

# HORIZON

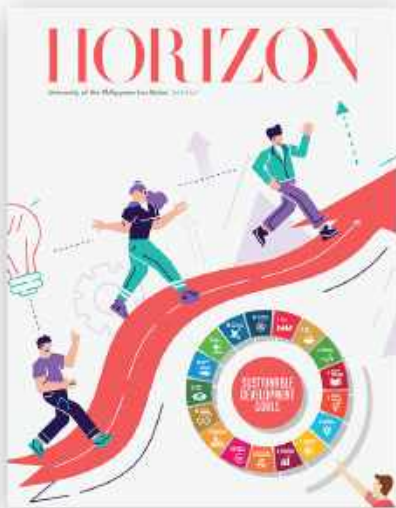
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The **UPLB Horizon** magazine showcases news and feature articles on research and extension, literary pieces, and information of general interest to UPLB and its stakeholders. Please email your contributions to OPR: opr.uplb@up.edu.ph.

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## About the cover



The cover shows people effortlessly moving up a path that is seemingly on a continuous upward trajectory. The path's upward movement symbolizes the relationship between the sustainable development goals (SDGs) index score and UPLB's contribution toward attaining the SDGs through its various programs. Hitting the goals is attainable with programs that alleviate poverty and positively impact the lives of people.

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## EDITOR'S NOTE

After featuring food sufficiency, public service, biodiversity, interdisciplinary collaboration, and the Fourth Industrial Revolution in the past five issues of the UPLB Horizon magazine, we are featuring in this issue UPLB initiatives and programs that respond to the universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity contained in the 17 Global Goals or the Sustainable Development Goals.

Featured in this issue are some of our initiatives and programs that respond to Goal 2, Zero Hunger; Goal 4, Quality Education; Goal 5, Gender Equality; Goal 6, Clean Water and Sanitation; Goal 13, Climate Action, and Goal 15, Life on Land. Not comprehensive enough, evidently, with the preponderance of activities that UPLB has undertaken and is undertaking, but a good beginning. We will be featuring more of our stories in future issues of this magazine.

This issue also features stories written by three guest writers: Prof. Teresita Borromeo, Dr. Lorna Sister, and Hidelisa De Chavez of the College of Agriculture and Food Science. Prof. Borromeo tells of her work in helping safeguard our plant genetic materials for food and agriculture at the Svalbard Global Seed Vault. Dr. Sister and De Chavez, on the other hand, take us with them as they rediscover the country through the documentation of Philippine indigenous vegetables.

We look forward to more stories from UPLB researchers and scientists whose writing will lend a first-hand perspective of experiences in the field. It would be great to hear more stories about UPLB from them.

IN BROAD STROKES

# Heeding the call to action in the SDGs

Dr. Fernando C. Sanchez, Jr.



In 2015, world leaders put out the 17 Global Goals or the Sustainable Development Goals (SDG), a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity.

The SDGs aim to find the balance in the development trajectories of the economic, social, and environmental dimensions so that development is sustainable and no one is left behind.

The SDGs resonate with us in our work here in UPLB. As we accomplish our programs and initiatives – to fulfill the university’s mission as a national university to lead and serve as a public service, research, and graduate university – we are also heeding the call to action in the SDGs.

Many of the SDGs cut across much of what the university is doing in instruction, research, and public service, if not focus on specific areas.

Some examples are featured in the handful of pages of this magazine.

We tell how our work takes us from the nooks and crannies of barangays, documenting and promoting the consumption of indigenous vegetables, to the permafrost of Svalbard in Norway where we have put in a vault some of our plant genetic materials, all to help ensure zero hunger in the future.

We also tell here of the importance of “seeing the forest for the trees” through the river basin approach in planning, as much as the “trees for the forest” by promoting the use and conservation of non-timber forest products to continue to protect life on land.

Our multidisciplinary expertise in the Climate and Disaster Risk Studies Center, a technical resource institute, a training provider, planner, and collaboration facilitator provides guideposts for climate action to local government units, research and development, and public service institutions.

We also contribute in efforts to ensure clean and steady supply of water through the UPLB Interdisciplinary Studies Center for Water (Water Center).

In gender and development, we stand out with a men-led movement opposed to violence against women.

UPLB has been synonymous with providing quality education, but what we accomplish in this SDG area goes far deeper in the case of our math and science teaching majors because of the multiplier effect they have in the young minds who they help prepare for and equip to ultimately take degree programs in science and technology, engineering, agriculture, and math.

We know that the handful of pages in this publication will not be able to feature all the university’s programs and initiatives that contribute to local action towards the attainment of the SDGs.

However, it is a step in the right direction of documenting our efforts. With this, I enjoin university researchers and scientists to write about their projects and researches that contribute to the attainment of the 17 SDGs and have them featured in future issues of this magazine.



# A JOURNEY OF PHILIPPINE REDISCOVERY, ONE VEGETABLE AT A TIME

LORNA E. SISTER AND HIDELISA D. DE CHAVEZ



**2** ZERO  
HUNGER

If health is wealth, then we have a treasure trove right under our noses—our indigenous vegetables. They are the inexpensive and natural sources of vitamins, minerals, fiber, and other essential nutrients.

Indigenous vegetables are part of Filipino cuisine. They are nutritious but low-cost options in the Filipino food basket.

Once part of traditional farming systems and home gardens, many are now depleted and underutilized despite their recognized importance. Behind this unfortunate state of affairs of our indigenous vegetables lies a lack of

many things: available germplasm for widespread use, seeds, information on their use and importance, and on how they can fit into production systems.

At the same time, there is a preferential emphasis on the production, marketing, and consumption of high-value vegetables reinforced by a generally low regard for indigenous vegetables among consumers.

To help encourage and engage Filipinos in producing and consuming indigenous vegetables, a two-year project of UPLB kicked off in January 2018 to document and promote indigenous vegetables.

The project, entitled “Documentation of indigenous vegetables in the Philippines” was funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD), particularly with support from Secretary Fortunato T. dela Peña who put this effort among DOST’s priorities.

