Chemical-free pest management cuts rice waste

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In 2006, Maria Otilia Carvalho, a researcher from the Tropical Research Institute of Portugal had an ambitious goal: to cut the huge losses of rice – a staple food crop for half of humanity – due to pests, without using toxic pesticides that are increasingly shunned by consumers worldwide. She realised she could not do it alone and turned to EUREKA to support an international collaboration to address a looming threat to world's rice supplies. Harvested rice is constantly under menace from pest insects and fungi - to avoid the pests, farmers and producers treat the rice with chemical pesticides, which leave residue on rice, potentially harming rice workers and consumers. Even the bigger problem is that insects are developing resistance to chemicals, slowly rendering it useless.

Carvalho was one of several scientists scattered around the world who were working on alternative, eco-friendly methods to protect rice in storage. None of the methods on their own could match the effectiveness of chemicals, but Carvalho thought that pulling them all together into one 'integrated pest management' system might wean the industry of pesticides and provide a safer, cleaner food product for the world's market.

She decided to bring researchers from Portugal, Spain, Germany, Greece, Israel and the USA together to find a sustainable, long term solution for the problem. She was awarded a EUREKA grant in 2006 for a project that involved rice farmers and scientists to find a more eco-friendly way to protect rice and other crops. Five years later, the solution they developed is already being put to use in India, and other developing

countries are considering adopting the new system as well.

A Rising demand

"This sort of research takes a long time, sometimes a lifetime," says Shlomo Navarro, a collaborator on the project and an entomologist at Food Technology International Consultancy Ltd., in Israel. "The EUREKA grant offered a tremendous opportunity to bring together the different research groups that were working on this problem separately and speed up results."

Rice is the staple food for around half of the world's population; three billion people depend on rice for their subsistence, according to the United Nations Food and Agriculture Organization (FAO). Most of the world's rice production is consumed in the developing world: Asia, Latin America and Africa.

As the world's population grows there is a rising demand for rice to ensure food security especially in Africa and the Latin American and Caribbean regions. The International Rice Research Institute estimates that an additional 8-10 million tonnes of rice will have to be produced each year. Another way to increase the amount of rice reaching people is to reduce the damage and waste caused by insect infestation, as this EUREKA project did.

Finding marketable solutions

And while the global demand for rice is growing, one of the main challenges is to protect it from pests during storage. "We designed a novel way to manage pests using technologies that are sustainable, environmentally and user-friendly," she says. "We did this to protect the quality of rice avoiding the use of polluting chemicals that leave residues

on rice – something that has been common so far."

When Carvalho's team tested the integrated system, they found that the amount of rice that had to be thrown away as a result of fungi and insect infestation dropped by more than 95%. Not only did less rice go to waste, but consumers were happier with a product that had not been chemically treated. Rice that has been stored using the integrated system is given the EUREKA stamp of approval: a seal on the product packaging to tell consumers that the product is the outcome of European research. So far four companies are using the technology.

Navarro says that their integrated approach has three key benefits for the European Union market: "improved quality, no infestation and no chemicals on the rice". "Our rice is cleaner than anything else on the market ... We are now in a position to be able to tell the rice industry: 'listen, you should stop using chemicals'," says Navarro.

Helping African farmers

The integrated approach involves three key technologies: electronic insect traps that allow growers to estimate the number of insects in rice storage silos, aeration or refrigeration of silos to delay insect development, and 'modified atmosphere' with the use of carbon dioxide or nitrogen gas, again to slow down pest development. "The main novelty of this project is that it brings the different technologies together," explains Navarro." And the approach can be used for other grains as well, not just rice, he adds. "The electronic insect traps are our eyes inside the storage silos", he says. He is planning to automate the traps so each time an insect is trapped, the storage manager will be alerted by a text message.

Apart from India, other developing countries that could increase the quality of their rice and reduce losses to pests, such as Argentina, Brazil

and Mozambique, are also considering adopting the new system. And Navarro says that the researchers will not stop there, as he is planning to bring the idea of modified atmosphere inside storage units to farmers in Kenya.

The system could eventually help small-scale farmers in Africa get better price for their crops as well. Shlomo Navarro is working with subsistence farmers who consume most of their product themselves, encouraging them to store their excess rice within their community until the price if profitable instead of selling it at the same time immediately after the harvest as everyone else, when the market price is the lowest."

Provided by EUREKA