partners to transform ordinary agricultural commodities into wonderful new products is, to us, nothing short of magical. It amazes us to no end to see the rebirth of taken-for-granted food and market articles to items very different from their original state, making them things of higher value, much like the homely caterpillar changing into a magnificent butterfly.

This issue of the BAR R&D Digest is all about agricultural commodities transformed into new products by the creative genius of our partners. The need to maximize the potential of produce

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Creating new possibilities for ag

Who would have thought that wine or beauty products could be made from local honey? Or that *kapis* is not just something for windows but could be eaten as well? Or that *malunggay* when combined with *dilis* in powder form fortifies the taste and nutritional value of many dishes? The exploratory penchant is true not only for Filipinos going abroad for greener pastures but it is also characteristic of many agriculture and fisheries entrepreneurs firmly planted in the country.

With its market-driven approach, BAR's National Technology Commercialization Program (NTCP) has worked resolutely for the transformation of agriculture and fisheries from resource-based to technology-based industries. With the firm belief that farmers and fisherfolk need not be mere producers of basic commodities, BAR has provided the crucial assistance needed for these producers to, themselves, be transformed into "agripreneurs" capable of turning out higher value products from NTCP-supported projects.

Noted in many of BAR's rural-based partners are their willingness to try out new forms and ways of product preparation. Thus, from the time the NTCP started in 2005 until the end of 2013, BAR supported 387 endeavors that explored fresh ideas. Now it is reaping the fruits of these labors as witness the increasing number of recipients of "Most Innovative Product Award" that is given in the yearly conduct

of the National Technology Forum.

An instant juice drink from sweet sorghum was patiently developed by the BAPAMIN Cooperative in Ilocos Norte and was found to be a hit among schoolchildren. This is an important development as the Department of Education has banned soft drinks in public schools. The production of sweet sorghum juice is also good for sweet sorghum growing as farmers and agripreneurs will find reason to sustain the industry which will create new employment and income opportunities.

Beekeeping is known as a sunrise industry not only because of the health benefits of honey but because other products can be made out of this commodity. The medicinal value and the beauty secrets of the ancient Egyptians are being rediscovered with the incorporation of honey in soaps, shower gels, lip balms, and skin moisturizers and conditioners. The Pampanga Agricultural College (PAC) is showing the way to their commercialization.

Another use for honey being explored is in wine-making. More and more Filipinos are drinking wine especially during the holidays. But honey wine is among the more expensive wines as it is imported and can be afforded only by affluent persons. If local honey can be made into wine, its price can be brought down and will benefit local honey producers and people engaged in

its processing and marketing. The PAC has managed to do just that.

The food and nutritive value of *adlay* as an energy source and soybeans for proteins have long been established. For the health-conscious, it is good news to know that these can be combined into a versatile form that can be a cereal meal or a hot beverage depending on one's preferences. The technology for the product, AdSoy, is still being perfected by the Department of Agriculture-Cordillera Administrative Region Integrated Agricultural Research Center (DA-CIARC) of the but it is well on the way to success.



agriculture and fisheries livelihoods

BY VICTORIANO B. GUIAM

Being in the tropics, there is an abundance of fish in the country. Fish is a major food resource which can be maximized if its shelf life can be

extended. In response to rising demand for fish products and to help out-of-school youth and rural communities with livelihood opportunities, the Mindoro College of Science and Technology has been developing technologies for the processing and canning of

important fish species that include bangus, tuna, and sardines which can be readily used.

Another potent combination is of two very common commodities: *malunggay* and *dilis*. With the view to improving the productivity and nutritional well-being of fisherfolk and rural dwellers, the Southern Luzon State University (SLSU) has been developing the technology





New agriculture...from page 3

or prolong their availability is driving the development of new consumer products. These are proud examples of R&D results that can only be found in the Philippines particularly as these make extensive use of agricultural and fisheries resources that are indigenous or are readily available in the localities.

On hand for this quarter's BAR R&D Digest are the rediscovered use of *kapis* as food; new uses for *malunggay*, garlic, and *adlay*; innovative products from bees, native pigs and *dilis*; and goat meat and *bangus* in processed form. These are the results of innovative processes and are in forms ready for consumers. Many of these have been featured in BAR's annual National Technology Forum, and R&D seminars and fora. In closing the gap between technology R&D and commercialization, BAR is making effort for these new products to be the basis for viable enterprises that will benefit agripreneurs and their communities all over the country.

As the results of research continue to mature, and our skills and abilities improve, we will continue to see more transformations and establishment of new product lines in very creative ways. BAR's National Technology Commercialization Program is seeing to it that *Pinoy* agripreneurship is alive and doing well and will remain dynamic and imaginative for years to come. ###

for *malunggay* and *dilis* in powder form that can be a food ingredient in various dishes and as flavoring to food delicacies.

In the processing of *kapis* for window panes, the meat is usually discarded. Aware that there is an opportunity in utilizing this as a food resource, the Kaliwanag Rural Improvement Club (RIC) in Samal, Bataan looked into ways on how to make use of it and settled on chips. High in protein, *kapis* chips have found a following as it is said to be tastier than similar chips. With assistance from Bureau of Fisheries and Aquatic Resources, the RIC has been doing product development; packaging, labeling, and facilities improvement; and capability building on marketing and enterprise development. Other *kapis* possibilities are *adobo*, *afritada*, *shanghai*, dried *daing*, and *bagoong*.

To connoisseurs of goat meat, its availability can be a problem especially in the urban areas where it is not readily available. This need not be the case now as the Isabela State University has developed canning techniques for goat meat already

in various dishes. Thus one can enjoy goat as *adobo*, *kaldereta* and *kilawin* anytime. Pretty soon there will also be curried goat, chevon *asado* and chevon *mechado*. In time, goats will no longer be regarded as the "poor man's cow" as goat farmers have big potentials to prosper.

Native pigs have long been known to be the breed of choice when it comes to local meat preparations such as *lechon*, *longganisa* and *tapa* because of their distinct flavor. However, since most native pigs are raised in far-flung areas, the meat will not keep for a long time. The Bureau of Animal Industry has developed technologies that prolong their shelf life and also established standards to promote their safety as well as quality.

Agriculture as a provider of livelihood opportunities is constantly touted by economic planners. These potentials can be more rapidly realized once agripreneurs "think outside the box" and consider other product possibilities. Value adding should be part of the producer's way of life and BAR is actively encouraging this thinking. ###

Kapis chips, a new snack from the sea

BY ANNE CAMILLE B. BRION



Filipinos generally love to eat. We even have snack time in between meals. But nowadays, we tend to demand for nutritious foods as we become more conscious of our health. This is why we constantly seek for ways on how we can keep on munching while still maintaining a healthy body.

