ISAAA Inc.

DEPARTMENT OF AGRICULTURE 1898

PINOY BIOTEK MAGAZINE

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Welcome Message

Welcome dear readers to the second issue of *Pinoy Biotek Magazine*!

In collaboration with the Philippine Biotechnology for Agriculture and Fisheries Program of the Department of Agriculture (DA Biotech), it is with pride that ISAAA Inc. brings you varied stories on the applications of biotechnology, from conventional microbial biotechnology to the latest tools in improving crops for food and agriculture: genetic engineering and gene editing. We feature red mold rice and guava probiotics, which are microbial biotech products to enhance food flavor and nutrition, and are prophylactic solutions against infections. A new detection kit to safeguard meat products against Salmonella is being extensively tested and fine-tuned for commercialization soon. An article on genetically modified Bt cotton narrates the science, potential benefits, and future commercialization plans in the Philippines. Lastly, a discussion on the regulatory decision to allow entry of the first gene-edited reduced browning banana in the Philippines.

We included stories of notable personalities including Ms. Caren Penaso, a scholar funded by the DA BPO and farmer AD Alvarez' testimony, a biotech farmer on how careers in agri-biotechnology can be explored in the government and on the farm.

We are also sharing the results of the *BioteKomiks* contest conducted in November 2023, which attracted several participants in both the professional and amateur divisions. To top it all, we introduce the *Pinoy Biotech Resource Page*, a repository of news articles and information on biotechnologies developed and commercialized in the Philippines.

It is with great pleasure to continuously provide everyone with these simple narratives to encourage the youth to pursue careers in bioscience, for the industry to partner with scientists to start commercialization paths of mature technologies, and to encourage researchers to pursue innovative biotechnologies to address pressing problems in food and agriculture.

We encourage the sharing of biotechnology information, so please contact knowledge.center@isaaa.org if you have valuable biotech information to share.

Congratulations ISAAA Inc. team and the contributors for another excellent issue of the magazine.

Dr. Rhodora Romero-Aldemita
Executive Director, ISAAA, Inc.
Director, Global Knowledge Center on Biotechnology

Director's Message

I want to express my sincere gratitude for the overwhelming response to the first issue of *Pinoy Biotek Magazine*, launched late last year. We've been truly humbled by the positive feedback received from both readers who obtained physical copies and those who accessed and downloaded it online.

The inception of the *Pinoy Biotek Magazine* was conceptualized with the intention to effectively convey research outputs and findings to a broader audience. Additionally, it serves as a platform for showcasing mature technologies that are ready for adoption. With a commitment to bridging the gap between research and practical application, the magazine plays a vital role in ensuring that valuable research findings are not only disseminated but also translated into tangible solutions for the benefit of communities and the agri-sector.

The DA Biotech Program Office is committed to featuring products and technologies from its supported projects if the succeeding editions of the magazine.

To our dear readers, we look forward to the same level of enthusiasm and support that you provided during the launch of the first issue of the *Pinoy Biotek Magazine*.

Dr. Paul C. Limson, DVM
Director
DA Biotechnology Program

PINOY BIOTEK MAGAZINE

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Bt Cotton to Catalyze the Revival of the Philippine Cotton Industry

BY DR. LENY C. GALVEZ, MA. MAGDALENA C. DAMO, & DR. EDISON C. RIÑEN

Cotton is an economically important fiber crop grown commercially in over 88 countries worldwide with China, the United States, India, Pakistan, and Uzbekistan being the major producers (Agbios, 2001). In 2021, the Philippines imported US$18.5M worth of cotton (OEC, 2021), which represented 95% of the requirement of the local textile mills.

The Philippines produces quality cotton comparable to imported varieties, but production is hindered by high costs and significant yield losses due to heavy pest infestation. One of the main pests is the destructive cotton bollworm (*Helicoverpa armigera* Hubn.), whose larvae feed on and damage terminal buds, squares, flowers, and bolls (Domingo and Damo, 1996; Campos and Orlido, 1978; Embuido, 1985; philfida.da.gov.ph.). This leads to a substantial 65% loss in cotton yield (Domingo and Damo, 1996). Controlling the cotton bollworm is challenging due to its high fecundity, short generation time, and wide host range, which allows for rapid population growth and overlapping generations (Fitt, 1989; Cacayorin et al., 2015).

