Pamela Ronald has developed a more flood-tolerant rice

By **Beth Lebwohl** *in* **HUMAN WORLD** | July 12, 2010

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About half the world's population eats rice daily. It's one of the globe's most important food staples, said plant geneticist Pamela Ronald. But, she added, around 25% of that rice is grown in flood-prone regions.

Pamela Ronald: Rice plants will die if they're completely submerged for more than 3 days, and this is a big problem in South and Southeast Asia, where farmers rely on the crop to feed their families.

Ronald, of California's UC Davis, has been working for the last 15 years to isolate the gene for flood tolerance in rice. Five years ago she finally found the gene, and a collaborator at the International Rice Research Institute in the Phillipines inserted it into varieties of rice typically grown in Asia.

Pamela Ronald: The new varieties of rice can withstand up to about 17 days of flooding.

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Pamela Ronald: It's estimated that something like 2 billion very poor farmers live in these flood prone areas and 75 million live on less than a dollar a day, so even a small change in the quantity of grain that can be harvested can have a huge impact on these families' lives.

Ronald added her new rice yields about five-fold more grain under conditions of flooding. She's now working on creating a rice with enhanced resistance to disease – a major cause of crop loss worldwide. Ronald noted it's expected that flooding in these areas will be exacerbated, due to climate change.

She also explained how genetic engineering worked, in this particular case.

Pamela Ronald: Genetic engineering is a tool that virtually all plant biologists use. It's a really useful tool we use in the lab to prove whether we have the right gene or not. So what we do is we isolate big chunks of the rice genome and then we identify all the genes in that region and then we were able to predict which gene we thought had this important trait. And we used this tool in my lab to show that we could generate a genetically engineered plant by showing that we could create a single gene that had this quality.

Then that information was used by the breeders in the Philippines.

Pamela Ronald: They used another approach which is sort of a hybrid between genetic engineering and conventional breeding. To do this, they start with a conventional pollination approach, but then they use what we call 'molecular markers' to be sure they use a very small number of genes. With this precision breeding technique, you cannot usually introduce one gene.

Ronald pointed out that sometimes unintended consequences occur, but she said most of them are positive or neutral.

Pamela Ronald: This has always been the case for the last 10,000 years. Everything that we eat today has been improved through some sort of breeding process. Anytime you do this, you introduce not only the genes that you know, but some that are not characterized. Some of the risks with conventional breeding are that you introduced genes with unintended consequences. And there was an

unintended consequence which is that the variety that the farmers normally eat called Swarna, the hull is very, very gold. Interestingly enough, the new variety developed during this precision breeding approach is slightly less gold. So it changed the color of the grain. That is an example of an unintended consequence. Of course, not that many people would consider this a risk to human health, but this is an example of the types of things that can occur.

BETHLEBWOHL

Beth Lebwohl researches, writes and helps produce science content in audio and video formats for EarthSky. She is one of the authors on EarthSky.org, a script-writer for our podcasts, and helps host our English science podcasts in 90-second, 8-minute and 22-minute formats. Beth came to EarthSky in 2006 from the American Museum of Natural History's Department of Astrophysics, where she was surrounded by some of the greatest telescope-building, equation-wielding, code-writing physicists of our time. And they made her think . . . this science thing . . . it's pretty cool.

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