In the coastal waters of Samal, Bataan, a new and unique healthy snack was introduced and is being developed that will cater to the Pinoy palate — the *kapis* chips.

Kapis, or windowpane oyster, is known in making Christmas lanterns, doors and wall decors, decorative items such as lamps, and other novelty items. However, in April 2013, a member of Kaliwanag Rural Improvement Club, a cooperative in Samal that engages in the development of



kapis-based products, thought of finding a way on how the *kapis* meat can be turned into a useful and edible product. This gave birth to the *kapis* chips.

“Before, after getting the shells, the meat is usually thrown away. Since Filipinos are very fond of eating finger foods, we thought of utilizing the meat of *kapis* into chips that could also be an opportunity for additional livelihood,” said Dr. Lilian Garcia, assistant regional director of the Bureau of Fisheries and Aquatic Resources (BFAR) Region III.

Kaliwanag Rural Improvement Club is only one of the cooperatives in Samal that is being supported by the Bureau

of Agricultural Research (BAR) through the project “Technology Utilization and Promotion of Windowpane Oysters Products”. Implemented by BFAR, provincial government of Bataan, and local government unit of Balanga, the project aims to utilize and to promote *kapis* and *kapis*-based products through product development; packaging, labeling, and facilities improvement; and capability building on marketing and enterprise development.

There are many chips that are now available in the market. Its novelty and unique taste somewhat make the *kapis* chips stand out than the rest of them. “In terms of size, *kapis* chips is

smaller than the commercially-available chips such as the *tahong* chips. Those who we were able to taste both of the chips said that *kapis* chips is tastier. However, those claims still need to be verified. Also, the taste is relative, depending on the preference of the consumer,” Dr. Garcia said.

Nutritionally speaking, Dr. Garcia mentioned that *kapis* is very rich in protein. “The chips, however, still need to be tested in the laboratory for its nutritional content. In terms of shelf-life, the *kapis* chips can last for about 6 months, but this has to be validated also through laboratory testing,” she furthered.

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LOCOS' GARLIC MIKI

pancit with a twist

BY DIANA ROSE A. DE LEON

Pancit or *pansit* (noodles) is a constant dish among Filipinos. It has been introduced into the country by the Chinese and has since been adopted into the local cuisine. In fact, no birthday is complete without it. According to food lore (also handed down by the Chinese), pancit should be eaten present in every birthday as it represents long life and good health.

In lieu of its popularity, there are now varieties of pancit available in the market including *sotanghon*, *bihon*, *canton*, *miki*, among others. There are also various ways of preparing pancit that are unique in a given province such as the *pancit habhab* of Lucban, Quezon; *batil patong* of Tuguegarao; *pancit bato* of Bicol region, among others.

Another innovation that has been recently developed is the garlic-enriched dried *miki* noodles of the Ilocos region.

The garlic project

Pancit *miki* is an all-time favorite merienda enjoyed by the Ilocanos. A visit in Ilocos will not be completed without tasting their famous local delicacies such as pancit *miki*.





Ilocanos' pancit *miki* is often flavored with garlic. This is the reason why researchers from the Department of Agriculture – Ilocos Integrated Agricultural Research Station (DA-ILIARC), developed a noodle product that is already incorporated with garlic powder.

Garlic is an in demand ingredient in cooking as it provides flavor and aroma to the dish. It is also known for its medicinal properties which can treat a wide array of diseases. According to the U.S. National Library of Medicine (2011), among its health benefits are: it is rich in antioxidants, it helps in weight management, it treats

fungal infections of the skin, it can reduce blood pressure, and it can lessen the risk of acquiring atherosclerosis (hardening of the arteries) and some types of cancers.

Ilocos is the major garlic-producing region in the country accounting to about 60-70 percent of the total's country garlic production. Ilocos garlic is preferred variety as it is known for its distinct pungent and aromatic smell.

To support the garlic industry in Ilocos and to ensure that there will be ample supply of Ilocos garlic available in the market, the Bureau of Agricultural Research (BAR), under its National

Technology Commercialization Program (NTCP), funded a project "Garlic Technology Commercialization in Region 1". This initiative aims to help Ilocos garlic farmers to adopt new technologies on garlic farming and to boost their production and income.

To capture larger markets and to empower the garlic stakeholders, through creating agribusiness on garlic, the project also included as one of its components, garlic processing and other value-adding activities, one of which is the product development of garlic-enriched



miki. Other products include: garlic polvoron, garlic pickles, garlic powder, garlic flakes, and garlic chips.

The garlic miki, R&D style

The preparation of garlic-enriched *miki* is just like any other preparations of a regular *miki*. Among its ingredients are all-purpose flour, garlic powder, and water which will make up the dough. The dough is flatten and cut using a pasta cutter, and left to dry. The process is simple and can be done even at homes.

The DA-ILIARC partnered with the Association of Garlic Growers and Processors of Ilocos Norte, the beneficiary of the project wherein the technology on

garlic processing was transferred. The Association makes use of the facilities of DA-ILIARC for garlic products processing.

The garlic *miki* is being marketed at the local markets in Ilocos while the Association supplies the garlic *miki* to some food restaurants in Laoag City. To further promote the garlic *miki* and other garlic products, DA-ILIARC is joining various agricultural trade fairs and exhibitions including the annually-held BAR's National Agriculture and Fisheries Technology Forum and Product Exhibitions held in August at SM Megamall.

The garlic-enriched *miki* is sold at Php 50 per 400 grams pack and can be stored for a year. ###

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Kapis chips...from page 8



Currently, there are two flavors of the *kapis* chips available, one is original and the other is sweet and spicy. Aside from chips, *kapis* meat is also turned into other home-made Filipino food products such as *adobo*, *afritada*, *shanghai*, *daing*, and *bagoong*.

According to Ms. Gladys Resubal, one of the co-project leaders, the development of *kapis* chips is still at its infancy stage. “Only few members of the Kaliwanag RIC do the processing of *kapis* chips. It is still on a smallscale basis. But some of them are able to sell it already to their *balikbayan* friends and to local tourists and buyers during trade fairs and exhibits,” Ms. Resubal added.

As of now, plans on improving the product are underway. “The *kapis* chips is new. We still need to identify its nutritive value and shelf life, and improve its packaging and labeling to make it more competitive. Once our product is ready, we will also introduce it extensively to

the markets through promotion and marketing especially to the *balikbayans* and local tourists. In fact, some *balikbayans* in Bataan usually look for *kapis* chips whenever they go home and make it as their *pasalubong*,” Dr. Garcia said.