Due to this phenomenon, cotton is among the most heavily sprayed field crops. The introduction of Bt cotton, a genetically modified crop resistant to insects, has significantly reduced the need for insecticides. This has resulted in economic, environmental, and human health benefits (Fitt, 2008; Qaim & Zilberman, 2008). Research shows that in the first 11 years of Bt cotton production (1996–2006), there was a 22.9% reduction in insecticide use worldwide (Brookes & Barfoot, 2008). Bt cotton has effectively addressed pest issues for farmers, leading to increased yields and higher profits.

Bt cotton field in Batac, Ilocos Norte. Photo Source: Dr. Leny C. Galvez

Bt cotton production in India and China

In India, Bt cotton varieties containing the China-developed fused Bt genes *Cry1Ab* and *Cry1Ac* (referred to as GFM *Cry1A*) have been cultivated on a commercial scale since 2006 (Karihaloo and Kumar, 2009). Reports show that yield increased by 31%, insecticide use decreased by 39%, and profitability increased by 88%, equivalent to US$250 per hectare (James, 2008). Bt cotton farmers experienced improved welfare benefits for their families compared to those planting conventional cotton

Similarly, China's 7.1 million small and resource-poor farmers who adopted Bt cotton saw a 9.6% in yield, a 60% reduction in insecticide use, and a substantial income increase of US$220 per hectare, with positive implications for both the environment and the farmers' health (James, 2008).

Bt cotton in the Philippines

The commercial propagation of Bt cotton has been approved for planting in the Philippines after undergoing extensive risk assessments by national regulatory agencies. Contained and confined trials were conducted from 2009 to 2010 and 2011 to 2012, respectively, closely monitored by the Department of Science and Technology-Biosafety Committee. From 2012 to 2014, multi-location field trials were conducted in Alabel, Sarangani; Tupi and Polomolok, South Cotabato; Batac, Ilocos Norte; and Alcala, Pangasinan under strict monitoring by the Department of Agriculture-Bureau of Plant Industry).

On August 24, 2023, the biosafety permit for the commercial propagation of Bt cotton was approved under the DOST-DA-DENR-DOH-DILG Joint Department Circular No.1 Series of 2021. Before this, the Insect Resistance Management (IRM) Advisory Team approved the IRM Plan of the Bt cotton technology. Likewise, the DA-Fertilizer and Pesticide Authority has approved the registration of the event GFM *Cry1A* as a Plant Incorporated Protectant-Insecticide and the Philippine Fiber Industry Development Authority (PhilFIDA) as a licensed pesticide handler.

The commercial propagation of Bt cotton, which will be promoted alongside the heirloom cotton and organic cotton production technology, is expected to catalyze the revival of the Philippine cotton industry in the years to come.

Dr. Leny C. Galvez is Career Scientist 1/Manager of Bt Cotton Program, PhilFIDA. Ma. Magdalena C. Damo is former Senior Science Research Specialist, Dr. Edison C. Riñen is former Project Leader of Bt Cotton Program, PhilFIDA.

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Reduced Browning Banana First Gene-edited Product to Get Non-GMO Determination in PH

BY CLEMENT DIONGLAY

Bananas are one of the most produced, traded, and consumed fruits globally. They are mostly planted in Asia, Latin America, and Africa, with India and China as the largest producers for domestic consumption.

There are more than 1,000 varieties of bananas in the world, and the most traded is the Cavendish banana which accounts for almost half of global production at an estimated annual production volume of 50 million tonnes.

According to the Food and Agriculture Organization of the United Nations, on average, more than 90 percent of bananas exported globally originate from Central and South America and the Philippines. At the same time, the largest importers are the European Union, the United States of America, China, the Russian Federation, and Japan.

