

# Hallmarks of a Genuine Scientist: An Inspiration and Example of “Paying it Forward”

by Leopold L. Ilag\*



“**T**here is no such thing as barren soil, only barren minds” ... inspiring words from his father which continues to resonate in the heart and mind of Academician Professor Romulo G. Davide of Argao, Cebu. Born to Hilario P. Davide Sr and Josefa L. Gelbolingo, he is the 5<sup>th</sup> of 7 children. His younger brother went on to become a Chief Justice of the Supreme Court of the Philippines. Rebuilding from the aftermath of war, his humble childhood rooted him to be mindful of the plight of the poor. He exemplifies the inspiring example of an accomplished scientist who makes his craft matter and hands them down for the success and prosperity of his fellow men.

Dr. Davide started his scientific career during an exciting period in the history of science when the structure of DNA was determined less than ten years before he began his PhD. He pursued an MSc in Plant Pathology from Oklahoma State University which was followed by a PhD in Nematology-Plant Pathology from North Carolina State University. During this time he had a chance to attend a lecture by the famous Nobel laureate James Watson. He is quick to point out, however, that more than his graduate degrees, he is very proud of having been a student laborer at the UP College of Agriculture during part of his undergraduate studies at the University of the Philippines

\* Department of Analytical Chemistry, Stockholm University, Sweden  
Email: Leopold.Ilag@anchem.su.se

Los Baños (UPLB) where he obtained his BS Agriculture degree in 1957. Having supervised more than 150 undergraduate and graduate students, his most notable contributions to science are his pioneering work on plant diseases caused by nematodes and their appropriate biocontrol.

He is often referred to as the “Father of Philippine Plant Nematology” by his colleagues in recognition of his more than a hundred scientific papers on studies of Philippine plant parasitic nematodes attacking economic crops like banana, pineapple, citrus, vegetables and others that have been published in scientific journals here and abroad, particularly in the U.S.A. and Europe. His book on “Studies on Nematodes Affecting Bananas in the Philippines”, published in 1992 (175 pp) is a foremost reference for scientists and employees of banana companies in the Philippines and abroad, particularly in South America. It is a handy reference for students and professors of Plant Pathology in the agricultural colleges of State Universities and Colleges. To help farmers identify plant diseases caused by nematodes, Dr. Davide published a bulletin on “Nematodes of Philippine Crops and their Control” (1972, 34 pp). He also co-authored a bulletin on “Fungi for Biological Control” (1975, 53 pp)

His primary interest was in understanding the nematode life cycle and to this day he still stresses the intriguing aspect of elucidating the details behind the capacity of some nematode species that can remain in a dormant state for years, like the wheat gall nematode, *Anguina tritici*, which has been observed to survive after 28 years of storage at room temperature and



Scientist Romulo G. Davide and his wife, Dr. Clara L. Davide, for whom a new *Mussaenda* hybrid, *Mussaenda* 'Clara L. Davide', one of UPLB's Centennial *Mussaenda* hybrids (right photos) was named by the late plant breeder Dr. Monina Siar and the Institute of Plant Breeding, UPLB, in recognition of their outstanding work in helping poor farmers improve their agricultural productivity through the FSTP training program and make them progressively prosperous.

humidity in a US Department of Agriculture Nematology Laboratory in Salt Lake City, Utah (Fielding, 1951).

He considers as one of his most important contributions to the science of Nematology his discovery and study of a marine nematode causing a gall disease on the brown alga, *Ascophyllum nodosum*, in Cork, Ireland (1976-1978). The nematode was first reported in England by Barton in 1892 and was identified as *Halenchus fucicola*. Since then there has been no thorough study on the life history and biology of the nematode. Dr. Davide felt that this was a challenging problem to study, especially since *A. nodosum*, when mixed with soil, is used as an organic fertilizer to potato plants by Irish farmers. This then became part of his post-doctoral studies at the Department of Botany, University College, Cork, Ireland. He was able to describe the distinguishing characteristic parts of the nematode body as well as the different stages of growth of the nematode life cycle inside the gall tissues of *A. nodosum*, the host plant. His paper on this study was published in the scientific Proceedings of the Royal Dublin Society (Series A, vol. 6, No. 13, pp 385–395, 1980) at the time when he joined his wife, Prof. Clara L. Davide, while she was doing her PhD in Dairy and Food Technology at the National University of Ireland, University College, Cork, Ireland.

