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Experts urge more studies on the opening of Bataan Nuclear Power Plant

By **Rodolfo P. De Guzman**, *DOST-STII*



Photo by Hans Joshua V. Dantes, DOST-PNRI

In a forum organized by the Department of Science and Technology - National Academy of Science and Technology (DOST-NAST), experts recommended further studies before finally putting the Bataan Nuclear Power Plant into use.

Acad. Dr. Alfredo Francisco Mahar A. Lagmay, member of the Mathematical and Physical Sciences Division of NAST Philippines and Professor at the National Institute of Geological Sciences of the University of the Philippines Diliman (UP-NIGS) discussed the geological hazards of Southwest Natib Volcano. Lagmay stressed the importance of monitoring and studying the volcano's activities thoroughly to come up with more precise scientific data to be used in determining the possibility of using the Bataan Nuclear Power Plant (BNPP).

On the other hand, Dr. Bartolome C. Bautista, representing Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS) Director Renato U. Solidum, Jr. talked about

the PHIVOLCS Current Hazards Information of the BNPP site. He outlined the different hazards in the area such as the active faults from the Manila Trench and Lubao Fault that must be studied further to collect substantial data in determining the risks involved. Bautista is DOST-PHIVOLCS deputy director.

From the engineering point of view, Engr. Carlos M. Villaraza, a structural-earthquake engineering consultant and principal engineer of Geohazard Structural Earthquake Engineering Design, discussed the seismic risk analysis of nuclear power plants. He focused on the various engineering designs to adapt to different risks and the different engineering interventions to ensure safety of structures relative to the strength of the earthquake.

Meanwhile, Dr. Carlo A. Arcilla, a professor at the UP-NIGS discussed faults, volcanoes, and nuclear waste disposal methods, one of which is the "deep borehole disposal concept drivers"

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Pisay studes score big in Biotech tilt

By **Espie Angelica A. de Leon**, *DOST-STII*

Leonides Babanto of Philippine Science High School (PSHS) –Central Mindanao Campus emerged as grand prize winner in the National Biotechnology Quiz Contest for High School held in November 22, 2016.

Three other PSHS students also made it to the winners' circle.

They are Eugene Toribio of PSHS Bicol who tied with another competitor for second spot; Erwin Awitan of PSHS Main Campus in Quezon City who bagged third place; and Ed Christian Tudela, also of PSHS Central Mindanao who placed fifth. PSHS is under the Department of Science and Technology (DOST).

The winners were announced during the closing ceremony of the weeklong 12th National Biotechnology Week (NBW) at the Bureau of Soils and Water Management Convention Hall on November 25, 2016.

Organized by the National Institute of Molecular Biology and Biotechnology-Diliman (NIMBB-Diliman), the contest aimed to instill in the youth the pivotal role of biotechnology in national development and encourage them to take up science and technology courses in college and become the Philippines' next wave of scientists. The contest also served as a hub of interaction between the students and biotechnology specialists in the Philippines.

Merriam Webster defines biotechnology as the manipulation through genetic engineering of living organisms and their components to produce useful commercial products such as pest resistant crops, new bacterial strains, pharmaceutical products, and others.

Biotechnology also has applications in protection of water quality, conservation of topsoil, improvement of waste management techniques, production of renewable energy, improvement of manufacturing processes, forensic DNA analysis, and similar DNA technologies.

The National Biotechnology Quiz Contest for High School was held in conjunction with the 12th NBW which highlighted the different programs and outputs of government and its partners in the field of biotechnology through exhibits, contests, and various forums.

being used by highly industrialized countries considered safe and environment-friendly.

Former Congressman and nuclear power advocate Mark O. Cojuangco likewise discussed his advocacy for the use of nuclear power as energy source. Cojuangco said that the BNPP has been certified to be safe and operational way back during the time of the late President Marcos and had undergone international standard tests for similar nuclear plants. He further stressed the economic gains in case the BNPP is re-commissioned, considering that the loans spent for BNPP has been fully paid already.

In the end, the question remains, "Is it safe to use nuclear power like the Bataan Nuclear Power Plant for the benefit of the people?" Basing on the recommendations of forum resource persons, there is a need for more scientific studies in determining whether the BNPP should be used.