The increasing curiosity of people to try new products is one of the factors that will help boost the Philippine *kapis* industry.

“Our *kapis* industry is just a budding industry. With the right interventions, the development of *kapis* chips and new *kapis*-based products would provide additional income to the fisherfolk of Bataan, thereby helping make the industry better,” Dr. Garcia shared.

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HONEY WINE FROM MOUNT ARAYAT

BY LIZA ANGELICA D. BARRAL

Parties are definitely all over the place during Yuletide season. As some would say, every celebration is never complete without any liquor on a shot glass to say “cheers” with. No wonder imported wine is one of the best buy Christmas presents in supermarkets and liquor shops. However, researchers and other businessmen have explored the potentials of underutilized fruits and other commodities as raw materials in producing wines. Hence, consumers started to be curious and eventually patronized the locally-made wines.

Through the National Technology Commercialization Program (NTCP) of the Bureau of Agricultural Research (BAR), various stakeholders from the research stations of the Department of Agriculture (DA) and state universities and colleges (SUCs) were able to produce a variety of wines made from *bignay*, *lipote*, *abiu*, *rambutan*, pineapple, mango, *guyabano*, *ybanag*, *arius*, *sapinit*, *duhat*, tamarind, *tambis*, and sweet potato. The latest addition is wine from honey.

The drink of love

Honey wine, also known as mead, is considered as the first alcoholic drink brewed by men, earlier than wine or beer, with alcohol level varying between 7-15 percent. In Europe, honey is fermented to produce this beverage, thus, it was also called the “Nectar of the Gods” or “Drink of Love”.

It was told that honey wine could have been produced by chance during the Stone Age when honey became wet from rain and wild yeast in the air settled into the mixture. For centuries, honey wine is widely-known as an aphrodisiac. In fact, the word “honeymoon” is believed to be derived from the ancient European custom of having newly-weds drink honey wine for a month in order to increase their fertility.

Honey wine is also taken as a health tonic drink as it has a good level of antioxidants. B-vitamins are also present which is a good energy booster. Another advantage of honey wine is it contains no gluten and therefore can be enjoyed by people with celiac disease or wheat sensitivities.

Imported honey wines are indeed expensive which ranges from US \$10-30. In the case of Philippines, honey wine is being sold to cater the high-end consumers.

PAC’s newest pride

From patronizing tamarind

as their flagship commodity, the Pampanga Agricultural College (PAC) has begun to explore the market potentials of honey wine by producing their own.

According to Dr. Norman de Jesus of the Alternative Low Input Agriculture System Center (ALIAS Center) and professor at the Institute of Agriculture Systems and Technology Center of PAC, the selection of honey followed the standard guidelines. Honey wine processing is a series of confirmation steps specifically the racking, clarification and aging wherein the fermented mixture is being measured based on its alcohol reading, pH, degree brix and organoleptic test and have it transferred to another vessel.

PAC’s honey wine was raised following organic production systems or guidelines and is organically certified by Ecoland as the second party certifying body and Negros Island Certification Services (NICERT) as the third party certifying body.

“Honey wine is more on the sweet category. Whereas the commercially available honey wine is more on the dry side,”

explained Dr. de Jesus. PAC’s honey wine is economically priced at PhP 200 per 750 ml.

To produce a wide variety of choices for its target consumers as well as to make the product as part of the income generating projects, the academe is planning to produce honey wine infused with herbs such as mint, basil, tarragon, and oregano with tamarind. When asked about their tagline for the product, Dr. de Jesus was proud to say that PAC’s version of honey wine came from “Honey from Mt. Arayat”. ###

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AdSoy:

Cereal meal and hot beverage in one nutritious blend

BY RITA T. DELA CRUZ

Filipinos are becoming more health-conscious. This has been the conclusion of a study conducted by Kantar Worldpanel, a leading provider of research-based information on shoppers' purchase and usage behavior in several countries. The result of the study was also published in the Philippine Daily Inquirer on 23 August 2011.

The study, which covered 2,000 households in urban areas, showed that in the past 10 years (2001-2010), Filipinos were increasingly becoming health-conscious, with 93 percent,

up from 83 percent in 2005, buying healthy foods in 2010. "Filipino consumers learned to read the labels, with 90 percent making sure they were getting really healthy foods before buying." The study also found that convenience had become a valued consideration for Filipinos, with products such as ready-to-drink teas, coffees, and cereal beverages claiming at the top three spots.

Given the health-conscious trend among Filipinos, researchers from the Cordillera Administrative Region Integrated Agricultural

Research Center (CIARC) of the Department of Agriculture (DA), developed a food product that combines both convenience and health benefit. They call it, "AdSoy Blend".

Adsoy: 2-in-1 health product

"It could have been called "AdSoy" or "Solai" but the point is to come up with a name that will capture both commodities: *adlay* and soybean," said Dr. Magdalena T. Wanawan, CIARC manager.

AdSoy is a cereal meal and a hot beverage rolled into one.

"Initially, the aim was to





develop a product that targets the health-conscious Filipinos with great consideration on the ease of preparing it, especially to those people who are always on the go, always in a hurry. We developed AdSoy as a cereal meal and as a hot beverage. Getting the right consistency will depend on the amount of water and mixture,” explained Dr. Wanawan.

The main ingredients of AdSoy are roasted *adlay* grains and roasted soybeans. A dash of roasted sesame seeds was also added into the blend for flavor. “If you want to utilize AdSoy as cereal food, you have to add hot water, milk, and sugar to taste. If you want to use it as tea or hot beverage, you have to add more hot water or milk and sugar as preferred. We did not add sugar into the blend because some diabetic patients drink it without the sugar.”

According to Dr. Wanawan, AdSoy was developed in April 2014 and was first introduced to the public during

the National Agriculture and Fisheries Technology Forum and Product Exhibition, organized by the Bureau of Agricultural Research (BAR) in August 2014 at SM Megatrade Hall, SM Megamall. Funding for this CIARC’s research initiative is part of the *Adlay* R&D fund from BAR.

Many products have been recently claiming the same thing, that they are both healthy and easy to prepare, what makes AdSoy different from these products? Dr. Wanawan revealed that, “AdSoy is organic! The blend contains *adlay* and soybeans which are both organically-grown here. *Kami talaga sa CIARC ay maka-organic!* [We at CIARC are into organic!].”