He established himself at UPLB with his work on biocontrol

of nematodes as he assumed the post of Assistant Professor of Plant Pathology in 1966. During this time, the thrust was on utilising nematode-trapping fungi. These are microbes widely found in soil and comprise a motley group distinguished by the types of traps they produce. Two major types are the adhesive rings and the constriction rings. As described in *The Friendly Fungi*, a book by C. L. Duddington, 188 pp, 1956 London (see also

<http://www.uea.ac.uk/bio/joyoffungi/nematodetrappingfungi>), the former is considered the simpler form being made up of adhesive knobs onto which nematodes stick. These adhesive structures can become elaborate branches formed from recurved hyphal tips. The constriction rings are similarly formed but are non-adhesive. The mechanism by which they constrict involves the apparent mechanical activation (lumen rupture caused by the nematode) of G-protein signalling which facilitates calcium entry into the cytoplasm, causing activation of water channels by activated calmodulin thus inflating the ring and trapping the nematode. All this happens within a fraction of a second upon nematode invasion. Years were spent looking for that silver bullet of a fungus that can control nematodes. However, screening these fungi never yielded any strong candidate.

On the occasion of the First International Symposium on Biological Control of Plant Parasitic Nematodes held at the

International Potato Research Center (IPRC), Lima, Peru, in 1986, one of the leading nematologists, Dr. Parviz Jatala of IPRC, gave an exciting paper about their studies on the biological control of plant parasitic nematodes by fungi. Coupled with his readings from Dr. C. L. Duddington's book on fungi, Dr. Davide saw a light bulb flash in his head and realized this may be the new path to tread – focus his investigations on the friendly soil fungi as potential biological control of plant parasitic nematode. After years of discussions, collaborations and serious research work with his major students, he identified what would become THE ONE!. Sixteen years of hard work resulted in the discovery of the fungus, *Paecilomyces lilacinus*, isolated from Philippine soil, that parasitizes eggs, larvae and adults of plant parasitic nematodes. This led to the development of BIOACT, the first Philippine biological control product containing *P. lilacinus* against nematodes affecting citrus, banana, pineapple, potato, rice and other crops.

