LINKS TO INDUSTRY

Counting on Technology for Help Up the Economic Ladder

D. NORMILE

Pulp fact. Ernesto Lozada milks low technology to help coconut farmers.

LOS BAÑOS, THE PHILIPPINES—The coconut-oil processing plant chugging away on campus is decidedly low-tech: It first dries and grinds the coconut meat and then presses the pulp to extract the milky-white oil. Yet its simplicity is what most pleases the machine's developer, Ernesto Lozada, dean of the college of engineering at the University of the Philippines, Los Baños. Local machine shops can make it, and workers can learn quickly how to operate it. Most importantly, the 15 agricultural cooperatives that have set up similar mills over the past 2 years now have an alternative to selling their raw coconuts to giant international traders. And selling a processed product could put more money in farmers' pockets.

Like it or not, the farms, factories, and businesses here and across Southeast Asia are increasingly knit into a global economy. And they will have to climb the technology ladder to compete successfully. That requirement is driving the steady rise in government spending on R&D throughout the region. "We realized that we needed to move into improving the interface between research and the private sector, to support the thousands of small and medium-sized companies that provide jobs and fuel the economy," says Tan Sri Omar Abdul Rahman, science adviser to the prime minister of Malaysia. "And government has to play a bigger role in a developing country," he adds. "Without that push, we would still be planting rubber trees and digging for tin."

In drawing up their R&D portfolios, government officials want to strike the right balance between applied and basic research, in particular between a desire by researchers to do world-class science and the country's need to develop technology appropriate to local industries. And despite an urge to rush into the 21st century (see sidebar on p. 1481), their starting point is usually the region's natural resources.

Lozada's coconut-oil mill is just the latest in a string of improvements in process manufacturing from his lab. In each case, his goal is to put local producers on the first rung of the technological ladder and to teach farmers and factory hands that technology is a tool for adding value to their raw materials and products. "That culture has not been brought [home] to us," he says.

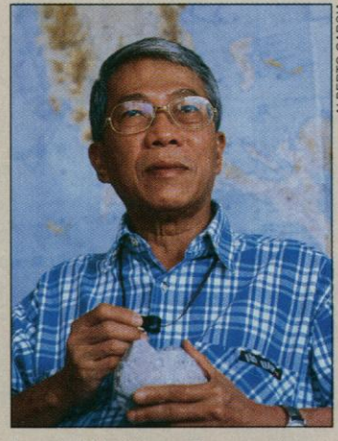
In Indonesia, the idea of applying science to solve economic problems began with a modest request from the president for the nation to become self-sufficient in rice, recalls geologist John Katili, recently retired vice speaker of Indonesia's Parliament and a former director-general of the Department of Mines and Energy. Its success, he says, "made

Shaking Up a Seismology Institute

QUEZON CITY, THE PHILIPPINES—In a sense, Raymundo Punongbayan spent nearly a decade preparing for the 1991 eruption of Mount Pinatubo. And when it blew—in one of the century's biggest volcanic events—Punongbayan and the Philippine Institute of Volcanology and Seismology were ready.

In the old days, staff members at the forerunner of what's known as Phivolcs recorded changes in geologic conditions "without trying to understand the underlying processes," says Ernesto Corpuz, the institute's chief monitoring scientist. But that passivity disappeared when Punongbayan became director in 1982. Soon, staffers were headed overseas for advanced degrees—Punongbayan was the only one on the staff with a Ph.D., which he received from the University of Colorado, Boulder, in the early 1970s—and research was part of every scientist's job description. In addition, Phivolcs was no longer a lonely outpost atop one of Earth's most active faults: Scientists were arriving from all over the world, bringing the latest techniques and equipment. "Now we try to relate [what we see] to what is going on beneath the ground," says Corpuz.

When Punongbayan, 60, left the University of the Philippines, Diliman, to take charge of Phivolcs, he promised "to deliver what we're supposed to deliver," referring to the institute's mission to keep tabs on the country's two dozen or so active volcanoes and other seismic activity. In early 1991, when Mount Pinatubo began rumbling, Phivolcs's staff could see a big one coming. However, with limited instrumentation on hand, Punongbayan turned to the U.S. Geological Survey (USGS) for help. As its understanding of the precursor events increased, Phivolcs repeatedly enlarged the size of the area that it recommended be evacuated, eventually to a radius of 30 kilometers. That advice saved thousands of lives when Pinatubo exploded on 12 June.



ALBERTO GARCIA

Irresistible force. Raymundo Punongbayan aims for world-class science.

Although USGS scientists have received much of the credit for their work, Chris Newhall, a USGS volcanologist at the University of Washington who headed the USGS team, insists it was a joint effort. "The truth is, neither team could have done it by itself," he says. "[Punongbayan] has really done quite a remarkable job in turning Phivolcs from what was a small, sleepy bureau that did no research at all into a very active group."

Since Punongbayan's arrival, six staffers have earned Ph.D.s and 10 more are pursuing advanced degrees. He hopes their training will enable the institute to take advantage of the natural laboratory under its feet. "This is one field where I think Filipinos can excel and be recognized internationally." –D.N.