Although, AdSoy has been already been introduced to the public through tech fora, Dr. Wanawan admitted that they are still perfecting the product in terms of taste and consistency. “We need to improve on the taste by conducting public taste test and also improve the product

packaging,” said Dr. Wanawan.

Healthful benefits from AdSoy

“We developed it because of the health benefits from *adlay* and soybean. Both are high in nutrients, containing both energy and protein which are essential needs of our body. Another reason is that both crops are easy to grow and produce,” she said.

Adlay, scientifically known as *Coix lacryma-jobi* L. belongs to the family Poaceae or the grasses, the same family to which wheat, corn, and rice belong. It produces good yield in areas where rice and corn hardly grow like the highlands. Just like rice, farmers grow *adlay* as their staple crop for its good eating quality. It bears tear-shape grains which when matured and are harvested, pounded, threshed, and winnowed, cooked and served steamed just like rice.

As a food source, *adlay* is as versatile as rice. It can be cooked and processed as main ingredient for Filipino food

products including *maja blanca* and *sinukmani*. The grains can be ground into flour and used to make breads, pastas, and porridge.

Studies showed that eating 100 grams per serving of *adlay*, one is less likely to feel hungry after awhile compared to eating rice or corn. This is because *adlay* has the highest food energy content (356 kcal) compared to corn, white rice or brown rice. It is also superior to its staple counterparts when it comes to carbohydrate content (73.9 g), protein (12.8 g), and fat (1.0 g). *Adlay* is also packed with other minerals including calcium (25 mg), phosphorus (43.5 mg), iron (5 mg), niacin (4.3 mg), thiamine (0.28 mg), and riboflavin (0.19 mg).

The other component of AdSoy blend is the soybean, considered as a wonder crop due to its resilience, versatility, and its nutritive value. Locally known as *utaw*, it has been widely used to meet the protein need of Filipinos with a great potential in helping alleviate hunger and poverty in the country.

Soybean seeds contain approximately 40-45 percent protein, 20-25 percent edible vegetable oil, and a significant amount of vitamins A and E, as well as minerals and micronutrients making it a valuable component in many food items both for humans and for animals.

There is a widely-held public perception that eating soybeans can increase the risk of gout and can potentially trigger acute attacks for those already

suffering from the disease. Most people believed this because beans are high in protein, concluding that consumption of high protein leads to high uric acid in the blood leading to gout. This is not true as revealed by numerous scientific studies. In fact, according to Elmer E. Enicola, researcher from the Institute of Plant Breeding, University of the Philippines Los Baños (IPB-UPLB), there is no reason why the public, with or without gout, should avoid eating soybeans and soy-based foods because they provide plentiful amounts of high-quality protein.

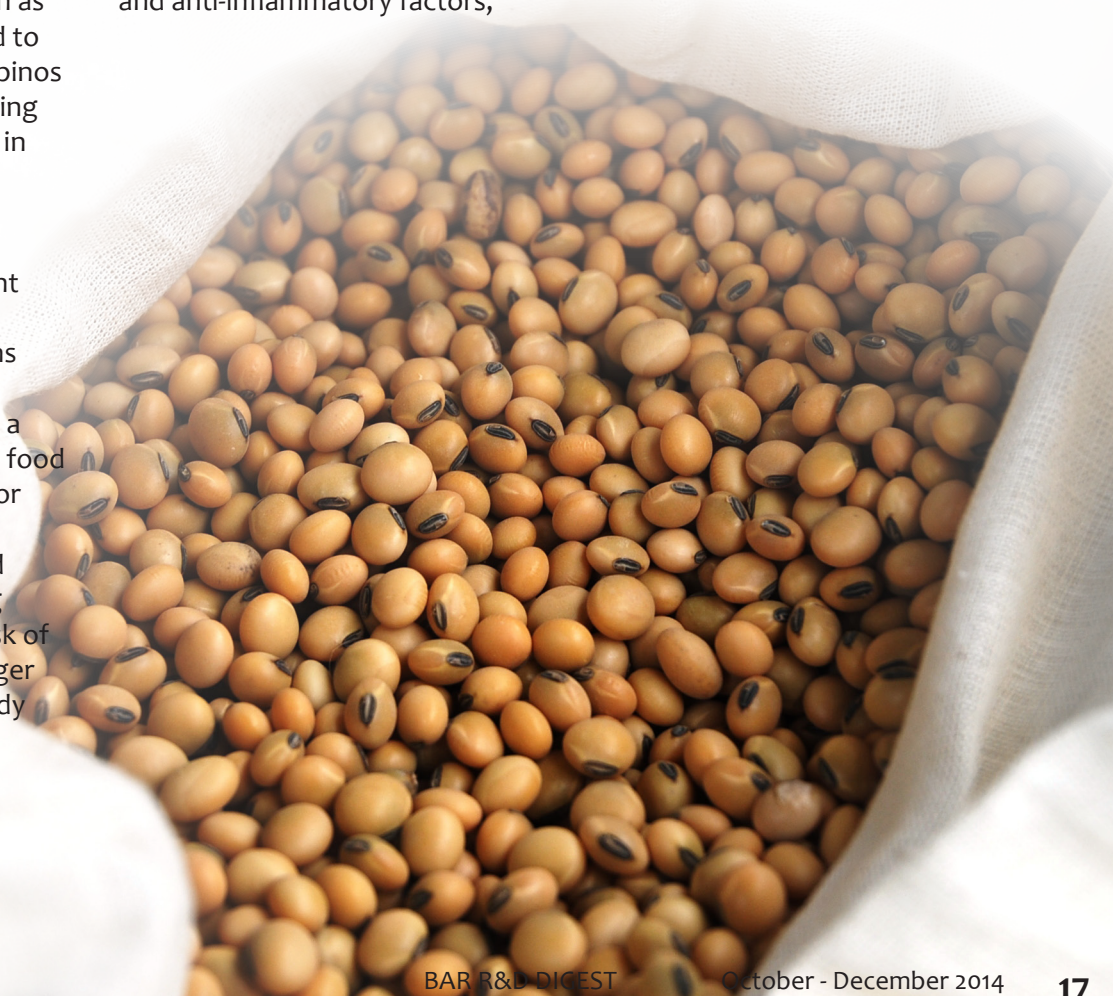
This health fact on soybean was reiterated by Rose Mary Aquino, senior agriculturist at the DA-Cagayan Valley Integrated Agricultural Research Center (CVIARC) in Region 2 citing that soybean is known as a good source of dietary fiber and it contains anti-cancer and anti-inflammatory factors,

and components that aid in the prevention of osteoporosis, heart diseases, and diabetes.