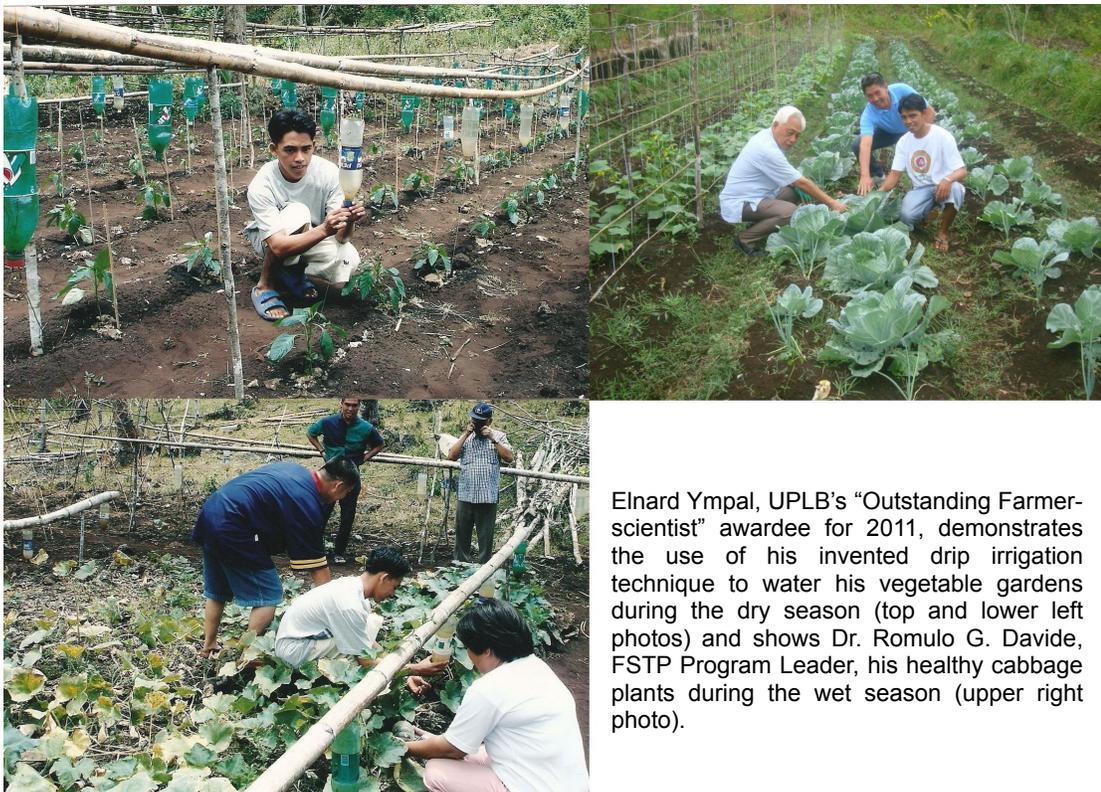
Unfortunately this success story was slightly clouded by the fact that during this time and since then, there has been no support structure for protecting intellectual property rights to benefit the university, nor the inventor. The case of BIOACT is reported in a STAR SCIENCE article, “Patenting Academic Research”, by Lawrence L. Ilag, PhD, JD, published in the Philippine Star (March 24, 2005). *“In the 1970s and 1980s, a university faculty member, with the help of graduate students, developed an environmentally friendly method of controlling plant parasitic nematodes. This invention generated a lot of*

*interest abroad. Its market was even estimated to reach \$87 billion. Owing in part to the university's unfamiliarity with patent laws, the university transferred its interests in the invention to outside groups. The technology was refined elsewhere and is now patented, with the university having no patent rights in the invention.”* As this issue has been raised, the University now has a pending agreement that would finally allow royalties to be paid to UPLB.

Not to be deterred or disillusioned, the unassuming Dr. Davide who was never galvanised by economic gain or external recognition, continued to do good science. He went on to discover other economically important nematodes that could be controlled by BIOACT. These include *Meloidogyne incognita* that attacks tomato, eggplant, potato, ampalaya, okra and others; *Radopholus similis* that attacks Cavendish banana; *Tylenchulus semipenetrans* that attacks citrus; and *Rotylenchulus reniformis* that attacks pineapple and others. He discovered at least 9 species of nematodes that attack economic crops in the Philippines.

For his numerous scientific achievements, Dr. Davide has received 47 significant national and international awards and citations. These include the ASEAN Achievement Award for Research and Development from the ASEAN Business Forum in Bangkok, Thailand in 1993; the Jose Rizal Pro Patria Gold Medal Award and Presidential Citation as Outstanding Agricultural Scientist from the Department of Agriculture and

former President Fidel Ramos in 1994; the Outstanding Scientist Award in Nematology and Plant Pathology from the Department of Science and Tech., Region 7 in 1994; the Recognition Award for Outstanding Contribution to Agricultural Development in Asia from the Asian Agricultural Research Development Fund Ltd Hongkong in 1995; the Concepcion D. Dadufalza Award for Distinguished Achievement from the University of the Philippines Diliman in 2002; and the Distinguished Award in Agriculture, given by the Gamma Sigma Delta International Society of Agriculture in 2007. He was elected member of the National Academy of Science and Technology



Elnard Ympal, UPLB's "Outstanding Farmer-scientist" awardee for 2011, demonstrates the use of his invented drip irrigation technique to water his vegetable gardens during the dry season (top and lower left photos) and shows Dr. Romulo G. Davide, FSTP Program Leader, his healthy cabbage plants during the wet season (upper right photo).