The mothballed BNPP was built during the administration of the late President Ferdinand E. Marcos and is now being considered for possible commissioning.

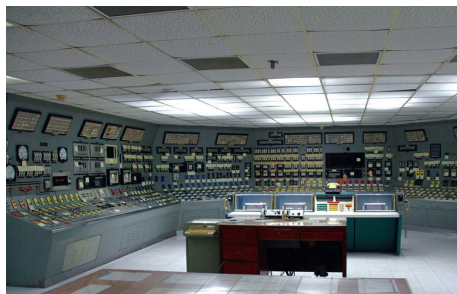


Photo by Hans Joshua V. Dantes, DOST-PNRI

Once the BNPP is up and running, it is expected that electricity cost for consumers and commercial users will dramatically drop. However, there are other issues to consider such as safety and possible effect on the environment, experts said.

The forum, dubbed "Policy Forum on Bataan Nuclear Power Plant (BNPP): What is its Future?", was held recently in Pasig City and organized by the Engineering Sciences and Technology Division of DOST-NAST, with Acd. Alvin B. Culaba as

moderator. Acd. Fabian M. Dayrit, acting president of NAST delivered the welcome remarks.

Per Executive Order 818 s. 1982, NAST PHL serves as adviser to the President of the Republic of the Philippines and the cabinet on policies concerning science and technology in the country. In this forum, experts assessed the possibility of opening the BNPP from the point of view of scientists and engineers to ensure its safety and viability. This is done to allay fear of possible nuclear accidents like the Fukushima Dai-ichi in Japan on March 11, 2011.

The Fukushima accident was caused by a major earthquake and a 15-meter-high tsunami that disabled the power supply (diesel-run generators) and all three cores largely melted in the first three days causing possible water contamination through radiation.

The forum highlighted the: 1) current state of BNPP; 2) viability of reusing the BNPP facility from the technical, economic, social, and environment perspective; and 3) presentations on some scientific studies on the BNPP.

Divisoria trips nurtured entrep spirit of PH pioneer in healthy sugar

By **Geraldine B. Ducusin**, DOST-STII

Maura De Leon was in grade six when she tagged along with her aunt to Divisoria for the latter's banana business.

This little girl would later find herself in various businesses. At 25, she got into the embroidery business. After 17 years, the industry went for a downturn due to the influx of garments from China. The business eventually folded up.

Next she ventured into chemicals. However, that venture came into a halt when her chemical warehouse was destroyed by fire.

Despite yet another loss, she ploughed on, this time venturing into uncharted territory: Stevia.

It all started when a friend came home from Malaysia and pitched a healthy coffee product. Then, a doctor told her about a plant that serves as sugar substitute – Stevia which grows in Paraguay.

De Leon hired an agriculturist to look for the plant in Baguio, La Union and Tagaytay. However, the agriculturist returned empty handed.

Not all is lost, though. She had a child in Europe who was able to send her the seeds of the plant which will be the core of her business.

They tried to make use of Stevia as feeds to chickens and hogs. They noticed that chickens which normally laid 12 eggs were producing 24 eggs upon feeding on Stevia. And the pigs who fed on Stevia were more meaty and not smelly

even if they hadn't bathe for 10 months.

Later, a family member suggested that they approach the Department of Science and Technology (DOST) for assistance.

They first approached DOST-National Capital Region (NCR) in 2009 and obtained assistance a year later. They were able to obtain a cabinet type dryer, form fill & seal machine, calamansi juice extractor, shrink tunnel, bench top pH meter, refractometer, and digital incubator.

They also availed other DOST services, such as Technology Needs Assessment, Technical Assistance on Food Safety (GMP, SSOP and HACCP), Seminar on Good Agricultural Practices (GAP), and Consultancy for Agricultural and Manufacturing Productivity Improvement (CAMPI).

The interventions led to increased gross sales by 40%, improved product quality and safety, improved packaging, and elimination of outsourcing of packaging.

Now, her company Glorious Industrial and Development Corp. (GIDP) has been in the business of food and non-food products for six years. Their brand, the Sweet and Fit Stevia, is the first organically grown in the country. It is sold in leading supermarkets and drugstores.