Under the technical leadership of the country’s foremost experts in plant genetic resources conservation and management, Prof. Nestor C. Altoveros and Prof. Teresita H. Borromeo of the Institute of Crop Science (ICropS), the team composed of

researchers and faculty of ICropS (Dr. Lorna Sister, Prof. Renerio P. Gentallan, Jr. and Dr. Leah E. Endonela) and the National Plant Genetic Resources Laboratory (NPGRL) based at the Institute of Plant Breeding (Hidelisa de Chavez and Catherine Hazel M. Aguilar) assembled available information on indigenous vegetables from printed and electronic resources as well as from on-the-ground municipal- and barangay-level interactions in 20 provinces in the Philippines.

These provinces include Abra, Batangas, Bohol, Bukidnon, Comarines Sur, Capiz, Davao del Sur, Ilocos Norte, Ilocos Sur, Iloilo, La Union, Leyte, Nueva Ecija, Nueva Vizcaya, Quezon, Rizal, Siquijor, South Cotabato, Surigao del Sur and Zamboanga del Norte.

The information and insights have been overwhelming, with efforts still ongoing to compile these into a simple database on Philippine indigenous vegetables, a compendium of literatures on indigenous vegetables, a semi-technical book containing vignettes of information on the different species identified by the communities, and 20 pamphlets.

Come and have a taste of this journey of re-discovery with a dish of *pakbet*.

### **PAKBET: FROM ILOCANDIA TO THE REST OF THE PHILIPPINES**

*Pakbet* is one very local dish that is known, prepared, and eaten by so many Filipinos but which will probably cause a bit of a stir of confusion on its true nature.

*Pakbet* has many local versions. Cebuanos have their own *pakbet* just like the Ilocanos have theirs. Ilocanos, likewise, have a number of versions. From north to south, there are enough *pakbet* versions to easily fill a two-week lunch menu.

According to Prof. Altoveros, *pakbet* (read as “*pakbut*” with a short u sound) is one of the truly Filipino dishes with no foreign influence. Its name was derived from the Ilocano word *pinakebbet*, or shriveled; hence the mix of shriveled sautéed vegetables.

There is really no dichotomy between Ilocano *pakbet* and *Bisaya’ng pakbet*. *Pakbet*, in fact, enjoys rather than suffers from multiple personalities, but *alukon* or *himbabao* (*Broussonetia*

*luzonica*) perhaps makes a *pakbet* dish distinctly of the north although it may not actually be always present.

*Alukon* is the long, spike-like inflorescence (called catkin) of a medium-sized tree of the mulberry family. It offers carbohydrates, proteins, fibers, and calcium for energy, blood production, and bone and teeth health. An economically important species, it is already listed as “depleted in the wild” according to the definition of the International Union for Conservation of Nature (IUCN).

### **DIVERSITY OF PHILIPPINE INDIGENOUS VEGETABLES IN A PLATE OF PAKBET**

The multiplicity of *pakbet* gives insight into how much diversity there is in the Philippines’ indigenous vegetables. There are at least three other noteworthy versions of Ilocano *pakbet* most of us may not be aware of.

The *ampalaya’ng pakbet* is an all-bitter-gourd version featuring the globose fruits of the native variant. *Pakbet na lasona gulay* features the whole immature shallot plant, while *pakbet na bawang gulay* is a similar version but features native garlic greens or whole immature garlic plants. The latter two are available in December to January when the garlic and shallot crops are at the appropriate stage. Also, both have no need for any other spices. Mind you, though, immature shallots and garlic greens do not mix, they say in Ilocandia.

Normally, *pakbet* can have any combination of *saluyot* (jute), *utong* (cowpea), *pallang* (winged bean), *kabatiti* (sponge gourd), *patani* (lima bean), *okra* (lady fingers), *parda* (hyacinth bean), *panalayapen* (false olive), *u-ong* (mushrooms), *ampalaya* (bitter melon), *singkamas* (jicama), *kardis* (pigeon pea), *galiang* (yautia), *rabong* (bamboo shoots), *bagbagkong/sabidukong* (*Telosma procumbens*) – and even *camote* (sweetpotato).

Well, yes, a few more indigenous vegetables are just as qualified for a slot in a *pakbet* pot, like the squash, string beans, eggplant, and *okra* that are main features of the *Bisaya’ng pakbet*.

Invariably, a *pakbet* dish is flavored with *bagoong* (fermented fish sauce) in the north or shrimp paste among the Bisaya, along with lots of chopped tomatoes.

Imagine a journey across the archipelago to spot these indigenous vegetables in their natural setting. It would probably take one summer to search only for *pakbet*’s ingredients.

### **A FEAST AT OUR FEET**

Roughly 10 months of field work led to the following conclusions:

- The literature on Philippine indigenous vegetables is mostly grey, pointing to a significant research potential
- Even then, there is a significant body of research output from the early champions such as the Institute of Plant Breeding at UPLB, Mariano Marcos State University in Ilocos Norte, Central Mindanao University in Musuan, Bukidnon, the Batanes Experiment Station under the Department of Agriculture Field Office-Region II, and even local government units such as the provincial government of Capiz.
- The more than 150 species identified is only the tip of the proverbial iceberg – this vegetable iceberg – as more species from other provinces and ecosystems have been brought to the team’s attention by eager informants.
- Most are cooked in simple dishes – sautéed or as a vegetable soup. Cooking in coconut milk is another dominant preparation that reflects the country’s tropical environment. So far, more than 200 traditional preparations have been shared by the communities visited.
- Some spices and condiments have been reported as vegetables in some communities; others would not have any of it – spices, colorants and aromatics are what they are, and they are not vegetables, they say.
- Leaves and fruits in various stages depending on the species, stems or vines, underground parts and even flowers, buds/cores (ubod), and seedlings or whole plants are harvested and utilized as vegetables.

The list of preparations and their recipes pile up, and the team realized that most of these are just gathered from the wild, field borders, and homegardens or shared/exchanged in the community. So, let us go and be wowed (again) by the Philippines, one vegetable – or dish – at a time.