Philippines in 2002; was a member of the Board of Regents, the highest policy-making body of the University of the Philippines from 2005-2009; and is now Professor Emeritus at UPLB.

Not to rest on his laurels, he initiated what is known as the Corn-Based Farmer-Scientists RDE Training Program for Sustainable Agriculture Development (FSTP). This is an innovative endeavor that was initially funded by a P500,000 grant that Dr. Davide received as part of his 1994 Gawad Saka Outstanding Agricultural Scientist Award. It was established as a cooperation among different government and non-government agencies targeting poverty and hunger reduction among small Filipino farmers. The premise is that farmers are smart individuals who by themselves can become scientists implementing the rigours of experimentation to arrive at useful conclusions with the guidance of scientists. This is based on the practical definition of “What Is a Scientist?” (author unknown) lifted by Dr. Davide from the American Scientist Journal in 1964 while he was working for a PhD degree at North Carolina State University at Raleigh. It says “He watches things. He reads. He finds out how things work, and how they can be made better. He wonders. He experiments. He finds out what is true. He sees that wonderful things do indeed happen.” The FSTP has three phases. These are: Phase I – Value formation, research exposure, and technical empowerment; Phase II – On-farm experimentations and technology adoption; and Phase III – Farmer-to-Farmer technology transfer and adoption. Their graduation is confirmed by the Dean of the UPLB College of Agriculture and the Dean of

the Regional University where the farmers are residing, making them alumni of those universities and giving them dignity as farmer-scientists.

Impressive results have come out of this effort with farmers gaining success on their own. For instance, farmer-scientist Elnard Ymbal of San Juan, Siquijor, independently discovered for himself what to most is known as drip irrigation, commonly used in Israel. As cited in his award from UPLB as Outstanding Farmer-Scientist last April, 2011, “Ymbal discovered a unique and innovative drip irrigation technology by using hanging plastic bottles filled with water and provided with coconut midribs as drip water regulator and strings as water line passage above each individual plants to water them during the dry season.” With his invention, Ymbal generated an income of about P8,000 from sales of vegetables in his 800 sq m. garden plots. Where other farmers cannot grow vegetables during the dry season, Ymbal enjoys high yield and good price for his vegetables using his invention. Another Outstanding Farmer-scientist UPLB awardee was Cirila Cuyacot from Barangay Imelda, Ubay, Bohol, who discovered sea water as “fertilizer” to peanut plants that opens a new field of research studies. She had no definite income before her FSTP training; however, applying her FSTP-developed technology, now she gets more than 50% increase in her peanut yield with an annual income of more than 100,000 pesos in 2010. She still conducts more studies on the volume and rate of sea water application. Both Ymbal and Cuyacot are models of FSTP-trained farmers to be emulated by



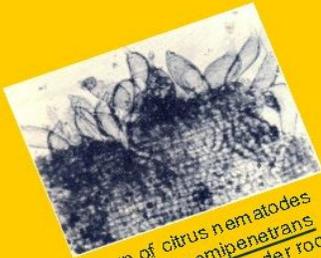
Lands that poor farmers previously thought rocky and barren now show that corn planted on them can grow luxuriantly using the scientific agricultural technologies they learned from their FSTP training initiated by Dr. Romulo G. Davide (right in upper photo).



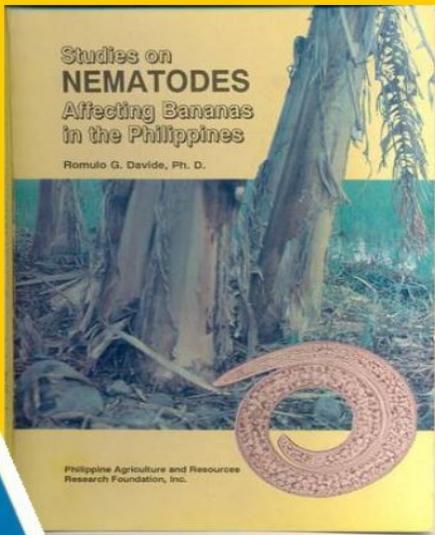
Curious farmers learn to recognize a diseased corn plant as Dr. Romulo G. Davide (left in both photos) describes the characteristics of the fungal leaf spot disease in corn. They also learn the technique of isolating the fungus into sterile potato-dextrose agar plates.



