

SCIENCE FOR THE PEOPLE

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"SCIENCE FOR THE PEOPLE" IS THE DOST tagline of this Administration. Why "Science for the People?" Some people think that when we talk about Science & Technology it only involves the scientists and researchers. But we are promoting science to benefit the people.

Just a brief background how we evolved - some of you may have heard of the old National Science Development Board which started in 1958. This became the National Science and Technology Authority (NSTA) in 1981. That was the first time I was seconded to the NSTA as head of the planning unit. This was in 1982 to 1984 during the Marcos Era, and our head was Emil Javier at that time. It became the Department of Science & Technology (DOST) in 1987 under the presidency of Cory Aquino, and I also served under Cory as the director of the Technology Application and Promotion Institute under Sec. Ceferino Folloso.

Not too many people are familiar how we are organized. We have a conglomeration of different agencies. We have three research and development councils who do the plan for R&D in their respective sectors. Agriculture, aquaculture, marine fisheries, forestry, natural resources are all under the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARD). Then we have the Philippine Council for Health Research



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and Development (PCHRD) for health, and have one for industry energy and the emerging technologies.

We have two advisory bodies attached to us, both are collegial: the National Academy of Science and Technology, composed of around 70 academicians including some 18 national scientists, and the National Research Council of the Philippines (NRCP) which is a membership organization of researchers all over the country. It has now around 4,000 members all over the country.

And we have under us also 16 regional offices and 80 provincial offices. These are relatively small offices. Our provincial offices usually have only 3 regular personnel. And our regional offices have around between 40-45.

We have research and development institutes. Some of them have long been in existence under the Bureau of Science which started in 1901, like the Industry Technology Development Institute, it used to be the Bureau of Science. We have others which belonged to DTI before like the Metals Industry Research and Development Center, and the Philippine Textile Research Institute.

We also have service organizations - the biggest of which is the weather bureau, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). We have the Institute of Volcanology, and we also have the Philippines Science High School system which has grown from a single campus in 1964 now to 16 regional campuses, as prescribed by law. We also have the Science Education Institute which manages our scholarship program, and an institute in-charge of technology promotion and commercialization.

SUPPORTING THE 0+10 SOCIOECONOMIC AGENDA

We think science and technology can make a significant contribution in the President's socioeconomic agenda. For example, when we talk of "increasing competitiveness" we support research and development transfer in areas that will improve competitiveness of our agriculture, manufacturing and service sectors. In promoting rural and value chain development, we are very supportive of the President's instructions to hasten the development of our regions. We invest in human capital development through our scholarship and training programs. Finally, this is really the first time that an item on science and technology was included in a president's agenda, which is to "promote science, technology, and the creative arts to enhance innovation and creative capacity towards self-sustaining, inclusive development."

It is also the first time we are lumped together with the creative arts. So we are now trying our best to find out how we can utilize technology to contribute to the growth of the creative arts.

We are also very fortunate that under this Administration there has been a chapter included in

the Philippine Development Plan 2017-2022. We have two specific desired outcomes: Stimulate innovation through R&D and bottom-up innovations, and technology adoption and promotion. In the past, the science and technology community were just doing R&D without caring whether the results will be used or transferred for useful purposes. Now we translated PDP and also the agenda of the President into our own agenda in DOST. These were the outcomes that we have identified:

- Innovation stimulated
- Technology adoption promoted and accelerated
- Critical mass of globally competitive STI human resources developed
- Productivity and efficiency of the production sector and MSMEs improved; and
- Resiliency to disaster risks and climate change ensured. A big portion of our R&D money is being devoted to research covering disaster risk reduction and climate change adaptation.
- Effective Governance

These outcomes have something to do with our effort to expand our R&D pool to cover those research centers in the regions, particular with universities. For a long long time, we have not really included them in our activities by way of supporting them with research grants. But there is really a big improvement in terms of the capabilities of these research centers in the regions. We have identified what we call niche research centers in the regions, particularly those devoted to very specific commodities.

As a department that practically covers all line agencies when it comes to R&D and technical services, we were mandated to come up with a Harmonized R&D Agenda 2017-2022, and we did this through consultation and participative planning. Agriculture has the longest list in terms of harmonized agenda because it covers many sectors. But we have to make it clear that we are not the extension unit when it comes to agriculture. We have the outputs of research but we are not in the position to roll it out down to the level of the farmers. It's the responsibility of the Department of Agriculture (DA). For livestock, our work includes breed development, vaccines, biologics, and diagnostics development. We are focusing our attention to native livestock. For fisheries and aquaculture, our work covers applied genomics, culture systems, and new cultivable species for culture. Forestry is very important, particularly the development of sustainable management and practices, development of high-yielding varieties, and development of protocols for propagation of



quality of timber and non-timber planting materials. Under natural resources, we have research intended to preserve and protect our biodiversity, as well as our soil and water. These are done through PCAARD funding researches by different agencies.

Under agriculture, drug discovery and development is top priority because of the richness of our biodiversity which can be the source of medicines, and also of active ingredients that can be developed later into medicine. Other priorities in health include the development of functional foods, hospital equipment and devices, the use of ICT for health, nutrition and food security, and health aspects related to climate change adaptation and disaster risk reduction.