# SAFEGUARDING PHILIPPINE PLANT GENETIC RESOURCES IN THE PERMAFROST OF NORWAY

TERESITA H. BORRAMEO

Deep under the permafrost of Svalbard on the remote island of Spitsbergen in Norway, halfway between the Arctic Circle and the North Pole lies a structure – a seed vault. Should a catastrophe escalate and wipe out the planet’s biodiversity, this vault will enable humanity to recover seeds for key plant genetic resources for food

and agriculture. It is food security’s last stand in this planet’s uncertain future.

Established 10 years ago, the Svalbard Global Seed Vault (SGSV) opened in February 2008. Now, it shelters around one million seed samples from 76 depositors from

around the world. It has the capacity to house approximately 4.5 million seed samples, or around two billion individual seeds. The Philippines has a total deposit of 2,254 accessions of nine species.

The seed vault was designed for long-term seed storage at minus 18 degrees Celsius (minus 0.4 degrees Fahrenheit).





## 2 ZERO HUNGER

The author during her second visit to the Svalbard Global Seed Vault (SGSV), Norway on its 10th anniversary in 2018. She is a professor at the UPLB Institute of Crop Science and a member of SGSV's International Advisory Panel.

The permafrost ensures the continued viability of the seeds should the mechanical cooling system fail.

Seed samples, sealed in aluminum foil envelopes and stored inside sealed boxes, are duplicates from national and international gene banks. In the event that these gene banks are unable to function or become inaccessible as a result of natural and man-made disasters or due to lack of resources, the

depositor can withdraw them from Svalbard to re-establish its collection.

Such was the case when the International Center for Agricultural Research in the Dry Areas (ICARDA) lost access to its gene bank in war-torn Syria. The Center withdrew some of its seed deposits from the Seed Vault to reestablish operations in Morocco and Lebanon.

The Svalbard Global Seed Vault is a project with global and historic significance. It is an important contribution towards reducing hunger and poverty in developing countries by conserving genetic resources of the world's food crops for future generations. SGSV provides this service free-of-charge and depositors can be certain that only they can gain access to their own materials.

With the meager budget of USD 1,000 that the Philippine government allocates annually for genetic resources conservation at the national repository, safety duplication at SGSV provides some security of a fallback source of genetic materials. The Philippine repository lost many accessions to the flood waters of Typhoon Milenyo (*Xangsane*) in 2006, but there was no global seed vault then.

The Norwegian government is responsible for SGSV. The Nordic Genetic Resource Center, under the auspices of the Nordic Council of Ministers, takes responsibility for its operation. The Global Crop Diversity Trust (GCDT) funds a portion of the operating costs as well as the preparation and shipment of seeds from some developing countries.

The vault was opened in October 2019 to accept seed deposits. Guidelines for depositors can be found at <https://www.nordgen.org/en/depositing-seeds/>.

# QUALITY TEACHERS, QUALITY EDUCATION

JUAN PAOLO A. AQUINO



## 4 QUALITY EDUCATION

Quality secondary school teachers.

Not many know it, but UPLB is contributing this human resource profile to the country's basic education sector.

They are at the frontline of delivering inclusive and quality education for all as provided in the Sustainable Development Goal 4 set by the United Nations.

But UPLB-trained teachers possess a unique brand because of the focus on science and math in their training in the Bachelor of Science in Mathematics and Science Teaching (BS MST) program.

Since its launching in 2003, UPLB has produced 335 BS MST graduates.

For the past five years, UPLB BS MST graduates, together with graduates from

other degree programs who later pursued teaching certificates, have registered 97 to 100% passing rates in the Licensure Examination for Teachers (LET).

In the September 2019 edition of LET-Secondary Level alone, UPLB ranked first among more than 2,000 HEIs in the country with a passing rate of 98% in the board exam.

What makes BS MST distinctly strong is the training provided through the three giant institutes of the UPLB College of Arts and Sciences (CAS)—the Institute of Biological Sciences (IBS), Institute of Chemistry (IC), and Institute of Mathematical Sciences and Physics (IMSP)—all declared as National Centers of Excellence in the Basic Sciences.

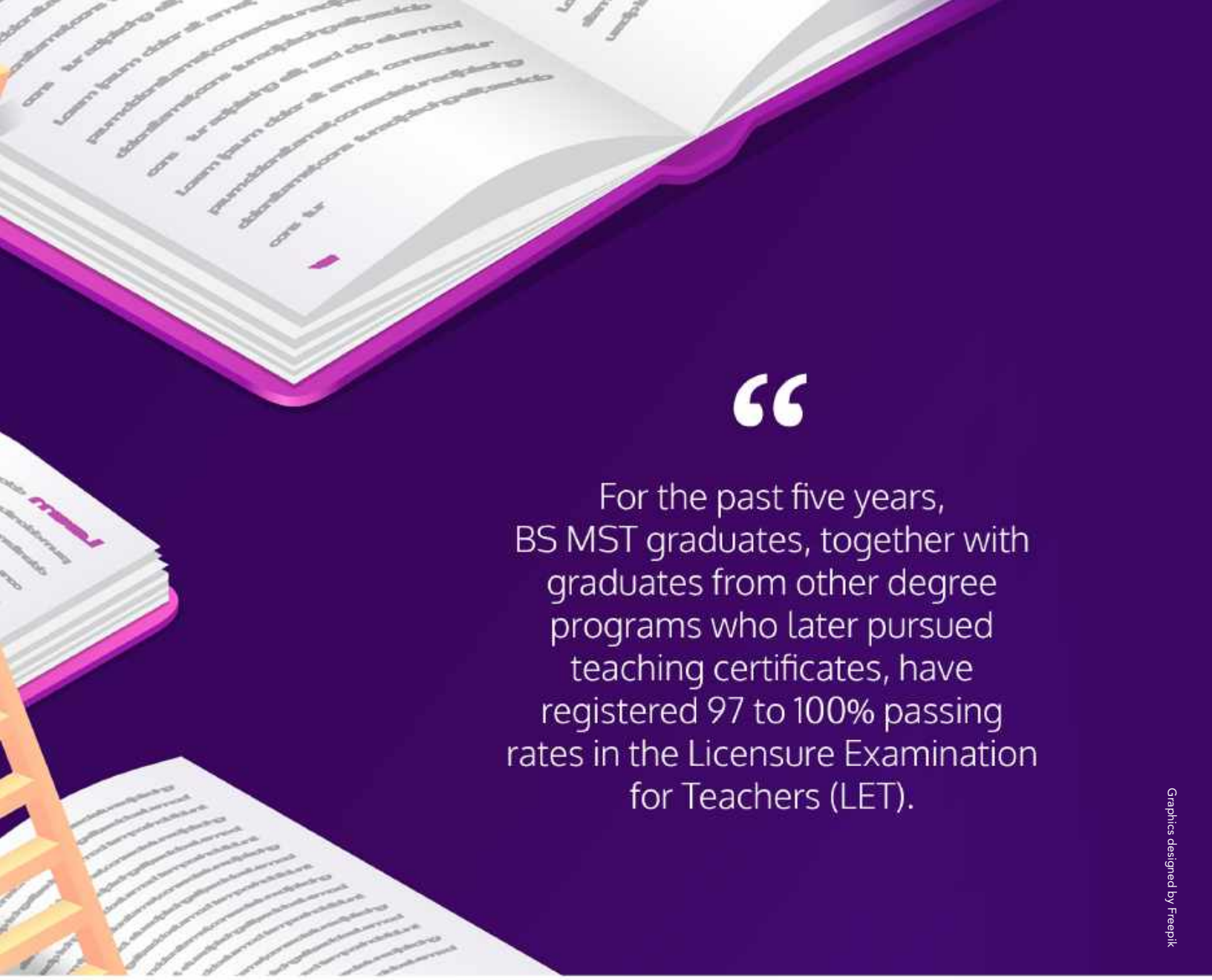
BS MST students choose their major in any of the following areas: biology, chemistry, physics, and mathematics.