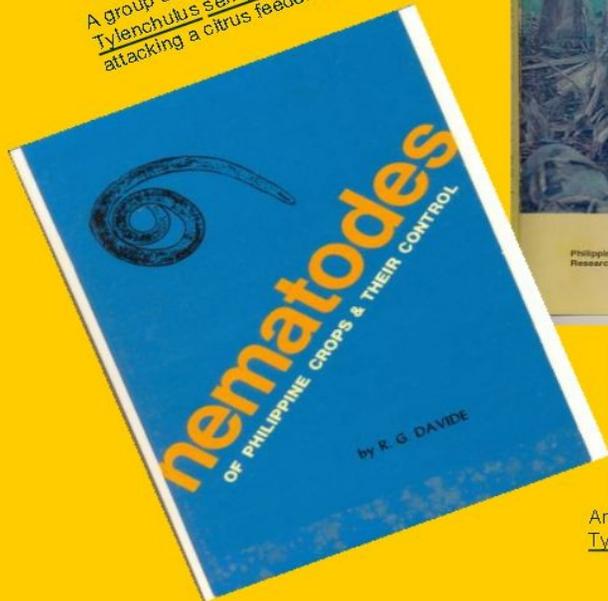
Books on nematology authored and co-authored by Dr. Romulo G. Davide that serve as practical and excellent references for diseases of plants caused by nematodes.



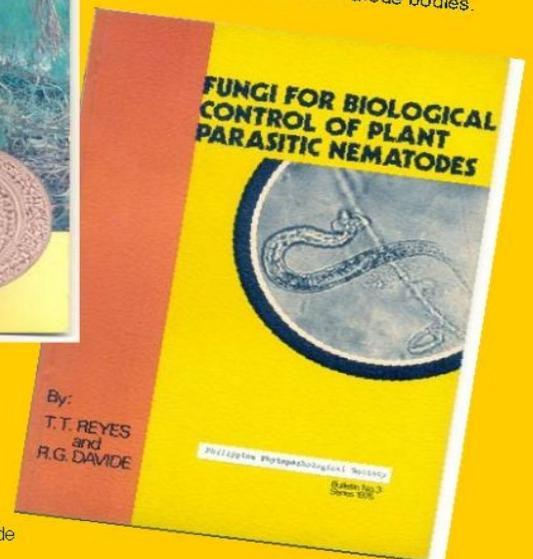
A group of citrus nematodes *Tylenchulus semipenetrans* attacking a citrus feeder root.



Two adult *R. similis* nematodes parasitized by *P. lilacinus* mycelia around the nematode bodies.



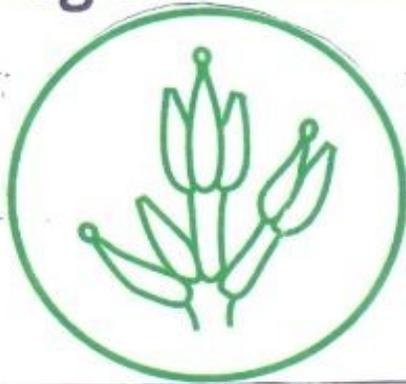
An adult female citrus nematode *Tylenchulus semipenetrans*.