Now in industry emerging technologies, there are researches that are directed towards countryside development, those intended to develop competitive industries, researches devoted to renewable energy, and related research involving energy storage. We have also a basic research agenda this is covered by NRCP, the only council which gives grants to individuals. Their agenda relates to water, food, health, energy, sustainable communities, and, in general, re-engineering the Philippines towards inclusive nation-building.

S&T FOR AGRICULTURE

We have developed a system called Smarter Approaches to Reinvigorate Agriculture as an Industry in the Philippines (SARAI). This uses technology, ICT and even artificial intelligence to guide our farmers and even the corporate producers in the area of agriculture.

There is also an ongoing research on the breeding of true-to-type of native chickens, ducks and pigs. We have adopted techniques to develop the pure lines of native ducks, pigs and chicken. What is significant about this? First of all, they are quite sturdy breeds, resilient and will be resistant to climate change. We can also expect more uniformed sizes and quality of eggs, and a higher yield in terms of the number of eggs that can be laid. So it is now capable of producing 260 eggs per duck per year.

We have a project involved in the establishment of seed orchard for industrial tree plant species,

because there are specific species of trees that are recommended for our greening program.

Now specific to coconuts, we have devoted a substantial part of our resources to coconut research, which has been long neglected. Some of our ongoing researches under the genomics program include:

- Whole genome sequence and assembly of Philippine heirloom varieties Catigan Dwarf and Laguna Tall varieties are now publicly available at the National Center for Biotechnology Information (NCBI)
- Enhanced Coconut Somatic Embryogenesis Technology (CSet) for the mass propagation of coconut. In our current technology, we can produce 200 plantings in one mature coconut. The problem is trade off, because in the usual method you get 3 per one coconut and it takes a short time, but in the tissue culture technology, you can get 200 plantings in one mature coconut but you have to wait as long as 18 months for it to be ready for planting. But even then, this is also very good not only for the quantities but also for the quality of planting material.

RESEARCH ON HEALTH

Now in the research on health, as I said earlier, our priorities are drug discovery, adapting ICT in health, malnutrition reduction, and R&D on food fortification. Sad to say, the Philippines still has the highest incidence of malnutrition in the ASEAN (region). So this malnutrition reduction program is important to us, therefore we produce products that are intended to address malnutrition. Many of these products are already consumed in public schools

When we started the research in drug discovery in 1980s, it was only UP Manila that was involved, but today there are around 11 universities all over the country that are involved in our Tuklas Lunas Program. And 3 of the 11 are now involved in the clinical trials. We have collected around 1,700 different species and about half of them have already gone through extraction processes. And out of those there were already 28 that have been identified to have direct use as medicines. Our classic example is lagundi. This was the first one that was commercialized. Royalties from this has gone into 7 or 8-digit levels after lagundi hit the global market.

Another track in drug development is instead of going to the clinical studies, which can be very costly, some of the extracts can already go through bioassay guided isolation, purification and structure elucidation. This now will become the bioactive heats. It will only require synthesis, and this will already be attractive to drug companies and manufactures. They can be the ones to proceed with the clinical trials. We can already have economic benefits out of the bioactive ingredients that we are able to isolate.

So these are the two tracks for drug discovery, and we are very inspired that many local private companies have expressed interest.

We have helped established the Bioactivity and Toxicity facility in support of this Tuklas Lunas program. So we are strengthening facilities in the universities particularly who helped us in our research program. These are some key areas with partnership with the private sector as far as this program is concerned:

- Share facilities
- Partners in R&D phase for discovery of herbal drug candidates/ drug leads
- Early licensing/partnership for development of herbal drug candidates
- Licensing products after pre-clinical development
- Co-funding of clinical trials
- Licensing/co-funding of drug leads for preclinical development

DOST'S SPACE TECHNOLOGY PROGRAM

One of the ongoing researches are on space technology. There are 10 members of ASEAN, and five of them have tech development programs and space agencies: Singapore, Thailand, Malaysia, Indonesia and Vietnam. We should have one. We launched the first micro-satellite Diwata 1 in April 2016, still under the previous DOST Sec. Montejo who led this particular project. We will launch Diwata 2 by mid-2018 with much improved features and cameras which will have the capability to be used as means for communication. We have a bill pending in Congress and Senate to create the Philippine Space Agency. So what is the importance of this? To have increased knowledge for use, not only in disaster mitigation but also in agriculture, forestry monitoring, maritime application and other value-creating endeavors. Of course, I should mention national security.

DOST FOR DISASTER PREPAREDNESS

We have taken advantage of this remote sensing technology (Light Intensity Detection and Ranging (LIDER)). It's a technology in UK that we adopted, which we even improved on. This is mainly for the information on hazardous areas, so we have produced maps for 257 river basins, 351 agricultural land cover maps, 357 coastal land cover maps, 488 forest maps, 135 river basins that were processed, and we turn them over to local governments.

Disaster preparedness covers weather forecasting, the development of sensors, so you will notice there we have installed something like 1,000 automated rain gauges, stream gauges, weather stations... these are now locally fabricated. And then the flood inundation

maps; before we only know typhoon signals, now we have rain signals on the volume of rain. We are now being asked to come up with flood signals.