Among the legumes, soybean has the highest protein content. Aside from its numerous health benefits, soybean is also an important crop in an agricultural system because of its capability to fixate nitrogen that is present in the air. "The symbiotic relationship between the nitrogen-fixing bacteria [in the root nodules] and the host legume plant provide nitrogen to the agricultural system," explained Aquino. ###

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When one does not have the luxury of time to cook food, more often than not, canned and/or other ready-to-eat foods become the instant solution. They are easier to prepare, available everywhere, and affordable. They even come in varieties, from all sorts of fruits and vegetables, to a choice of meat.

This is why a team from the Isabela State University - Cagayan Valley Small Ruminants Center (ISU-CVSRRC) in Echague, Isabela explored the commerciability of canned chevon or goat's meat. This research initiative was led by Dr. Jonathan N. Nayga, director of CVSRRC and professor at ISU, Echague Campus.

Why eat chevon?

Chevon is said to be the healthier choice among the usual red meats available in local markets such as pork and beef, and even chicken meat. It has lower amount of saturated fats and has high levels of unsaturated fats as compared to other meats. Saturated fats increase the risk of acquiring cardiovascular diseases while unsaturated fats help improve blood cholesterol levels and lowering the risk having heart diseases. It has lower calories and cholesterol, and has high levels of iron and protein when compared to equal serving sizes of chicken, beef, and pork (see Table 1).

Knowing that there is a healthier choice of red meat and through the various initiatives done to promote the consumption of chevon, the Philippines posted an increase of per capita consumption of chevon from 0.36 to 0.44 kilogram in 2010 according to the Bureau of Agricultural Statistics data.



Chevon from Cagayan Valley

Goat raising is one of the fastest growing industries in Region 2, thus, it become one of the valuable commodities in Cagayan Valley. The common practice for goat raisers is to sell their goat on a per head basis, and usually the meat is sold fresh, chilled or frozen.

Even though there are continuous researches being conducted to ensure availability of quality stocks of goat, and increase its production and productivity, the price of goat meat remains high in the market. According to Dr. Nayga, goat meat

is sold at Php 200 – Php 500 per kilogram (kg) depending on the cuts, and the price may even get higher depending on the seller. The ISU-CVSRRC is selling vacuum-packed chevon prime cuts at the minimum price of Php 350 per kg.

Realizing that there are still untapped markets for goat meat and can be sold in a much affordable price, ISU developed the technologies on small ruminants meat processing that includes the chevon prime cuts and canned chevon. “Product development is vital to transform the basis of disposal from per head to retail scheme, making it

Table 1. Meat comparison

100g (cooked)	Calories	Fat (g)	Saturated Fat	Cholesterol (mg)	Protein (g)	Iron (mg)
Goat	143	3.03	0.93	75	27.10	3.73
Beef	208	11.07	4.07	84	25.05	1.66
Chicken	165	3.57	1.01	85	31	1.04
Pork	252	14.28	5.25	96	28.88	1.05

Source: Desert Viking Ranch. (2010). Goat meat health benefits <http://www.desertvikingranch.com/goat-meat-health-benefits/>



Canned chevon, the healthy red meat

BY DIANA ROSE A. DE LEON

other commercially-available canned meat is that, it has no preservatives. The canned chevon *kaldereta* will last up to 7.7 months; canned chevon *adobo* is up to 12 months; and canned chevon *kilawin* is up to 15.6 months.

ISU had been able to get approval for their application for utility models for these canned products.

To promote the product, ISU joined various agricultural and scientific fora and exhibitions as well as various trade fairs. The ISU collaborated with Agricomponent

Co., a private company that engages on agricultural machinery distribution, hotel, resort and restaurant management, to be the exclusive franchisee of Chevon Valley. The two institutions signed a Memorandum of Agreement (MOA) in July 2014 stating the three-year exclusive right of Agricomponent to sell the products nationwide.

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more affordable to every Filipino,” said Dr. Nayga.

This initiative on product development is made possible with the support from the Commission of Higher Education (CHED), Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD), DOST-Industrial Technology Development Institute (DOST-ITDI), Bureau of Animal Industry-Animal Products Development Center (BAI-APDC).

In 2010, ISU released to the market the canned chevon under the brand name Chevon Valley with the funding support from DOST-PCAARRD. The canned chevon are available in three flavors – *adobo*, *kaldereta*, and *kilawin*. The canned products are packed in tin cans at 200 grams and sold at PhP 100 each.

Dr. Nayga mentioned that one advantage of their canned chevon over the



Beauty in the Bees

BY DARYL LOU A. BATTAD

Bees keep an important role in maintaining the equilibrium of the environment, and human beings are the luckiest to have been bestowed one of the greatest nature's gifts in promoting a sound health.

The bee's honey is such a valuable product of nature that has proven its worth over a million years bearing essentially medicinal, cosmetic, and nutritive properties. It has a number of uses ranging from being a sweetener substance, an effective and safe home remedy, a good source of antioxidants, to being a beauty regimen. It can be used raw, or can be combined with other substances and natural sources. Aside from honey, beeswax is also an indispensable and widely-used bee product that serves well especially in the field of cosmetics.

The beekeeping business

The apiculture industry in the Philippines has shown good opportunities both in the local and international markets. Its potentials are consistently being developed to further improve the business, in a collaborative effort among various sectors such as the government, non-government, and private sector.

The Pampanga Agricultural College (PAC) in Magalang, Pampanga has ventured in the beekeeping industry through research and development in the hopes of promoting it to various communities in the vicinity of Mt. Arayat. Supported by the Bureau of Agricultural Research (BAR), the project aims to upscale the apiary of PAC for training, research, and extension; conduct relevant researches which include pollination and foraging behavior

and economics; and extend beekeeping technologies to farmers through training.

In its two-year implementation, among the accomplishments of the project was the establishment and commercialization of bee products which include soaps, ointment, lip balm, body scrub, shower gel, and beeswax candles.

Beedazzling products

Since ancient times, bee products have been used in body and beauty care. It was said that Cleopatra used honey as a beauty potion. For PAC, its bee products are no different than Cleopatra's beauty regimen especially in terms of skin care.

Honey, combined with other natural sources, produces a wide array of healthy, all-natural products. These are what the project was able to come up with



such as honey moisturizing soap, lotus honey soap, and tamarind soap with honey; tamarind shower gel with honey and body scrub made of lotus-honey. With its antioxidant properties, honey becomes an important ingredient in cosmetics that serves as good moisturizer and skin conditioner.