Bananas are widely consumed globally and one of the most important fruit crops in the Philippines. Photo Source: Jose Miguel Sanchez from iStockPhoto.com

Banana production in the Philippines

Bananas are one of the most important fruit crops in the Philippines, with the Davao region as the top banana producer, followed by Northern Mindanao and SOCCSKSARGEN. The Philippine Statistics Authority estimates the area planted for bananas in the country was recorded at 443.64 thousand hectares from January to June 2023. Banana production was estimated at 2.269 million metric tons from April to June 2023.

The Banana Industry Profile from PCAARRD's Industry Strategic Science and Technology Programs identifies three major banana varieties produced in the country as cavendish, the primary variety (50% of the total banana production); lakatan, a popularly known dessert (11% of the total banana production); and saba, a major cooking-type banana, comprises 29% of the total banana production.

Problems in banana production

Diseases continue to be serious threats to the banana industry. The two serious diseases of bananas are the fungal Panama Disease or Fusarium Tropical Race 4 (TR4), and Black Sigatoka Disease. TR4 threatens 80% of global banana production and has been confirmed in 21 banana-producing countries. This disease has decreased the Philippines' global market share as the top producer and exporter of bananas in Southeast Asia. Other challenges facing the banana industry are prolonging the fruits' shelf life and reducing food waste.

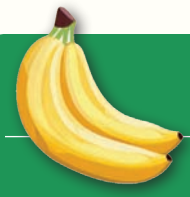
Gene editing to help extend the shelf life of bananas and reduce food waste

In April 2023, Tropic, a pioneering agricultural biotechnology company in the United Kingdom using CRISPR gene editing to improve traits in bananas, coffee, and rice, announced that their reduced browning gene-edited banana was technically evaluated and determined to be a non-GMO by the Philippines Department of Agriculture-Bureau of Plant Industry (BPI). This banana is the first gene-edited product to go through the Philippines' gene editing regulatory process.

Tropic's gene-edited bananas have the potential to significantly reduce food waste and CO2 emissions by more than 25%, as over 60% of exported bananas go to waste before reaching the consumer. This innovative product can support a reduction in CO2 emissions equivalent to removing 2 million passenger vehicles from the road each year. With this determination from BPI, the Tropic gene-edited banana can be freely imported and propagated in the Philippines.

Dr. Ofir Meir, Tropic's Chief Technology Officer said, "The Philippines government has implemented a science-based, transparent, and efficient process for assessing the safety of gene-edited plants. This is exactly the type of system that encourages companies like Tropic to invest in innovative technologies to develop sustainable solutions for Filipino farmers."

Clement Dionglay is Project Associate at ISAAA Inc.



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https://tinyurl.com/ynsp9hmd

Guava Leaves: From Traditional Medicine to Probiotic Functional Beverages

BY JENNIFER D. SAGUIBO

Guava or "bayabas" (*Psidium guajava* Linn.) is a common and important plant in tropical countries like the Philippines because of its diverse medicinal and nutritional properties. Guava is one of the 13 approved herbal plants by the Department of Health, with a scientific basis for traditional medicine (Republic Act 8423 or the Traditional and Alternative Medicine Act of 1997). Guava leaf extract has anticancer, antimicrobial, antidiarrheal, antidiabetic, anti-obesity, lipid-lowering, hepatoprotective, and antioxidant properties.

Since 2000, the University of the Philippines Los Baños National Institute of Molecular Biology and Biotechnology (UPLB BIOTECH) has worked on probiotic lactic acid bacteria. Researchers Jennifer D. Saguibo and Francisco B. Elegado explored the sturdiness of some local lactic acid bacteria (LAB) against the inhibitory effects of selected plant extracts. LAB are generally regarded as safe (GRAS) microorganisms commonly used as probiotics. The scientists found that LAB could grow in guava leaf tea and at a certain percentage of pure guava leaf extract, which led to the development of beverages using guava leaves.