# BIOACT® WG

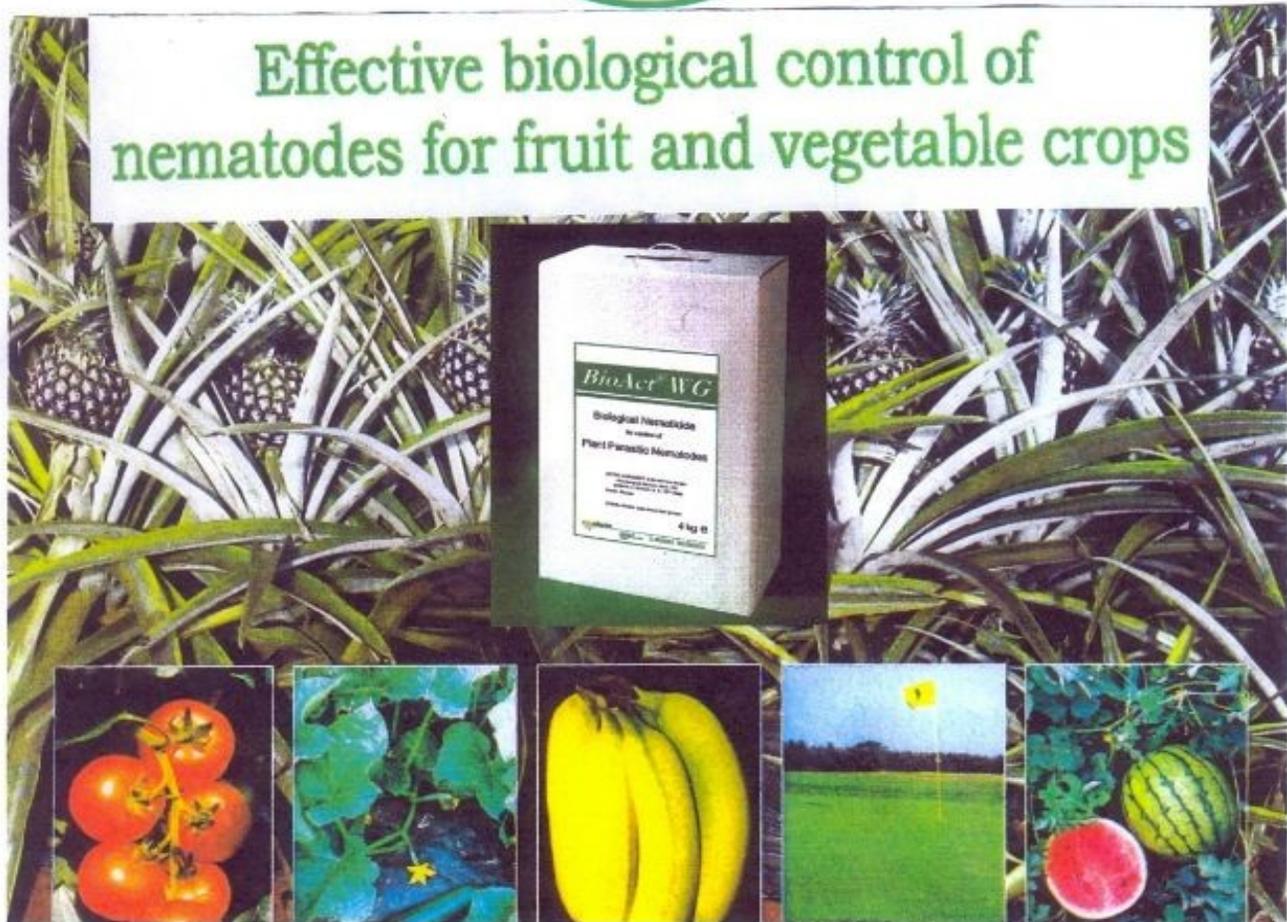
## Biological Nematicide

- ✓ Effective
- ✓ Safe to use
- ✓ Environment-friendly



- ✓ Non-toxic
- ✓ Non-chemical
- ✓ No accelerated resistance

Effective biological control of  
nematodes for fruit and vegetable crops



BIOACT is the trade name of the first commercial biological nematicide developed by Dr. Romulo G. Davide and associates at UPLB for the control of plant parasitic nematodes that attack economic crops. It consists of a spore concentrate of the fungus *Paecilomyces lilacinus* isolated from Philippine soil.

other farmers. Indeed cultivation of the mind should come first, ahead of the cultivation of the soil, as Dr. Davide believes.