The UP Rural High School (UPRHS), UPLB's 91-year-old high school known for its competitive admissions, serves as the *de-facto* teaching laboratory for BS MST students.

It is no wonder that BS MST graduates eventually teach in UPRHS. Among these are Hazel Joyce Ramirez, chemistry major, and Ma. Angelie Millanes, physics major.

The two said that BS MST trained them to become holistic and effective teachers. "It provided avenues for me to develop the skills in teaching different fields in science," said Ramirez, who teaches general science, chemistry, and Earth science.





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For the past five years, BS MST graduates, together with graduates from other degree programs who later pursued teaching certificates, have registered 97 to 100% passing rates in the Licensure Examination for Teachers (LET).

Graphics designed by Freepik

“This was very beneficial since we had a spiral curriculum in UPRHS five years ago,” Ramirez added. According to the International Bureau of Education of UNESCO, spiral curriculum repeatedly presents concepts and topics over time while making them broader and more complex as the learning progresses.

As someone who handles diverse student profiles—from Grade 7 in Junior High School to Grades 11 and 12 in Senior High School—Ramirez has learned to devise techniques to customize approaches for many types of learners.

Millanes, for her part, counts on her learnings from her course to cope with the challenges of classroom size and limited facilities.

This is by thinking of better teaching strategies, motivating the students, and stimulating their interest in math and science.

Graduates of BS MST can also be found in big schools in CALABARZON, such as John Joshua Azucena of the Philippine Science High School-CALABARZON Region Campus in Batangas, and Carl Kenneth Reyes of the Dasmariñas Integrated High School in Cavite.

“BS MST offers a curriculum which capacitates its graduates to effectively teach mathematics and different fields of science. The ability to teach these fields while having in-depth background knowledge in each discipline is a very important pedagogical

skill needed in delivering the spiral progression of the K+12 curriculum,” Azucena stated.

Department of Education-based Reyes said that despite the problems that the education sector faces, he still chose to continue teaching and to pursue his passion. “It is worth it – the knowledge that my students are learning and applying these to their everyday lives,” he said.

The quest for quality education in the country is a complex issue that is influenced by a web of interrelated factors.

But by simply looking at competent and dedicated science and math teachers from UPLB, there is hope for a better quality of life in the future.

# A VOW TO HELP END VAW

KRISTINE E. ARAGUAS

Legendary dancer Martha Graham once said that “dance is the hidden language of the soul.” If that is so, imagine the manifold messages that people dancing together for a cause could possibly convey.

And it is through dance that a group of male UPLB employees have been expressing their advocacy. Since 2018, they have danced, likely not as well as Graham, to express a vow to help end violence against women (VAW).

Now numbering 35, these men are collectively called MOVE, or Men Opposed to Violence against women Everywhere. UPLB’s MOVE, the only one in the UP System, is a local counterpart of MOVE organizations across the country that the Philippine Commission on Women created in 2006.

The UPLB Gender Center (UPLBGC), the focal point of all gender concerns in the campus, established UPLB MOVE in 2018.

UPLB MOVE’s march and solidarity dance to the tune of the song “Break the chain,” happens each November 25 or the start of the 18-day nationwide Campaign to End VAW.

By virtue of Republic Act 10398, the day has been declared as the National Consciousness Day for the Elimination of Violence Against Women and Children (VAWC).

According to Miguel Victor Durian, secretary of MOVE and a university research associate at the Office of the Vice Chancellor for Community Affairs, the End VAW solidarity dance is the organization’s way of raising awareness about the cause to the UPLB community.

Atty. Eric Paul D. Peralta, director of UPLBGC, said that members of MOVE are expected to serve as champions and advocates of gender and development, gender equality and empowerment, and of ending VAWC.

“MOVE can help the UPLBGC a lot inasmuch as not only the goals of the office, but also the vision, mission and objectives are enhanced by the projects, activities, and programs (PAPs) of the group.”

“MOVE also opens a new window as these PAPs are being facilitated, promoted, and championed by male UPLB constituents,

breaking traditions and stereotypes about men,” Atty. Peralta added.

Despite being a young organization, MOVE has taken initial steps to realize their goals to further advance their cause.

Vladimir Amatorio, president of MOVE and an administrative officer at the Human Resources Development Office, said that MOVE aspires to become a full-fledged program under the UPLBGC. He added that they are also open to assist and collaborate with other UP constituent universities in establishing their own MOVE.