Guava leaf-based probiotic functional beverages as ready-to-drink fermented guava tea (left) and guava leaf-based probiotic beverage ingredient (above) for the development of plain tea (hot and cold), fermented, or blended with fresh fruit or milk variants.
Photo Source: Jennifer Saguibo

Health challenges in the Philippines

In April 2023, the Philippine Statistics Authority reported that ischemic heart diseases, neoplasms (tumors), cerebrovascular diseases, diabetes mellitus, and hypertensive diseases were the leading causes of mortality among Filipinos in 2021 and 2022. COVID-19 was the third leading cause of death in 2021. The challenges posed by these health conditions, along with the global crisis of the COVID-19 pandemic, sparked a growing interest in self-care and integrative medicine. This led to an increased demand for functional foods, such as probiotic beverages.

Probiotics for functional beverages

Probiotics are preparation of, or a product containing viable, defined microorganisms in sufficient numbers. According to Jürgen Schrezenmeir and Michael de Vrese, these microorganisms alter the microflora in the gastrointestinal tract and exert beneficial health effects.

The use of these "good bacteria" for food product development has been the focus of research. Beverages have the largest share and essential part of the eating plan for healthy living in the food pyramid recommended by the Food and Nutrition Research Institute. They also account for 20% of spending among people dining out, making them an ideal delivery vehicle for functional ingredients.

Functional beverages include plant-based beverages with health-promoting ingredients like probiotic-rich fermented additives. Plant-based probiotic functional beverages provide better alternatives to lactose-intolerant persons and those with hypercholesterolemia and allergy issues. Moreover, vegetarianism has increased over time because of medical reasons. Herbal probiotic functional beverages combine the health benefits of both herbs/medicinal plants and probiotics.

Probiotic guava leaf-based beverages

The BIOTECH team, which includes Jennifer D. Saguibo, Francisco B. Elegado, Margarita A. Mercado, Maria Teresa M. Perez, and Ronilo P. Violanta, with support from the Department of Agriculture Biotech Program and Department of Science and Technology Grants in Aid - Technology Innovation for Commercialization (TECHNiCOM), developed a probiotic guava leaf-based beverage. This beverage comes in two forms: a ready-to-drink fermented guava leaf tea and a probiotic guava leaf-based beverage ingredient in a versatile powder form.

The two major components are Proculant™ and guava leaf extract. Proculant™, a probiotic inoculant, contains four locally isolated probiotic LAB (100 billion cells per gram) that are stable for one to two years at a refrigerated temperature. When frozen, they can last for two to three years. These probiotic LAB produce bacteriocins, natural preservatives that inhibit common food-borne pathogens and prolong shelf life. They are also acid and bile-tolerant, which helps colonize and alter the microflora of the gastrointestinal tract for better digestion and nutrient absorption. Additionally, they produce lactic acid and other organic acids, which prolong shelf life and improve sensory attributes, and diacetyl compounds that contribute to flavor and aroma development. The two components of the product offer synergistic health effects.

Fermented functional foods, such as probiotic guava leaf-based beverages, provide healthier alternatives to high-calorie beverages. Their consumption offers nutritional health benefits that modulate immune responses to bolster resistance against infections in our fast-paced, advanced, and digital era.

Jennifer D. Saguibo is University Researcher III at UPLB BIOTECH.

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BiotekKomiks

Comic Strip Making Contest on Pinoy Biotek

Organized by ISAAA Inc. in partnership with DA Biotech

BioteKomiks centers on the theme "*The Wonders of Pinoy Biotek*" and aims to capture the perspectives of artists on the impact of Pinoy Biotek on the country's agriculture and fisheries through a four-panel comic strip.