Beeswax, another bee product, is a natural wax secreted by the bees when constructing their honeycombs. It goes far beyond history when it was used in the manufacturing of various applications such as bows, wax tablets, and cosmetic products including bath essentials, lipstick, fragrances, hair-coloring products, nail care, and body creams and lotions.

The medicinal attributes of beeswax are what make its products attractive especially to Filipinos who are often drawn to naturally-made products offering safe yet effective results. Much like the different ointments made from beeswax that are infused with other natural ingredients

such as tamarind, lotus, and adlay — these products are proven to relieve skin inflammation and hasten wound healing. There are also lotus beeswax and honey lip balm which are guaranteed to soothe dry lips.

In various tests and treatments conducted by the project team led by Dr. Norman de Jesus, a horticulture professor and researcher at PAC, the lotus-honey soap was able to treat sun rashes and pimples with regular application in as early as nine days. The same goes for the lotus beeswax ointment, which showed good results when applied to wounds twice a day for 10 days.

Social relevance

For Dr. de Jesus and the rest of the team, this project on the “Promotion of Beekeeping and Bee Product and By-Product Development” serves a much higher purpose which to bring beekeeping technologies to various municipalities and barangays around Mt. Arayat in

Pampanga to create awareness on the importance of bees in agriculture, and to become a source of livelihood for local farmers and entrepreneurs. “PAC will continue to collaborate with stakeholders to strengthen and develop science-based approaches and technologies in the development of beekeeping particularly in the province of Pampanga,” Dr. de Jesus shared.

As for BAR, it will continuously support the government’s directives in the promotion and development of apiculture through research and development, which in the end will create new opportunities to sustain the bee sectors and their contributions to agricultural development of the country in general. ###

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In the midst of a rising demand for ready-to-eat food that are packaged in various forms like Tetra Pack, bottles, plastic containers, and foils, canned products are not left behind. In fact, from the usual sardine in can, it now comes in variants, fish in oil, tuna in oil, or other fishery products that are packaged and preserved in various flavors.

Since the first production of canned tuna in oil and bangus French style in 2011, the Mindoro State College Agriculture Technology (MinSCAT), Bongabong Campus, now regularly produces and markets these products locally and even abroad as *pasalubong* or *pangregalo*. Through the

research effort of MinSCAT, they were able to maintain the quality, palatability, and even sanitary standard of their fishery products reaching more customers and expanding their market.

The Philippine canned industry is competitive given that there are already well-known commercial companies that are producing the same products. MinSCAT, a state college, is offering knowledge and skills on the technologies including culture, propagation, and wise utilization of fish and other fish products through proper preservation. From what started mainly for instructional purposes, MinSCAT is now producing their own canned products out of the research efforts that they've conducted. Among the canned products

that they produce are tuna in oil, bangus in tomato sauce, and bangus French style.

"In its 47 years of existence, MinSCAT has continuously engaged in developing different fish processing practices including the canning of different species of fish," said Dr. Edna G. Piol, MinSCAT campus administrator.

The Bureau of Agricultural (BAR), under its National Technology Commercialization Program has supported two of its projects: 1) "Commercialization of fishery products (tuna in oil and bangus French style) through improved packaging and labeling" and 2) "Technology commercialization and promotion of some fishery products of MinSCAT Bongabong, Campus". The first project was funded in coordination with the National

FILIPINO-MADE CANNED FISHERY PRODUCTS CREATE BIG MARKET DEMAND

BY MA. ELOISA H. AQUINO

Agricultural and Fishery Council (NAFC), through the Japan Official Development Assistance's (ODA) - 2KR Program Grant Assistance for Underprivileged Farmers. Meanwhile, the second initiative, aims to promote fishery products in the different parts of the country and even abroad and later engage in extensive production.

"The College proposed to further develop technology package of different canned fish products and disseminate technology to various levels and clientele," shared Dr. Piol.

The technology package showcasing the canning of different fish species such as tuna, *bangus*, and sardines are among the Filipino-made fishery products promoted by the Department of Agriculture (DA) both locally and internationally. "The project aims to promote these canned products here and abroad to increase the demand for Filipino-made products, thereby alleviating poverty specifically in the rural areas," Dr. Piol added.

Part of the components of the project is the upgrading of the Fish Processing Laboratory and the procurement of fish processing equipment.

These BAR-MinSCAT projects have helped fisherfolk, adults, out-of-school youth, and other people in the community to engage in various livelihood

activities using the transferred technology. Some of the participants have since engaged in smallscale enterprises by producing and selling canned products and other processed fish products.

"The training provided opportunities to gain knowledge and insights on preserving fish like canning," Dr. Piol explained. She added that, it enhanced the entrepreneurial spirit of the wives of the fishers in the community, which in the process, optimizes the income potential of fish caught of the local fishermen.

MinSCAT also sought the assistance of the Department of Science and Technology (DOST) on brand development including the design of the product label and support of the the local government unit of Bongabong and other municipalities of the second district of Oriental Mindoro for the conduct of trainings.

"Fisheries as the flagship program of our College, it used to engage in the

transfer of technologies, one of which is the canning of fishery products. MinSCAT has been requested to conduct lecture demonstrations by the LGUs in Oriental Mindoro, schools, and other private enterprises not only in the province but the whole of MIMAROPA region," said Dr. Piol.

MinSCAT participates in different product exhibitions to market and promote their



products. These include BAR's National Agriculture and Fisheries Technology Forum and Product Exhibition, Provincial Agro Fair in Mindanao, Product Exhibit during the National Gender and Development Summit at Batangas State University, and exhibits of fishery products at the Bureau of Fisheries and Aquatic Resources in Calapan, Mindoro, among others.

To date, there are 3,364 cans of tuna and 2,721 cans of *bangus* were produced and packaged since 2011. Despite the much higher price compared to commercially-available canned products, MinSCAT- Bongabong Campus was able to produce more canned tuna and *bangus* to cope with the consumers' demand

while improving its packaging and labeling. They were able to innovate their packaging materials by using glass jars. They have produced 113 tuna in oil and 160 *bangus* French style in glass jars.

A research study on the "acceptability and marketability of canned tuna in oil and *bangus* French style of the MinSCAT Bongabong Campus" revealed that these products are palatable, of good quality, and have selling power.

"The very favorable and enthusiastic comments of clients led to the increase and continuous demand for tuna in oil and *bangus* French style was that pile of orders which have been reserved already even before the

processing is finally done," Dr. Piol proudly mused.