MOVE members have also participated in gatherings that push to end VAW in Cavite, Laguna, Batangas, Rizal, and Quezon. In 2019, they participated in the regional MOVE Summit that convened various MOVE chapters from state universities and colleges and other government agencies.

For Dr. Emilia A. Lastica-Ternura, coordinator of the Office of Anti-Sexual Harassment (OASH), organizing MOVE is a good initiative that shows that men can be advocates to stop VAW.

Dr. Lastica-Ternura said that the members of MOVE can be the primary examples on how people should behave themselves. “Their advocacy should be evident in their dealings with people every day in their jobs and at home,” she said.

“The organization is active in pursuing their agenda, not only by convincing the community that this is the right thing to do, but [also because] they educate themselves in gender sensitivity to be able to fully adhere to the principles of their organization,” Dr. Lastica-Ternura noted.

*“I can see a world where we all live - safe and free from all oppression; no more rape or incest, or abuse; women are not a possession.”*

These lines from the lyrics of “Break the chain” is the message that UPLB MOVE conveys in the solidarity dance. When men break the chains of tradition, there just might be a future when VAW will finally end.





 **5 GENDER EQUALITY**



Photos by Miguel Victor T. Duran



## 6 CLEAN WATER AND SANITATION

# AT THE 'CENTER' OF WATER SECURITY RESEARCH

JESSA JAEL S. ARANA

From being a habitat of biodiversity, down to regulating cell functions in organisms, water is the ultimate multi-purpose element that separates us from other planets and makes life on Earth possible.

While this resource covers about 70% of the Earth's surface, less than 3% of it is fresh water. Of that, less than 1% is accessible and can be used for food, agriculture, and industry needs.

Today, access to water remains limited by factors such as geography and technology. This is further aggravated by stressors including climate change, natural disasters, and human activity, which not only diminish water quality but also make water less accessible to marginalized communities.

A problem of this magnitude requires a collaborative and transdisciplinary solution, a fact well-recognized by the UPLB Interdisciplinary Studies Center for


Water, better known as the Water Center.

The two-year-old center has been in active pursuit of water security since it was officially formed in October 2017. Water Center has committed itself to activities that focus on expanding and coordinating science-based knowledge and practices on sustainably managing water for the benefit of the community.

The center currently pursues three projects.

First is "Assessing the resurgent irrigation development program in the Philippines," led by Dr. Agnes Rola, a professor emeritus at the College of Public Affairs and Development.

According to the Philippine Institute for Development Studies, its funding agency, this project aims to evaluate



the overall effectiveness and efficiency of the irrigation program of the government by examining its engineering and governance aspects.

It examines both the national irrigation systems, which are directly managed by the government wherein farmers pay an irrigation fee per hectare, crop or season; and communal irrigation systems, which are constructed by the government in partnership with farmers through irrigation associations that later on take over in managing the irrigation system.

Two more projects that the Water Center is pursuing are the “Hydro-geological assessment of Mt. Iraya Watershed in Basco, Batanes,” and the “Ridge-to-reef disaster risk and climate change impact assessment of floods and droughts in the agricultural sector of Angat Watershed, Philippines.”

Both are led by the over-all chair of the Water Center, Dr. Patricia Ann J. Sanchez, a faculty member at the School of Environmental Science and Management (SESAM).

The research, based in Mt. Iraya Watershed, is carried out in partnership with the local government in order to establish baseline data about the watershed to ensure the sustainability of its services and management. An article from the SESAM website reported that the study works closely with local barangays to determine local issues and needs about water consumption in the community.

On the other hand, the Angat Watershed-based research seeks to provide a means of predicting the intensity of floods in the surrounding areas and help dam operators in the National Power Corporation (NPC) to make optimized decisions based

on data gathered about the local landscape.

“It’s a tool that will guide the dam operators regarding when they can release the water without flooding the lowland areas and at the same time maximize power generation upstream,” said Dr. Sanchez of the research project.

“I want this to be a learning tool as well, like learning both ways,” added Dr. Sanchez. “Because the [dam] operators’ expert judgement can aid in fine tuning the decision, further optimizing the process.”

For this groundbreaking research, Dr. Sanchez was named Outstanding Young Scientist by the National Academy of Science and Technology in 2019.

These valiant first efforts of the Water Center in its first few years of existence hope to contribute toward water security in the country.



# WEATHERING CLIMATE CHANGE WITH PLANS THAT SCIENCE BUILT

JESSA JAEL S. ARANA

UPLB accomplishes its role in addressing climate change by putting scientific knowledge to work in local communities through local government collaboration.

In early 2019, social media was flooded with exasperated Manileños lining up for pails of water. In agricultural towns, farmers bemoaned the loss of their crops. Online news service Rappler reported that the loss had exceeded PhP 4 billion by March due to the onslaught of a brutal El Niño.

Six years previously, super typhoon Yolanda (*Haiyan*) swept over the Visayas. Its unforgiving winds and waves left more than 7,300 dead or missing and inflicted PhP 9.46 billion worth of damages. The millions whose lives were spared but displaced were left to pick up the pieces, or whatever was salvageable in the ruins.

These stories tell us of extremes. They are the vivid pictures once predicted by science decades ago which now live in our reality. The science that once announced this situation's approach is the same tool humanity wields today to ride the changing temperaments of the times.

At times like these, the application of accurate and scientific data to government plans is vital in making sure communities are depending on a vetted solution against the slow but drastic changes in climate.

In UPLB, there's no other program more focused on this need than the Interdisciplinary Studies Program on Climate Change Adaptation and Mitigation (CCAM) and Disaster Risk Reduction and Management (DRRM), commonly recognized as the virtual Climate and Disaster Risk Studies Center (CDRSC).

The CDRSC is hosted by the School of Environmental Science and

Management (SESAM) and is one of the interdisciplinary studies centers of UPLB. It provides expertise, technical assistance, and training in the quest for building adaptive and resilient communities in the face of climate change and disasters.

The CDRSC's mission has put them in conjunction with the Department of the Interior and Local Government (DILG) IV-A, the Climate Change Commission, Department of Environment and Natural Resources, Department of Science and Technology, UP Resilience Institute, UP Manila College of Public Health, other public and private institutions, and sectoral groups.