Amateur Category Winners

1st

by **Daryl B. Ceribo**
UP Los Baños

2nd

by **Hershey A. Balan**
National University - Laguna

3rd

by **Jean Vollerie Regalado Boyles**
Maranatha Christian Academy of Imus

Professional Category Winners

1st

by **Alexis Raphael L. Moreno**
Freelance Artist

2nd

by **Bladimer C. Usi**
The Manila Times &
Samahang Kartunista ng Pilipinas

3rd

by **Kevin Ray Valentino**
Freelance Artist

Red Mold Rice: Natural Dietary Supplement for A Healthier Life

BY LUCILLE GRACE V. PUNZALAN AND CLEMENT DIONGLAY

White rice is a staple in Filipino cuisine, but some people opt for brown rice due to its ability to lower blood sugar levels and aid in weight management. Have you ever considered trying red yeast rice? Here are some compelling reasons to do so.

Red Mold Rice Project

Red mold rice (RMR) is a functional ingredient or dietary supplement that is also commonly used as natural colorant in various East Asian products. In the Philippines, it is utilized as a food colorant in fermented fish (*burong isda*) and fermented fish paste (*bagoong*). A survey among 30 local pharmaceutical companies revealed that no existing RMR products are being marketed in the Philippines as a functional ingredient or supplement. Currently, the Philippines imports red mold rice from China or Taiwan.

To address this, a team from the Philippine Rice Research Institute (PhilRice), led by Mr. Henry Mamucod, has worked on establishing the best processing technology for red mold rice within the country. Red mold rice is produced by fermenting non-glutinous rice with *Monascus purpureus*, a species of red mold with known health-promoting properties against lifestyle-related diseases. The researchers have identified that the optimal parameters include a pH of 6.5, a 14-day incubation period, an incubation temperature of 30 to 37°C, and a moisture content of 30 to 40%.

PhilRice-produced red mold rice is now available for commercialization.
Photo Source: Henry F. Mamucod, PhilRice

A prototype of the PhilRice-produced RMR-based supplement was developed in May 2021 using the optimized processing technology. The prototype was evaluated and compared with the 10 commercially available RMR-based supplements and was found to be either superior or comparable with the other RMR-based dietary supplements.

The RMR technology is now available for commercialization or transfer to interested parties.

Features of Red Mold Rice

Red mold rice has strong antioxidant properties due to its bioactive compounds, including phenolics and flavonoids. It also contains mevinolin, which can lower total cholesterol, triglyceride levels, and LDL or bad cholesterol, while boosting HDL or good cholesterol. Pre-clinical studies on test animals have also shown that red mold rice exhibits anti-diabetic and anti-cancer properties.

Recognizing the health benefits of red mold rice, PhilRice has developed an RMR supplement with quality comparable to or better than commercially available RMR-based dietary supplements. This supplement is notable for its total phenolic content, antioxidant activity, and mevinolin content.

Additionally, PhilRice has produced food products from red mold rice, such as cookies, sausage, and coffee, which are of superior quality and have better consumer acceptability.

Impact of Red Mold Rice

Red mold rice offers numerous economic opportunities for entrepreneurs and businesses. It can assist individuals and companies involved in producing or marketing products such as functional food, dietary supplements, and medicine. Its production can be a sustainable source of income for many. Since RMR can be utilized in the manufacturing of food, supplements, and medicine, it can offer a new range of products to consumers. Local and international markets can also leverage red mold rice to benefit their customers.

Ultimately, RMR is expected to have a positive impact, particularly in improving the health of consumers, especially those with diabetes and hyperlipidemia.

Lucille Grace V. Punzalan is Project Assistant at ISAAA Inc.

PhilRice produced food products from red mold rice, such as these cookies.
Photo Source: Henry F. Mamucod

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PCR-based Detection Kit for *Salmonella* in Meat: Towards Safer and Healthier Food Products