After attending livelihood trainings on fish processing methods, fisherfolk from the coastal municipalities of Bulalacao, Mansalay, Roxas, Gloria, and Bongabong are now venturing in bottled sardines and *bagoong*-making either for household consumption or as business. ###

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Canned chevon...from page 19

Chevon variants

Seeing the potentials of Chevon Valley to capture larger Filipino consumers, especially those living in the urban areas and at the same time to help the goat raisers in the country, the Bureau of Agricultural Research (BAR) funded in 2013 the technology transfer of chevon product processing and commercialization of new chevon products. Aside from the original three variants

of *adobo*, *kaldereta* and *kilawin*, Chevon Valley will offer five more new flavors of canned chevon including chevon curry, goats "happy feet", pounded chevon, chevon *mechado*, and chevon *asado*.

Also, under the project, Dr. Nayga is happy to bring up that the team is also currently developing new recipes that will be served in microwaveable packaging. There are four flavors

that include chili-garlic chevon, chevon meat balls, chevon with white sauce, chevon ribs with chestnut sauce. At present, these new products are still undergoing various analysis and market studies. ###

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Powdered Malunggay and Dilis: A union to keep the flavor last

BY PATRICK RAYMUND A. LESACA

Malunggay (*Moringa oleifera*) is a perennial vegetable tree and is the most cultivated plant from the Moringaceae family. Proven to be highly nutritious, it primarily grows in tropical, subtropical and semi-arid climate. Moringa leaves can be consumed fresh, cooked, or as powder. The powdered form is also a good source of many health benefits. Two or three spoonfuls of Moringa leaves powder can provide a substantial amount of iron, calcium, vitamins

A and C. Another important use of the *malunggay* powder is that it can be a natural food ingredient and can be added to any food or beverage.

Dilis or anchovies (*Engraulis japonicus*) is a small, common salt-water forage fish of the family Engraulidae. The flavor is so strong that it only takes a small amount to add flavor to sauces, salad dressings, pasta, and pizza. Dried *dilis*, considered as finger food, is also a great snack to many Filipinos. Anchovies

are rich in protein, vitamins, and minerals that help in maintaining good health. It contains calcium, iron, magnesium, phosphorus, potassium, sodium and zinc. Anchovies are a good source of vitamins such as thiamin, riboflavin, niacin, folate, vitamins C, B12, B6, A, E, and K. It also contains fatty acids and cholesterol.

Maximizing the nutritional and health benefits of *malunggay* and *dilis*, researchers from the Southern Luzon State University-



Amount Per Serving % DV*		Amount Per Serving % DV*	
Total Fat 0.5g	1%	Total Carbohydrate 9g	3%
Saturated Fat 0g	0%	Dietary Fiber 6g	24%
Cholesterol 20mg	7%	Sugar 2g	4%
Sodium 30mg	1%	Protein 14g	28%
Vitamin A 40% • Vitamin C 2%		Calcium 40%	

Amount Per Serving % DV*		Amount Per Serving % DV*	
Total Fat 0.5g	1%	Total Carbohydrate 9g	3%
Saturated Fat 0g	0%	Dietary Fiber 6g	24%
Cholesterol 20mg	7%	Sugar 2g	4%
Sodium 30mg	1%	Protein 14g	28%
Vitamin A 40% • Vitamin C 2%		Calcium 40% • Iron 10%	

Amount Per Serving % DV*		Amount Per Serving % DV*	
Total Fat 0.5g	1%	Total Carbohydrate 9g	3%
Saturated Fat 0g	0%	Dietary Fiber 6g	24%
Cholesterol 20mg	7%	Sugar 2g	4%
Sodium 30mg	1%	Protein 14g	28%
Vitamin A 2%		Calcium 40% • Iron 10%	



Judge Guillermo Eleazar (SLSU-JGE) in Tagkawayan, Quezon, came up with a research project, “*Dilis-Fortified Malunggay Powder Project*”. Funded by the Bureau of Agricultural Research (BAR), under its National Technology Commercialization Program, the project hoped to expand the uses of both *malunggay* and *dilis* by processing into powder forms, which can be used as food ingredients in many dishes and as flavoring to various food delicacies.

According to Professor Doris Gatus of SLSU-JGE, they have already completed the study and have been conducting sensory analysis and other benchmarking activities to ascertain the degree of acceptance to consumers and end-users. They have also conducted series of school feeding activities among students with the end goal of supplementing their nutritional requirement and intake.

Malunggay powder and fish flour are prepared by: 1) weighing the *malunggay* powder and fish flour for their desired mixture, 2) mixing the materials thoroughly, 3) packing the mixture in bags, and 4) labeling each pack

and storing them in an assigned storage room until it reaches the customers. The recommended ratio for *malunggay* and *dilis* are: 1:1, 3:1, and 3:2, depending on the use. One kilogram of fresh *malunggay* leaves can produce 300g *malunggay*-powder and 1kg. *dilis* (utilizing the fleshy part) can likewise produce 100g *dilis* powder.

Professor Gatus hoped that through this project, fisherfolk and rural residents will improve their productivity and income, increase the home consumption of highly-nutritious yet inexpensive food such as *malunggay* and *dilis*, and help reduce malnutrition and create livelihood opportunities for residents and non-residents of Tagkawayan.

She reported that for every 100 grams of *dilis* flour fortified with *malunggay* powder, the following nutritional values can be achieved: carbohydrates (3 percent), protein (5 percent), vitamin A (40 percent), vitamin C (2 percent), calcium (40 percent), and iron 10 (percent).

To obtain complete health diagnostic and nutrition facts, the mixtures of *malunggay* powder

and *dilis* flour (2:1 ratio) were submitted to DOST for chemical analysis. Once they have received the results, the proponents will take proactive campaign to promote the product in schools, barangays, and communities within the Tagkawayan and possibly in Quezon province. ###

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Processed meat products from Native Pig

BY ANNE CAMILLE B. BRION

According to the Food and Agriculture Organization (FAO) of the United Nations, the most valuable livestock product is meat. Its consumption, along with other meat products, is essential to our health as it contains important levels of high quality protein, vitamins, minerals, and micronutrients.

In the Philippines, pork remains at the top spot among the most consumed meat in the livestock and poultry sectors. Data from the Bureau of Agricultural Statistics (BAS) revealed that

in 2012, annual per capita consumption for pork was around 9 kilograms, followed by chicken with 8 kilograms, while beef, carabeef, chevon, and duck were less than a kilogram.

With people becoming more conscious of their health, demand for meat products derived from native animals is on an increasing trend. Aside from their nutraceutical value, consumers prefer them for their delectable taste and distinct flavor, thus commanding better prices in the market.