Before DOST's intervention, they only had over 30 employees. Today, their employees number to over a hundred, including Stevia growers.

"We're very proud that we're DOST-assisted," de Leon revealed. "Before, when there was nobody assisting us, we were hesitant because Stevia was not yet known. Whenever

we're asked what is Stevia, is it safe? When we say we're DOST-assisted, it helped us a lot in boosting public's trust on product's safety."

For more information on technology products and services at the DOST-National Capital Region region, visit <http://ncr.dost.gov.ph/>.

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Genomics for new and better sugarcane varieties

By **Geraldine B. Ducusin**, *DOST-STII*

The sugarcane industry is huge in the Philippines, with many other industries heavily dependent on sugar, such as the energy and fuel sectors including bio-ethanol.

In fact, according to a March 31, 2016 article in *Inquirer.Net*, sugarcane farming is the second most in demand job in the Philippines, the first time in recent history that this has happened in local agriculture. The article cited data from the Bureau of Local Employment indicating that as of January 2016, there were 12,400 vacancies for sugarcane farmers and 100 job openings for sugarcane grinders.

Then Department of Labor and Employment Secretary Rosalinda Baldoz claimed that this could be attributed to the stable sugar prices in the global market.

Therefore, the sugarcane industry along with its allied industries should be supported to sustain this strong demand, especially considering the fact that like any other crop, sugarcane deteriorates, becomes prone to disease and its yield decreases as it remains in the field.

To sustain the industry's growth, new and superior varieties of sugarcane should be developed, according to Dr. Liwayway M. Engle of the Philippine Sugar Research Institute (PhilSURIN).

The problem is, sugarcane breeding which includes marker assisted selection of promising varieties, is a long and tedious process – taking as many as 8 to 9 years – thus requiring a lot of human and financial resources. The process is long due to sugarcane's long life cycle and complex genetic nature which requires huge breeding populations of 100,000-400,000 genotypes.

To solve this problem, Engle said that genetic improvement of sugarcane must be continuously undertaken. Speaking at the recent S&T Agri Biotech Forum held at the Bureau of Soils and Water Management Convention Hall, Engle stated that sugar genomics is good for increased productivity, profitability, sustainability and global competitiveness of the Philippine sugar industry.

Organized by the Department of Science and Technology Philippine Council for Agriculture and Aquatic Resources Research and Development,

the forum was part of the activities for the 12th National Biotechnology Week held last month.

Engle and her team which includes a pathologist, agronomist, and breeders, started a project in 2012 that sought to apply genomics in sugarcane variety development. For this, PhilSURIN partnered with the Philippine Genome Center, whose state-of-the-art DNA sequencing facilities were funded by DOST.

The objective was to reduce the time it takes to develop a new variety by 2-3 years, thus shortening the process from 8-9 years to 5-6 years, "so we can bring new varieties to sugarcane planters a lot quicker," Engle said.

In particular, the group wanted to produce high-yielding varieties while eliminating their susceptibility to two major diseases affecting sugarcane through DNA marker assisted selection (MAS). These two diseases are downy mildew and smut.

MAS is a process in which scientists search for biomarkers associated with a particular trait. When a marker is found to be consistently associated with a specific trait, that marker may now be used by the scientists to screen for that trait. Biomarkers therefore help speed up the development of new sugarcane varieties.

Under the conventional 8 to 9-year breeding program, there are two stages where selection against diseases is done.

For screening of downy mildew, the team selects the best in terms of morphological traits among the 100,000 varieties they produce. These selected ones are subjected to a screening procedure so they can see which of them are resistant against the disease. They are planted and laid down in mildew nurseries where there are also susceptible varieties. Then inoculation is done where the inoculum (water containing downy mildew pathogens or agents which cause downy mildew) is sprayed on the seedlings. After this, evaluation is undertaken so the team can discover which of the varieties selected are resistant to downy mildew.

For screening of smut, the planting materials are soaked in the inoculum containing the smut pathogens after which incubation is done. Then the planting materials are planted in the field and the team awaits the growth of the seedlings.

The team then rates the plants on whether they are susceptible or resistant to smut.

Hence, to shorten the process, Engle's team decided to undertake the project particularly on application of biotechnology for marker assisted selection.