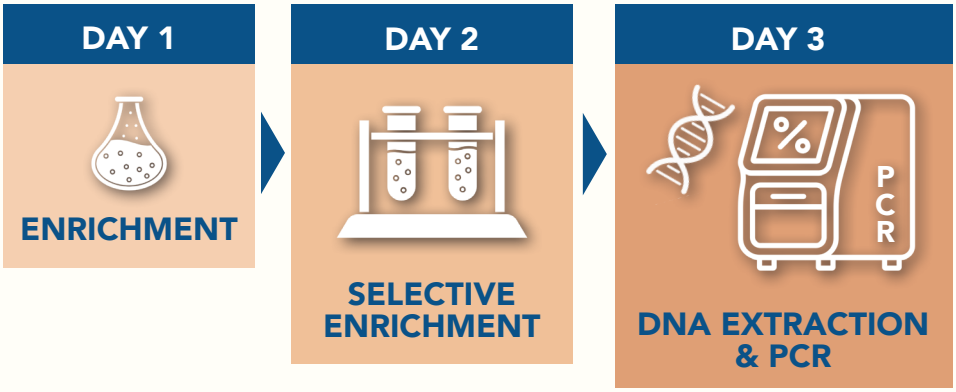
BY JONAH FELIZA B. MORA AND DR. WINDELL L. RIVERA

Salmonella is a bacterium that can cause foodborne illnesses, leading to symptoms such as vomiting, stomach cramps, diarrhea, and fever. It can be acquired from consuming contaminated or mishandled food, including pork, beef, chicken, eggs, fruts and vegetables. Currently, food testing laboratories use a culture-based method as the gold standard for detecting *Salmonella*. This method involves growing or culturing bacteria on different media to characterize and identify them as *Salmonella*. However, this process is laborious, subjective, and takes over seven days to complete, posing challenges for perishable food items. Additionally, the culture-based method can only identify *Salmonella* up to the genus level and cannot distinguish between its two species—*Salmonella enterica* and *S. bongori*, which are associated with warm-blooded and cold-blooded animals, respectively. *S. enterica* is of particular concern as it is the species that can infect farm animals and humans.

Development of accurate and efficient *Salmonella* detection method

The research team at the Pathogen-Host-Environment Interactions Research Laboratory, Institute of Biology, College of Science, University of the Philippines Diliman, has developed a more accurate and efficient method to detect *S. enterica* in food using molecular biology techniques. The team identified specific DNA fragments unique to *S. enterica*, particularly the *invA* gene, which is absent in *S. bongori* and other microbial species. The *invA* gene has a weight of approximately 244 base pairs.

In the laboratory, food samples suspected of *S. enterica* contamination undergo pre-enrichment and selective enrichment procedures to promote the growth of *Salmonella* and restrict the growth of other contaminating bacteria. contaminating bacteria. This step is crucial as the initial bacterial population might be lower than the limit of detection. After enrichment, the bacterial growth is collected through serial centrifugation. From the harvested bacterial cells, the entire DNA of the bacterial population is extracted. At this stage, the extracted DNA might be from a mixed population of contaminants. The developed DNA-based protocol is sensitive enough to detect *S. enterica* from a mixed population.



DNA-based *Salmonella enterica* detection protocol takes only two to three days to complete, which is faster to the current process being used.

PCR-based protocol for *Salmonella* detection in meat

The DNA extract goes through a process called polymerase chain reaction (PCR), which makes millions of copies of the gene of interest, if present. PCR requires a cocktail of molecules, including primer pairs that correspond to the *invA* gene. If the *invA* gene is present, the primer pair attaches to it, and amplification occurs through the action of an enzyme called DNA polymerase, resulting in millions of copies of the *invA* gene. The resulting products, called amplicons, are then analyzed using a process called agarose gel electrophoresis, where they are separated by weight, measured in base pairs. To confirm that the resulting product is indeed *invA*, a molecular weight ladder containing genes of known weights is used.

An electric current is applied to the agarose gel to separate the DNA molecules into bands, which are then visualized using a machine called a UV transilluminator. This method, which takes only two to three days to complete, is faster and more sensitive than the current process being used. It has also been validated by a UK-based third-party accredited proficiency testing provider in four matrices: beef, chicken, feeds, and swabs.

Food safety is extremely important to nutrition and food security. Various challenges in food safety in the Philippines can be addressed with the help of research, academe, and the government's efforts. The PCR-based *Salmonella* detection kit is a significant tool in *Salmonella* detection and it has been proven to be proficient in beef, chicken, animal feeds, and cotton swabs. While the technology is not currently available to consumers, it will now go through the technology transfer stage. The laboratory is continuing to optimize the protocol using other food matrices such as egg, seafood, and water.