Improved processing technologies for native pig meat

A project supported by the Bureau of Agricultural Research (BAR) was implemented by the Bureau of Animal Industry (BAI) that focuses on improving processing technologies for meat and skins from selected strains of native pigs, particularly the BAI Tiaong Black Pig. The technologies were developed by BAI so that they can easily be adopted by native pig growers and raisers.

“Meat processing technologies will add value



producers and food processors in different areas of the country.

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to the native pig and provide opportunities for income generation and establishment of business enterprises,” said Ms. Nenita R. Estante, project leader and senior agriculturist from BAI. “Furthermore, native pig raisers need improved technologies on value adding for the meat they produce in order to achieve longer shelf life,” she added.

As a component of the project, meat products from native pig such as *lechon*, dried *tapa*, smoked bacon, fresh native sausage, and pork hotdog were developed. Standardization of recipes based on the standardized formulation of the Animal Products Development Center (APDC) of BAI has been made for the meat products. Parameters include the amount and type of ingredients, and the detailed

procedure for each recipe. This is to ensure that the meat products will be safe to the consumers, as well as guarantee the consistency of quality and preservation of unique flavor.

Based on the sensory evaluation conducted by trained panelists at APDC, the native lechon was acceptable in terms of color, flavor, crispness, juiciness, and tenderness. Likewise, the other meat products were favorable in terms of their color and flavor.

Apart from meat products, the project also looks into the possibility of utilizing the native pig skin as a raw material for leather. To disseminate information on the processing technologies, BAI continuously conducts seminars and demonstrations among native pig

A refreshing, natural drink from Sweet Sorghum

BY RITA T. DELA CRUZ

Years after sweet sorghum was first introduced in the Philippines in 2005, through its active partnership with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), its benefits have expanded from being the best source of feedstock for ethanol production to being a multi-purpose crop that can provide food, feed, and fertilizer among its many uses. Out of these 4Fs (fuel, food, feed, fertilizer) sweet sorghum as food source proved valuable in providing both income and livelihood opportunities to farmers.





Various research initiatives have led to the development of different sweet sorghum products. Sweet sorghum produces two important products: *the grains* which bear starch, and *the stalk* which holds sugar-rich juice. Developed from the grains are sweet sorghum pop and flour which can be processed into bread and pastries while the

stalks produce products like juice, wine, vinegar, and syrup.

Extracting natural sweetness

One of the main products from sweet sorghum is its sweet juice. It is twice the sweetness of juice extracted from sugarcane. Dr. Heraldo Layaoen, sweet sorghum expert, explained that this is because sweet sorghum has 23 percent sugar content as compared to sugarcane's 14

percent. Thus, its sweetness is preserved when extracted from its stalks making it the perfect juice that doesn't need sugar for added sweetness. This sweet extract is gathered after passing the harvested stalks via mechanical presser. Fresh extract can be consumed as is, can be concentrated or can be mixed with other juices.

The fresh juice from sweet sorghum, is one of the most recent products developed by BAPAMIN Multipurpose Cooperative, which is owned and led by the husband-wife team, Mr. Tony and Doris Arcangel of Batac, Ilocos Norte. Prior to the development of the juice, the couple has produced other sweet sorghum products like vinegar, syrup, flour, hand sanitizer, and natural sweetener. Their products are being marketed under the brand name Healtika.

“It was in 2010 that we first thought of developing sweet sorghum juice, but we did not pursue it further as there were other products we need to develop first. The fresh juice easily ferments, so that we did not have the necessary equipment to process it at that time. Also, there are so many juices and drinks that are already out in the market, so it becomes very competitive,” explained Mr. Arcangel.

When BAPAMIN finally pursued to focus and improve the product, they wanted to get the consumers’ reaction on the juice so they conducted a taste test in May 2013 during the Farmers’ Festival in Batac, Ilocos Norte. “The feedback we got was good. We even asked those who have tasted it if they would buy the product in school and we got affirmative replies!” said Mr. Archangel. They also conducted taste test among the kids to know if they will like the taste. “The kids liked more of the natural flavor of sweet sorghum than the flavored ones,” he added.

From powder sweetener to juice drink

“We are putting together the technology of making sweet sorghum juice drink from its powder form which is a result of the spray drying technology that the Bureau of Agricultural Research (BAR) has funded through the project titled, Value Adding Technique in Sweet Sorghum Syrup: Spray Drying and Packaging for Convenience Market,” explained Mr. Arcangel.

The goal of the project is to convert the sweet sorghum syrup into a high value food product such as the powder

sweetener and packaged them into sachets for convenient handling and longer shelf life. Through the project, BAPAMIN was able to acquire the spray dryer, which can convert the sweet sorghum juice into powder and packaged it.

The spray drying machine, which they acquired in June 2013, originally came from Germany and was eventually fabricated in the Philippines. “At about 15 feet tall, the spray dryer for sweet sorghum is only the fifth of its kind in the Philippines,” Mr. Archangel shared.

In a six hour operation, the machine can process and convert a 10-kilo of the sweet sorghum feedstock (syrup) into powder form. This will be packaged in sachet, each containing 10 grams. The 10 kilo powder sweetener will produce around 1,000 sachets. The suggested retail price will be at P3.50 per sachet which makes it competitive to other sweetener products available commercially.

Sweet sorghum powder is fine in texture and slightly hygroscopic which means that it has good solubility even in cold water and has high flavor retention. Taste-wise, it is milky and has a distinctly sweet taste that does not leave any after taste in the tongue or add any unnecessary flavor to your beverage. “When you buy the powder in individual sachet, you just add water and it becomes an instant juice drink. So in a

way, one product becomes both a powdered natural sweetener and a juice drink when mixed with cold water,” said Arcangel.

He added that “eventually, we will also develop the sweet sorghum fresh juice drink in bottles. We are now on the lookout for the appropriate packaging. The banning of the Department of Education in selling pop soda to school children has inspired us again to further develop this product. It renewed our enthusiasm to offer a healthy, nutritious, power-packed juice drink not only for the kids but for adults, as well.” ###

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Alternative Low Input Agriculture System (ALIAS) is the trademark of the Pampanga Agricultural College's (PAC) technology center. PAC has ventured in the beekeeping industry through research and development in the hopes of promoting it to various communities in the vicinity of Mt. Arayat, thus, the BAR-funded project titled "Promotion of Beekeeping and Bee Product and By-Product Development". Through the project, the development and commercialization of bee products, which include soaps, ointment, lip balm, body scrub, shower gel, and beeswax candles, are realized. (full stories in pages 13-14 and 20-21).

PHOTO BY DDELEON



BAR DIGEST

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