From 2016 to 2018, CDRSC embarked on one of its major activities when DILG IV-A Regional Technical Working Group (TWG) appointed UPLB as a Local Resource Institution (LRI) partner, making the university their official academic counterpart. This arrangement allowed CDRSC to conduct Climate and Disaster Risk Assessment (CDRA) training-workshops for 91 municipalities in Cavite, Laguna, Batangas, Rizal, and Quezon (CALABARZON), the country's most populated region.

According to Dr. Yusuf Sucof, university coordinator of CDRSC and a university researcher at SESAM, CDRA incorporates data from DOST-PAGASA to create maps and graphs that indicate observed climate trends, climate change projections and scenarios specific for their locality. It describes seasonal mean temperature changes and projections,



# 13 CLIMATE ACTION

seasonal changes in total rainfall patterns, extreme weather events, and sea level rise.

The training-workshops enabled CDRSC to guide local government units (LGUs) of Region IV-A in training and coaching their more than 900 officers about the CDRA process and derive from it their Local Disaster Risk Reduction and Management Plan (LDRRMP) and Local Climate Change Action Plan (LCCAP). LCCAP details the locality's climate change-related risks and their long-term strategies to adapt to and mitigate these risks in the future.

Dr. Socol said that the training also discussed the impacts of climate change on various ecosystems or systems of interest, including populations; urban use; natural resource production areas; critical facilities, like water and electricity services, roads and communication facilities; and lifeline utilities, in relation to the state of their forests and uplands, coastal and lowland areas, agriculture, and urban or built ecosystems.

Other mandated LGU plans, such as the Comprehensive Land Use Plan, Comprehensive Development Plan, and other sectoral/thematic plans on gender development, tourism development, ancestral domain, and agriculture development, also use CDRA findings.

After finishing the said undertaking with CALABARZON, CDRSC will focus on UPLB's host province, Laguna. An MOU with the Provincial Government of Laguna (PGL), which was signed in April 2019, will kick-start technical cooperation between Laguna and UPLB for future programs, projects, and activities related to climate actions.

The technical cooperation, Dr. Socol explained, covers academic, research, and extension activities on climate change studies that would involve

faculty members, researchers, extensionists, and students. Aside from those activities, the MOU also entails the creation of a Scientific Advisory Board for PGL.

Preceding the MOU was a report on the PGL website in 2015 about the latter's commitment to climate change adaptation to prevent the probable effects of natural calamities. Laguna was in fact recognized by Hon. Lucille L. Sering, Secretary of the Climate Change Commission at the time, to be the first province in the Philippines to take concrete action to address the effects of climate change.

While this MOU is underway, Dr. Socol said that they also plan to collaborate with Laguna municipalities to further mainstream CDRA into their planning tools and methodologies. One is with the PGL which will facilitate cooperation with Calamba City and the Second Congressional District of Laguna composed of Cabuyao, Los Baños, and Bay. Another will be with the Los Baños LGU, which aside from fostering technical collaboration, will create a local CDRA TWG.

While these initiatives are good steps towards being climate change-ready, Dr. Socol said that collaboration between academe and the government needs to go further and be sustained.

"For me, it doesn't end with the assessment," said Dr. Socol. "We also need to assist them in writing their proposal for the People's Survival Fund. We need to be consistent. We should work together to the end of the process."

With these activities and more to be held in the coming months, Laguna, CALABARZON, and the LGUs in the other parts of the country are sure to have a science-based approach in climate change adaptation and coping with the impacts of disaster events.



Graphics designed by Freepik

# A FOREST'S BOUNTY BESIDES TIMBER

JOHN GLEN S. SAROL

Just by the number, sheer size, and usefulness of timber from trees, it is easy to overlook what else a forest can offer.

For Dr. Ramon Razal, a professor at the College of Forestry and Natural Resources (CFNR), the forest is home to abundant renewable products other than timber, which are collectively called non-timber forest products (NTFPs).

"They include fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences, and a range of barks and fibers such as bamboo, rattans, and a host of other palms and grasses," enumerated Dr. Razal, who is also one of the members of the board of trustees of the NTFP Exchange Programme Asia and former dean of CFNR.

In the Philippines, various types of NTFPs can be found in different provinces. "For instance, Iloilo, Pangasinan, Abra, and Bukidnon are rich in bamboo. Agusan provinces, Palawan, and Mindoro provinces produce a lot of rattan, while Palawan, Davao Oriental, Isabela, Samar, and Quezon are abundant in Almaciga resin," Dr. Razal continued.

Promoting NTFPs can contribute to the attainment of the Sustainable Development Goal (SDG) 15 or "Life on Land" to protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss.

According to the United Nations (UN), investing in forests and forestry represents an investment in people and their livelihoods, especially the rural poor, youth, and women. Around 1.6 billion people - including more than 2,000 indigenous cultures - depend on forests for their livelihood.

## DIVERSE BENEFITS

Unlike agricultural crops, most naturally growing NTFPs like bamboo and rattan do not need thorough cultivation. They can also be gathered using simple, common tools.

NTFPs can be sources of fiber and structural materials, medicine and cosmetics, chemical or extractive products, fruits, nuts, leaves, and animal products. Their abundance makes them reliable sources of livelihood for forest communities.

"They also save the forest from being exploited for the trees. Plus, protecting the forests for NTFPs also helps ensure forest diversity," Dr. Razal explained.

"For the environment, we can use NTFPs such as plant leaves rather than plastic bags for packaging. For our health and wellness, we can consume medicinal plants and fruits from the forests rather than fast foods," he added.

According to him, the use of NTFPs is also closely intertwined with the culture of indigenous people. "Many of the elements of musical instruments, houses, and accessories they use are made of NTFPs. Paying attention to NTFPs helps in protecting indigenous culture that otherwise would be lost if these resources are ignored."

Research from the International Network for Bamboo and Rattan also found that bamboos have the ability to store carbon better than plantation trees, which helps in mitigating climate change.

## COLLECTIVE EFFORT

Dr. Razal and his project team have been working with different sectors to develop and promote NTFPs through marketing, bamboo inventory and mapping, tissue culture, and exploratory studies.