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Jonah Feliza B. Mora is University Researcher I at the Institute of Biology, College of Science, University of the Philippines Diliman. Dr. Windell L. Rivera is Professor of Microbiology, Institute of Biology, College of Science, University of the Philippines Diliman and Academician, National Academy of Science and Technology, Philippines.

PINOY BIOTEK ON SPOTLIGHT

Caren G. Penaso

Navigating My Way to Biotech

Raised in a semi-urban area in Bohol, I used to help my grandfather, a fisherman, sell his catch in exchange for a few pesos or a bag of rice. Looking back, those early experiences offered me a first glimpse of how the agriculture and fisheries sector is vital, not only in feeding the world but also in catalyzing economic transformation. This made me realize the need to prioritize uplifting the livelihood of our farmers and fisherfolks. Biotechnology is a viable option providing tools to improve agricultural production, lower farming costs, and enhance the quality of life.

Pursuing a bachelor's degree in agricultural biotechnology at the University of the Philippines Los Baños was a leap of faith because I barely knew the field. Beyond the challenge of distance, I knew I could not sustain my studies without financial assistance. Hence, being part of the first batch of recipients of the Department of Agriculture (DA) Biotechnology Program Scholarship has filled me with deep gratitude.

My limited knowledge about biotechnology ignited a deep curiosity within me, which turned into a great admiration for what living organisms are capable of, especially those that occur beyond our naked eyes. I am constantly fascinated by how scientists unraveled the story of life—from genes to the development and functioning of living organisms—and harnessed this information to alter biological processes at the molecular level for a wider range of applications in agriculture and fisheries, medicine and healthcare, energy, biodiversity management, and industry.

Key influence and professional development

The scholarship program enjoined us to take internships in public and private research institutions, providing valuable exposure to various applications of biotechnology. Choosing animal biotechnology as my specialization, I found a mentor in Dr. Agapita J. Salces, my research adviser. Under her guidance for my undergraduate and graduate studies, I delved into research on the association of genotypes with mastitis resistance and milk production traits in dairy cattle. In animal breeding, these studies help identify genetic variations that are associated with desirable traits, allowing for more informed selection decisions.

While research remains integral in biotechnology, a plethora of career opportunities await us. In my former role at the DA Biotechnology Program Office, I led the monitoring and evaluation of biotechnology research and development projects, contributed to the development of research programs and enabling policies, and organized activities for the advancement of biotechnology in the country. This role also allowed me to meet and work with prominent individuals, locally and internationally. Furthermore, it also provided an in-depth understanding of the rapidly evolving biotechnology landscape and its applications to bolster DA's core objectives related to food security, sector competitiveness, and resiliency.

Now part of the Bureau of Animal Industry's Biotechnology Program, I hope to help promote the safe and responsible use of biotechnology by facilitating the regulatory framework for genetically modified animals and strengthening the regulators through capacity enhancement activities.

A future of innovation, impact, and progress

Despite the growing acceptance of biotechnology in the country through the initiatives of the government and partner institutions and organizations, our country still has a long way to go. My dream for Pinoy Biotek is to witness a shift towards sustainable solutions to increase agricultural productivity using cutting-edge technologies, such as gene editing. I look forward to the day the Philippines becomes a leading biotechnology innovation hub in Southeast Asia. I envision a well-informed society where public engagement is characterized by awareness and understanding of biotechnology's sociocultural, economic, and ethical aspects.

Passion does not always come naturally. My passion for biotechnology grew as a result of my dedication to learning new things, later nurtured through experience and the people I encountered in my young career. May the future generation of DA Biotech Scholars develop a passion for science and find purpose in their respective fields to start a ripple of meaningful changes in society.

(Photos courtesy of Caren G. Penaso)

ASEAN Capability Building for Livestock Biotech Researchers in June 2023.

Caren at the 16th Symposium of the International Society for Biosafety Research (ISBR 2023) in St. Louis, Missouri, USA.