An economic survey of more than 1,000 FSTP-trained farmers in Cebu within two years after their completion showed that their total average annual income of P9,534,840 before FSTP became P20,692,415 after FSTP, or an increase of 117%, mainly derived from their sales of surplus corn plus intercrop products such as vegetables and fruits and a few poultry and livestock products as well. Evidence also showed that some of them have replaced their nipa huts with new concrete bungalows, including a refrigerator, or TV set. Dr. Davide observes that whereas before most farmers used to walk kilometers by the hours, just like what he experienced during his childhood days, now they could purchase motorbikes or multicabs for a faster travel while some others could now send their children to college. It is very evident that the farmer-scientists no longer live in poverty and hunger.

There are now more than 30,000 poor farmers scattered in Cebu, Siquijor, Negros Oriental, Bohol, San Jose, Oriental Mindoro, and Laak in Compostela Valley Province who have been trained by Dr. Davide and his FSTP team and who are on their path to prosperity. Yet more poor farmers are undergoing training since FSTP is now being implemented as a National Program under Executive Order No. 710 since 2008. Dr. Davide, as the FSTP Program Leader, is very happy about its nation-wide coverage since it will enable him to reach out to our poorest of the poor farmers. He feels that farmers, being the producers of our country's food, have no right to remain poor and that, whatever new and better agricultural technology that scientists have learned or produced, should reach them. Thus FSTP is now a joint program of DA, DAR, DENR, DOST, UPLB, CHED, DILG-LGUs and NGOs, with DA-ATI as the lead agency and UPLB as the Center of Management and Operation. Pilot FSTP municipalities are now in place in the 10 regions of the country, in Luzon, Visayas and Mindanao, with most FSTP-trained farmers being engaged in the business of farming and becoming progressively prosperous. Also, a number of our indigenous people, like the Blaans of Alabel, Sarangani in Mindanao, and the Mangyans of Mansalay, Oriental Mindoro, are now undergoing FSTP training and are proud to become farmer-scientists producing enough food for themselves.

In an article by Zac B. Sarian published in the Philippine Panorama (2009), FSTP has been recognised as having

contributed in a big way to lifting Argao from a 5<sup>th</sup> class to a 1<sup>st</sup> class town in 2006 where farmers' family incomes have soared from 5-10K to 100K and Internal Revenue allotment rose from 18.72 million pesos in 1996, to 51.5 million in 2006 and to around 70 million in 2009.

More than the economic gain, the key to what makes this whole program successful is in the value formation component. As a man of deep Christian convictions just like distinguished scientists before him, such as Boyle, Pasteur, Kepler and Newton, showing how faith and reason go hand in hand, Dr. Davide took a step further and recognized how certain values are essential in order to provide sustainable improvement in the lives of the farmers. Inspired by his favorite verse: Matthew 7:7 "Ask and it will be given to you; seek and you will find; knock and the door will be opened to you", he in turn has changed the lives of many. Dr. Davide mentions his formula for motivating the FSTP farmers to become rich as follows :

#### **KKAA + FSTP + MERKADO = PUGOS UG KADATO**

K = Kogi (Sipag/hardwork), K = Kusog (Lakas/strength), A = Antos (Tiis/sacrifice), A = Ampo (Dasal/Prayer). FSTP (Farmer Scientist Training Program); Merkado = Market and "Pugos ug kadato" = "Forced to become rich"

More than the awards, a true testament to a genuine scientist-leader is the list of accomplished students one has helped form and encourage to move on and make a difference themselves, paying it forward. Dr. Davide has mentored a number of people; the most prominent have become professors; deans of colleges/ graduate schools; directors of research institutions/consortia; R&D directors/managers of big plantation companies; and leaders in their own fields.

He started off choosing plant pathology as a course because he was not good at technical drawing necessary for fields such as entomology. Fortunately for him, the lack of talent in drawing didn't matter when he had to draw diseased plants. Dr Davide has chosen his path well, a path forged by hard work, a quick and ready mind, and a passion to make his science matter. He has shown how a scientist from humble beginnings has nurtured the support he received from others and has paid it forward, helping thousands of students and poor farmers share in his science and be scientists themselves in order to gain a brighter future. **PSL**