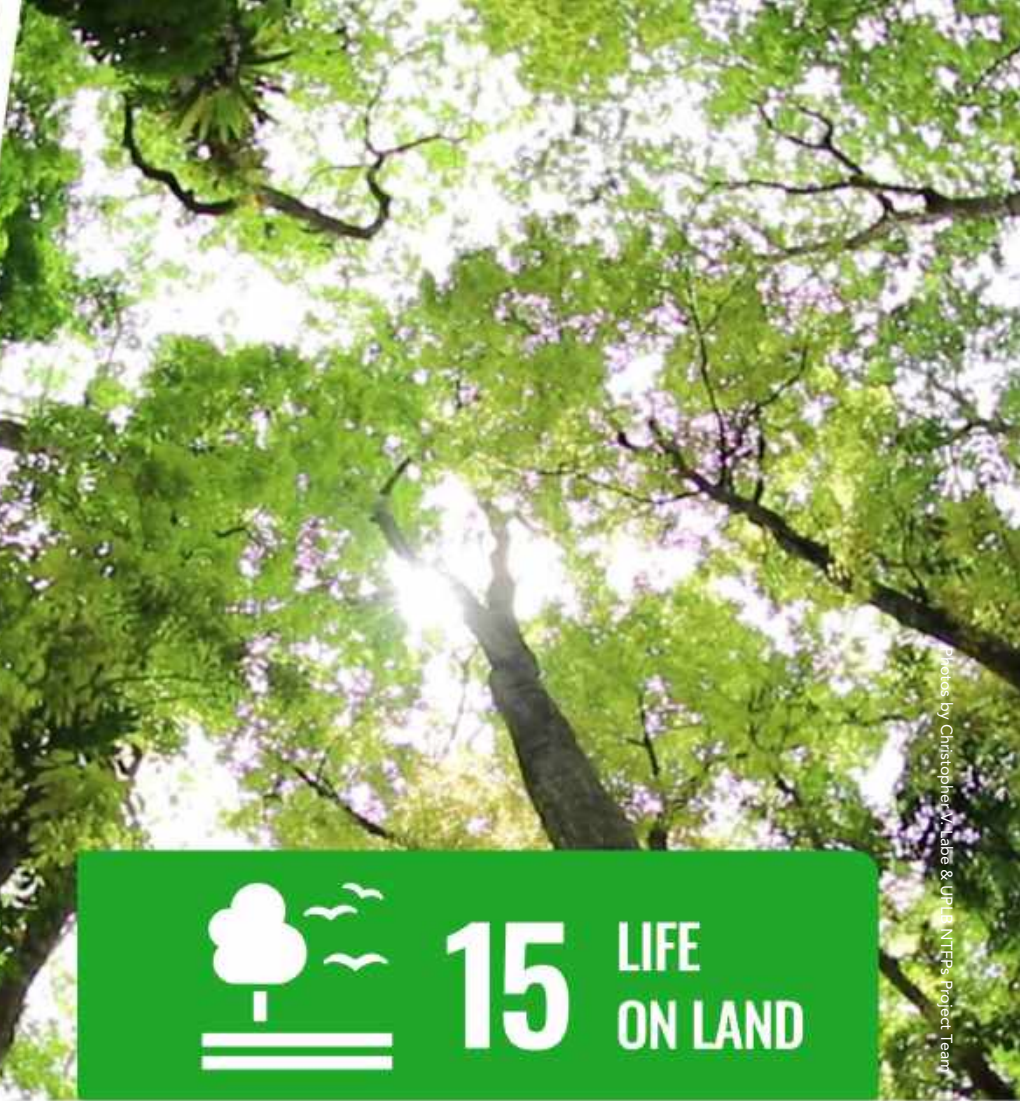


"In one of our projects called 'Foresters as agents of change: developing capacity of forestry graduates in assisting upland communities to commercialize non-timber forest products,' we were able to support 24 BS Forestry students to undergo their practicum in five different communities within CALABARZON. The students planned community-based small-scale enterprise using available NTFPs as raw materials that could be established in the communities identified," said Dr. Razal.

The project also established the FOREStore, a one-stop shop that sells goods and materials made from NTFPs developed by BSF students and their partner communities in Laguna, Cavite, and Quezon.

In another initiative, the NTFPs team combined remote sensing technology and free access maps, while also interviewing communities from Pangasinan, Iloilo, and Bukidnon, to come up with bamboo distribution maps in these provinces.





Photos by Christopher Valdez & UPLB NTFPs Project Team



## 15 LIFE ON LAND

"Our maps will tell you where the bamboo stands are located in the three provinces. You can use the map to estimate how many bamboos are harvestable, with an accuracy of more than 70%. We were also able to develop a guide that includes a detailed procedure on mapping and inventory of bamboo as well as a bamboo identification guide that inventory teams in different communities can use to recognize the bamboo species growing in the area," explained Dr. Razal.

His team has also ventured into tissue culture for bamboo production. He said that using tissue culture saves on space and produces more planting materials using fewer inputs.

"We collect three species of bamboo: *tinik*, giant bamboo, and *bolo* from six different locations in the country, two from each island groups in the Philippines. My part is to characterize the physical and mechanical properties of the bamboo to determine which area(s) in the country are the best places to collect bamboo for micropropagation," Dr. Razal said.

The project is in partnership with the Institute of Crop Science of the College of Agriculture and Food Science and Carolina Bamboo Garden based in Antipolo City.

"Hopefully with more tissue cultured bamboo, we can establish more plantations and supply the demand," he continued.

Lastly, the team is also leading the chemical non-timber forest products program, where they seek to compare Almaciga resins collected from Palawan and other parts of the country.

Almaciga trees grow in almost all mountainous forests in the Philippines, particularly in Quezon, Zambales, Palawan, Cagayan, Abra, Kalinga, Apayao, Nueva Vizcaya, Samar, Zamboanga, and Davao. Its resins are used in manufacturing varnishes, paints, soaps, printing ink, shoe polish, floor wax, and other products.

