Pamela Ronald, a molecular biologist with an active conscience and a talent for juggling the genes in plants, has given the Western world an imaginative push toward dealing more fairly with undeveloped nations.

For decades, industrialized nations have sent their scientists foraging through the fields and forests of Africa, Asia and Latin America in search of exotic plants that might prove useful for medicine and agriculture.

Native healers and farmers have long shared their traditional knowledge, which in scientific hands yielded new drugs and improved crops. Only recently have developing countries begun to seek to share the wealth that development of their natural resources can yield.

This is an issue that Ronald, a 36-year-old associate professor of plant pathology at the University of California at Davis, has thought a lot about. Her husband is an organic farmer in the fertile Sacramento Valley near the Davis campus, so she knows the chancy nature of cultivating crops where pests and disease can ruin an entire growing season.

"Even when I was a graduate student in Berkeley," she said, "I was aware that plant people can take as long as 10 or 15 years to breed crops to withstand even a single disease. And I also knew that many of the plant varieties the seed companies use to develop better hybrids come from Third World countries.

"Yet farmers in those countries hardly ever see any return for their contributions, while the scientific plant breeders can patent their new hybrid varieties and profit from them."

So four years ago, when Ronald set up her laboratory at Davis to clone plant genes, she knew what her goal would be. She would focus on genes that would help increase food production, renew the genetic diversity of crops and reduce the use of pesticides and herbicides.

"When you clone a gene," Ronald said, "it becomes 'intellectual property' and you can patent it. But ownership of a patented gene -- or an entire plant -- is problematical, and to me, working on the genes of crop plants, it seemed pretty natural to ask myself what that should mean. It ought to mean getting a share in the ownership for everyone involved, including the people of the countries where the genes come from."

Nearly two years ago, Ronald and her colleagues had a chance to put her ideals into practice. They succeeded in isolating a single gene from a variety of rice plants that endows them with resistance to a devastating plant disease called bacterial leaf blight, which is caused by a bacterium called Xanthomonas
Rice is the staple food for people in the developing world, and at least half of the world's rice crop is lost every year to attacks by bacteria, fungi and viruses. Pesticides -- which are often too costly for farmers -- lose their effectiveness as their use increases.

Ronald isolated the blight-resistance gene from a rice variety that is cultivated in the West African country of Mali. This was a remarkable achievement in genetic engineering considering that scientists at the International Rice Research Institute in the Philippines had been studying its genetics for 20 years.

When Ronald and her laboratory colleagues showed that the blight-resistance gene could be engineered into other varieties of rice so that all their offspring would inherit resistance to the blight, they knew they had made a valuable discovery.

UC officials quickly patented the gene as intellectual property, and began negotiations to license the discovery to American seed companies that hope to market the newly resistant rice seeds worldwide. Under established UC policies, royalties from the licenses would be shared among the university, the chancellor of the Davis campus, and the "inventors" -- meaning Ronald and her colleagues.

But with guidance from John Barton, a law professor at Stanford University with a long-standing interest in legal problems involving intellectual property rights and developing countries, Ronald pursued a novel idea: The royalty money that might be earned, she reasoned, should be shared with the people of Mali who were the original source of her rice gene.

So Ronald persuaded UC negotiators and Davis chancellor Larry N. Vanderhoef, a plant biochemist, to agree that a share of any royalty payments going to Davis from the seed companies would create new fellowships at Davis for scientists from Mali and perhaps from other West African countries. The companies licensed by UC would also contribute directly to the Davis fellowship fund under the licensing agreements.

And after their training, the African scientists would then carry their new knowledge and skills back to benefit their nations with advanced agricultural science.

Negotiations with two international seed companies are now complete, according to Candace Voelker of UC's technology transfer office, and two more are in the works. Names of the companies are not disclosed because they remain "proprietary," Voelker said, and so are the amounts of their up-front payments to the university.

As "inventors" of the rice gene, Ronald and her colleagues are putting their share into the fund, and the early fellowship money for West African students should total about $250,000 -- enough to finance about 10 students, she said.

Meanwhile, Ronald is working to clone another gene that gives rice plants resistance against a disastrous fungal disease called "blast." When that is completed, Ronald said, she expects to join UC licensing negotiators to require a different method of royalty payments that should eventually yield more money and bring more scientists to Davis from other African countries as well as India and the Philippines.

Improving developing countries' farm crops through biotechnology is now a major effort among gene-splicers in academic labs nationwide. This summer, Ronald is planning a campaign to get her colleagues to follow her lead in assuring that the developing nations share in benefits from the enterprise.

"It seems really obvious that this is the right thing to do," Ronald said.
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