PINOY BIOTEK ON SPOTLIGHT

Adriel Dave 'AD' Alvarez

Fighting Poverty with Biotechnology

Farmer AD on his corn silage trial production field, studying it as a safety net system in case of typhoon damage on standing crops (2019).

Farmer AD represented the Philippines at the Global Farmer Network - Roundtable Forum during the 2018 World Food Prize in Des Moines, Iowa, USA.

AD with Borlaug Foundation's Julie Borlaug, granddaughter of the 1970 Nobel Peace Prize winner Norman Borlaug, at the 2018 World Food Prize in Iowa.

I have been farming since 2010. As a farmer, I face several challenges while producing food for others. Farmers fight extreme weather and shifting climates. We cannot avoid market volatility. Farmers are always contending with recovering costs to produce against the price we sell our produce. Consumers naturally demand lower prices and some people tend to ignore whether farmers can make a profit and continue producing food, clothes, and fuel. This mindset has to change if we want our farmers to be sustainable. Cheaper does not necessarily mean it is better.

While these common challenges are beyond our control, we can use more tools in our toolbox to navigate these challenges. Biotechnology creates a huge space to develop more and better options for us. This somehow intentionally and unintentionally addresses concerns about our productivity, economic viability, and even our relentless fight against poverty. With the aid of biotechnology, better seeds and livestock are in our hands, which gives us a fighting edge in the complex challenges we are facing as farmers.

In my farming experience, I started my biotechnology journey by understanding the common practices of more experienced farmers in my community. Before becoming a farmer, I was a microfinance executive in an NGO doing poverty alleviation lending. I was trained as a theologian in college, but I was deep in the arena of fighting poverty for most of my professional life. As a science class student in an agricultural college, I had my agricultural orientation in high school. I was a member of the Future Farmers of the Philippines then. When I was starting as a farmer in 2010, I observed farmers whose traditional farming practices were yielding only around 600 to 800 kilograms of corn per hectare. It was not enough to cover the cost of labor and inputs even if the seeds were free and cheap. Most of these farmers end up not selling their crops because it simply does not make sense economically. They were losing money in the process.

As a farmer with a mission, I learned about the options of better seeds with built-in insect pest protection (Bt) and weed management advantage (HT) traits hybrids. We tried them and eventually introduced them to our fellow farmers in our community. In my farming operations, we were able to yield an average of 7,000 to 8,000 kg per hectare. There is great efficiency in taking advantage of this technology – more yield on the same land. This gives us a better position to make a profit in the process. This is a clear advantage of biotechnology.

Scientists can produce seeds and livestock with precision, accuracy, and safety in the shortest amount of time compared to conventional breeding technology. As this science continues to advance, it offers more ahead, especially for farmers. With biotechnology, we can produce crops that can survive droughts by utilizing water resources better, enhance growth by utilizing fertilizers efficiently, protect crops from destructive pests and diseases, and produce varieties with better nutritional value. Overall, it gives farmers more effective tools in producing food.

While there is still a lot of work to be done to improve the Philippine agriculture sector, including fostering a market environment that would enable farmers to become more sustainable, biotechnology has thus far been successful in equipping us farmers to increase our yield, protect our investments, and be better stewards of the environment.

"Farming is not simple, and to think that it is, is a common misconception. Biotechnology is a great space to create tools for Filipino farmers to improve their livelihood. If we keep believing that old ways are better than the modern ones, we have an unrealistic mindset. I believe it is backward thinking. Biotechnology, along with other good innovations, is a great technology in fighting poverty within the agriculture sector. Filipino farmers can best farm with biotechnology."

(Photos courtesy of AD Alvarez)

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PINOY BIOTEK MAGAZINE

Pinoy Biotek Magazine aims to raise the Filipinos' awareness, understanding, and acceptance of Pinoy biotech products derived from conventional and modern biotechnology. It is published in print and distributed for free to selected schools and institutions. This magazine is also available for free download in the ISAAA Inc. website.

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