"The Almaciga resins from Southern Palawan have been widely preferred

in the Philippines. Our team would like to find out if they really differ from other Almaciga resins harvested in other parts of the country, since these are purchased at a lower price by traders," Dr. Razal noted.

"Under the program, we would also develop products and technologies on the harvesting of Almaciga resin since the current practices endanger the sustainability of the trees. We would also want to come up with novel products out of Almaciga so that communities can also be entrepreneurs in their own right and have more returns from their efforts," he added.

The program will also tackle oil from indigenous tree species – the seeds of Bitaog and the essential oil from the leaves of Bagras in its second year.

As Dr. Razal and his research team strives to conduct more projects about NTFPs, he stays committed toward making more forest-dependent communities believe that the forest's bounty goes beyond the timber from trees.

# MASTER PLANNING AN IMMENSE LIFE SUPPORT SYSTEM

MARK JAYSON E. GLORIA

Nestled within the fabled mountain ranges of Sierra Madre, Cordillera, and Caraballo is an immense life support system for people, flora and fauna in northeast Luzon.

Grand rivers almost as extensive as the country's longest, the Cagayan River, cut across its fertile valleys and plains. Standing in its forests are endemic and critically endangered tree species. Roaming above its land are more than 100 bird species, the most regal of them the Philippine eagle.

Across its settlements – from the ridges to the lowlands – are almost four million people living in 12 provinces, 122 municipalities and cities, and more than 2,000 barangays. These places cover three agriculture- and natural resources-rich regions of the country – the Cordillera Administrative Region, Cagayan Valley, and a part of the northern portion of Central Luzon.

This is the Cagayan River Basin (CRB), the Philippines' largest watershed.

With its land area of 27,493.49 sq km, CRB occupies almost a tenth of the entire country, and it is in its vastness that this watershed is relevant not only to the regions where it sprawls, but to the entire archipelago.

"Cagayan River Basin is a very important watershed simply because of its area," said Dr. Rex Victor O. Cruz, a professor at the College of Forestry and Natural Resources (CFNR) and an Academician at the Philippine National Academy of Science and Technology.

"That's one-tenth of the entire country right there," Dr. Cruz continued. "Cagayan Valley, which is in the middle of CRB, is an important food basket of the Philippines, producing a lot of corn and rice."

CRB is composed of 12 provinces: Cagayan, Isabela, Quirino, Nueva Vizcaya, Ifugao, Mountain Province, Benguet, Kalinga, Apayao, the outskirts

of Abra, and parts of Aurora and Nueva Ecija.

"The watershed straddles political units. Some local government units (LGUs) will have big pieces of their land inside CRB; some LGUs will have a tiny part," Dr. Cruz said, who further explained that CRB, as a watershed, is technically called a "river basin" because its area exceeds the 100,000-ha threshold, based on watershed classification in the Philippines.

Dr. Cruz, a leading watershed expert in the country, said that CRB is a source of water, forest products, and agricultural land. It hosts biodiversity and shelters indigenous people. Its hydroelectric dams, such as the Magat Dam, provide water sources for irrigation and electricity for the national grid.

With the river basin's environmental, economic, and social importance, how does the government ensure that this shelter of life on land will be conserved and protected in this age of climate change?

In 2015, the River Basin Control Office (RBCO), the unit of the Department of Environment and Natural Resources (DENR) that oversees the government's efforts and initiatives for all of the country's 18 major river basins, sought the expertise of an interdisciplinary team from UPLB to develop a climate-responsive integrated master plan for CRB for 15 years.

"The master plan of the watershed contains the general framework for biodiversity conservation, for water conservation, and for soil conservation," said Dr. Cruz, who led the planning team of more than 20 experts.

According to Dr. Cruz, the said master plan is a good basis for the development plans of LGUs

within the river basin, such as the Comprehensive Land Use Plan (CLUP).

"A watershed is one whole system. You cannot develop a plan for the different parts of the watershed individually. So you develop one master plan for the [whole watershed] unit, and that becomes the framework for smaller plans for different parts of the watershed," Dr. Cruz maintained. "There should be no plan that will be contradictory to the master plan of the watershed."

While a master plan for CRB was earlier crafted in 2012, the UPLB team was tasked to "climate-proof" it in order to address flooding, drought, landslide, strong typhoons, and extreme temperature in the river basin. To address the risks associated with those hazards, Dr. Cruz and his team, in consultation with LGUs, national government agencies, academe, research institutions, private sector, and people's organizations developed the master plan together with the implementation and investment plans to make CRB climate-resilient.

The master plan is composed of programs and projects on the management of water resources, watershed, wetland, disaster risk reduction, economic development, and institutional development that would cost PhP 100 billion should they be implemented.

Among the actions that they recommended are the development of water impounding infrastructures in identified potential dam sites and rainwater harvesting systems to manage and maintain water. They also identified Forest Landscape Restoration and Conservation Farming Villages as cross-cutting strategies to manage the watershed, water resources, and wetlands.

They also called for the harmonization of CLUP, Forest Land Use Plans, and other related mandated plans of LGUs.



# 15 LIFE ON LAND

"[When] development plans of LGUs are not aligned and coordinated with one another, [and when there are] disharmonized plans and programs of different government agencies, your water is in danger," Dr. Cruz warned.

The master plan team also determined ways to improve the resiliency of communities amid climate change, such as relocating poor households exposed to hazards, improving early warning and forecasting systems, controlling soil erosion, constructing a sediment containment system, and implementing what would be called the Cagayan River Flood Control Project.

The interdisciplinary team considered all environmental, ecological, economic, and social factors in crafting the master plan. "You have to connect all of these. Once you have connected them properly, you will know exactly where to begin in providing a solution," Dr. Cruz said.

Aside from doing one for CRB, the RBCO also entrusted the team of Dr. Cruz with drawing up climate-responsive master plans for five other major river basins in the country, namely: Agno in Luzon, and Agus, Buayan Malungon, Mindanao, and Tagoloan, all in Mindanao.

There is no doubt that these river basins and watersheds are life support systems whose protection and sustainability should be ensured. The master plans drawn up by the UPLB experts should not just be consigned to gather dust in some bookshelves but should be implemented for our collective survival.



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