Landslides are also very important hazards to monitor. Storm surges, and even the calculation of populations that will be exposed to a particular risk has to be determined. Other ongoing researches include the use of new emerging technologies such as on Sea Worthy Vessel Safety Systems, Space Technology, Artificial Intelligence and data science program, and we have work on fabrication of solid state rechargeable batteries and supercapacitors.

ON INNOVATION DEVELOPMENT

You know, artificial intelligence has been there for a long time. Unfortunately, it is only now we are starting our research on AI, and we have started training people. People are saying that technology will displace a lot of workers such as in the BPO sector, but what should we do then? We cannot just wait until people are displaced. We have to train and re-train people. We need to participate in this new development which may benefit us economically.

We are currently faced with the challenge now on how to apply technology to our creative industries. We have started with animation and game development, on furniture and jewelry design, and even Filipino music and arts. But we need good proposals here. We have built electronic design center within DOST Bicutan to help our small electronics companies to do their prototype development because it's costly to have prototype facilities. We can share this facility with them.

Finally, we have started the introducing innovation development in the different regions. We started with food innovation centers. We have now 13 food innovation centers in different regions, mostly based in universities which have food technology academic programs. And this is where they develop new processed foods. You will be surprised in a year more than a thousand innovative food products have been developed in this regional food innovation centers. We equip them with the basic food processing equipment that are difficult to acquire if you are a small enterprise. At least the food innovation and development can be done there. If you want to mass produce then later on we can help you in that aspect.

In manufacturing, we have work on industrial biotechnology, textile, metals & engineering, and renewable energy including the use of analytics to improve systems for energy efficiency and conservation. We have a program to establish a facility that will provide portable type module testing and certification needs. This is where my Undersecretary in Research and Development is heavily involved now: collaborative research and development to leverage PH economy. This is our incentive to companies to partner with the universities for research proposals, because the researchers from the academe have a different agenda in doing their research proposals. Industry have

their own objectives. Now we are trying to force them to work together because we would like to optimize the use of resources and if they partner together, come up with a proposal that is within our priority, we will top-up their resources with a bigger amount.

We are also encouraging businesses to set up their research facilities. So we have been heavily involved in helping companies to upgrade technology by enabling them to acquire hardware and software. We do not call it a loan, as we provide the funds for the purchase but the title to the equipment belongs to DOST. They will have one year grace period, repay for 3 years without interest and then we transfer the title to them. Now on scholarships, we have around 22,000 scholars, and we will award probably 5,000 to 6,000 new scholarships following the new No Tuition Fee policy which will free up some of our money here and we can get more scholars and support with monthly stipends.

Now we do have a program that will assist the researchers cross the difficult stage from prototype to commercial, what we call in research as the death valley. Translating from laboratory to actual. We have now 13 technology business incubators being supported by DOST for start-ups, and we announced last two Fridays ago, an additional 20 whom we will support for start-up business incubation activities. Again, spread all over the country. We have 85% success rate here which is already good enough.

Our goals in science and technology can be achieved must faster as investment in our country grows and as more technology-based companies locate here. The science and technology human resources we are developing here will have more opportunities right here in our country. We try to catch up and develop



The Makati Business Club invites guest speakers to its General Membership Meetings and MBC Briefings to discuss public issues and trends, whether local or global, that have an impact on Philippine development. MBC Forum highlights the speeches and discussions at these gatherings. The full text of speeches and other presentations may also be found at the MBC website, www.mbc.com.ph.

more people in science and technology sector but if the opportunities are not here they will look for other opportunities.

In conclusion, let me just reiterate what I have been saying in all fora where I participate. I already mentioned the desire of the President to reduce inequality, so it is always in our minds when we do our programs. The second one is to create new opportunities, and the last one is to expand our potentials for growth. So these are the guiding messages that we always keep in our minds when we do our programs. ■

Excerpts edited by
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Q&A

Moderated Panel

I would like to ask how the private sector can enter the medical marijuana and the industrial hemp which is the highest value, I think, crop in the world?

In the case of medical marijuana, we are still waiting the policies that will cover this. If there is any research area where DOH and DOST will agree on then that will be the only opportunity that will have to be involved. On the other hand, if you're talking about business opportunities in hemp, we will research on that,

Does DOST have a program to attract Filipino scientists abroad to come back and help in our new programs?

The Balik Scientist Program started in 1977, and there was a lull period between 1983 to 1993. Later on it was resumed and we have been attracting anywhere between 30-40 BS a year. So there is now a piece of legislation in the Enhanced Balik Scientist Program that provides, among others, improved benefits for BS but more than that waiving so many bureaucratic requirements hindering him to come home. For example PRC would require them to be license in the PH because they can work here. Or the visa requirements - there is even a requirement if you are a dual citizen if you come back you have to renounce the other citizenship. These are discouraging our batik scientists, and these are the things addressed by the new bill which has passed Senate on its 3rd reading last November 20, and it has passed Congress 3rd reading a month before. Hopefully it will be a law very soon. ■