In identifying the markers for these diseases, they collect samples of sugarcane at the right age - about 3-6 months. These samples are ground and genomic DNA is isolated from the samples. The DNA then undergoes amplification or multiplication into several duplicates. The material is then subjected to electrophoresis, a technique for separating the components of a mixture of charged molecules in an electric field. Through electrophoresis, different band patterns consisting of different segments of DNA may be seen. Band patterns are also called DNA fingerprints. This data is then analysed and they compute for genetic distance which determines how similar or how different the two sugarcane parents are. This information is useful to the scientists in deciding whether to cross pollinate or hybridize the two parents. Next, they do analysis or association test for the trait that they are considering for the marker. Then they score the band patterns for each variety, to know which band pattern exists in which varieties and which band pattern is unique to a certain variety.

These band patterns or DNA fingerprints are also used in variety integrity tests to check the authenticity of the sugarcane variety, after which a certification is issued. This will ensure that farmers are planting the right variety in their fields.

Previously, a variety may only be identified via its morphological and agronomic characteristics, after it has produced enough stalk and it exhibits the characteristics unique to this variety.

So far, Engle and her team has already ranked the different promising sugarcane varieties based on field trials in Victorias City and La Carlota in Negros Occidental, and in Bukidnon. They hope to eventually produce five promising varieties.

Other partners for the project are the Sugar Regulatory Administration and the National Institute of Molecular Biology and Biotechnology of the University of the Philippines.



Teresa Dula-Laurel, founder and Chief Operating Officer of Goto King's Cater King Food Corporation

Technology, Innovation and guts: Ingredients to biz success

By **Geraldine B. Ducusin**, *DOST-STII*

A Cater King Food Corporation used to deliver their goto (congee with meat) to every stall. Then they offered goto in the van and on the street. When SM saw that Goto King was getting successful, SM offered Cater King a stall at their food court in SM Cubao in 1984. Ten years later, they started to franchise.

Teresa Dula-Laurel, founder and CEO of Cater King realized that the business needs technology. They had to develop their own soup base and retain the same cut size of ingredients. They also had to expand their product line because people might get tired of eating just goto all the time.

Then in 2010, Laurel received an invitation to a seminar. There, they learned of the Department of Science and Technology's Small Enterprise Technology Upgrading Program (DOST-SETUP), which gives assistance to small businesses.

The company first availed assistance from

SETUP to the tune of P1 million in 2011 which was used to maintain the mini processing plant for tapa (dried meat), tocino (cured meat), inasal (grilled chicken), and longganisa (local Filipino sausage). Goto King manufactures its own meat products.

In 2016, Cater King availed another assistance package to boost its bottled product line such as bagoong (fermented fish), bottled sauces, and gourmet tuyo (dried fish).

Before the SETUP intervention, the company's product costs varied because of difficulties in keeping track of the inventory using the same facility for Goto King and for other product lines. But the new equipment enabled the company to standardize ingredients and overall output.

The company was also able to monitor the inventory and document almost all operation procedures. Their manpower also increased. From about five employees, Caterking now employs

almost 400 people.

The company has notched up 32 years in the business with its product brand one of the most recognized in the whole country. It has even won an international award, placing second runner-up in innovation for the SME Excellence Award at the ASEAN Business Awards for 2016 held in Laos in September last year.

"There will come a time when people will just want to buy food, so I can see the market in the region for Filipino delicacies. We have to develop and make excellent products. We cannot promote our cuisine if our ingredients are not readily available," said Laurel who is also Chief Operating Officer of Cater King.

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The Department of Science and Technology's (DOST) dengue prevention kits, called Ovicidal Larvicidal Traps or simply OL Traps, were handed out for free to visitors of the 12th National Biotechnology Week recently at the Bureau of Soils and Water Management in Quezon City. An OL Trap is composed of a black canister, a lawanit paddle, and pellets. Putting OL Traps under the furniture, beside discarded tires and other dark, shady areas help decrease the *Aedes aegypti* mosquito population as mosquito eggs and larvae die in contact with the trap's organic active solution. This limits dengue cases especially among school children. For inquiries, email gigelera@pchr.dost.gov.ph. (Text and photos by Espie Angelica A. de Leon, DOST-STII)