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Gene firm pioneers desert crop

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Fri 4 Jun 2004 12.19 BST



Agriculture is facing a crisis. Mass irrigation is turning swaths of fertile ground into salty wastelands. Already a third of the world's irrigated land has been rendered useless because the soil is too salty for crops to flourish.

And the problem is rapidly worsening: each year 10m hectares goes. If the problem cannot be fixed, the world will struggle to provide for its increasing population.

Some scientists now think they have the answer to what has become agriculture's greatest challenge. Last week a group of world-class

researchers in the US announced that their company, FuturaGene, had developed the means to make plants fight harder for their survival in harsh environments.

Instead of putting new genes into the plants to help them survive, the scientists have found a way to make certain genes already present go into overdrive, beefing up the plants' defences to salty soils, cold weather and drought.

If the plants perform as well as hoped, it could dramatically change agriculture. Regions where crops have never been viable, because of extreme cold or frequent drought, could be useful farmland. "The real goal is not only to be able to plant in places where right now we can't grow anything, but to get more out of the land where we can," said Bruno Ruggiero, the president of FuturaGene. "Cold, drought and salt significantly damage yields. And if we can get more out of the land, that means limiting the need to cut down forests for farmland, and using less water," he said.

Greenhouse trials of the prototype tomatoes developed by FuturaGene are scheduled to start by the end of this week. If all goes well the company will push ahead with variations of rice, alfalfa and corn.

Not everyone is convinced. Critics say the scientists are throwing technology at a problem that could better be solved by thinking about what causes it in the first place.

Saline soils are more widespread largely thanks to irrigation. The worst effects are seen in hot regions where rainfall is scarce. As fresh water is poured on to land much of it evaporates, leaving behind traces of salts. Ironically the more the soil is irrigated, the saltier it gets. "Anywhere it's hot and getting hotter, this whole issue is just going to get worse. It's a really big deal," said Chris Leaver, a plant scientist at Oxford University.

Salty soils damage plants by dehydrating them and playing havoc with internal chemistry. The best way to prevent soils becoming too salty is to flush with more water; but when the world is facing an ever-pressing water shortage - 40% of the world's water is used for irrigation - flushing salt from soils is unsustainable and is rapidly becoming too expensive to contemplate.

The result is that agriculture is stuck firmly between the rock of less and less land to farm and a hard place of ever more mouths to feed.

The scientists behind FuturaGene, including Ray Bressan of Purdue University in Indiana and Hans Bohnert at the University of Illinois, have patented a suite of genes to make plants more hardy. One of the most significant, SOS1, pumps salt that gets into the roots back out into the soil before it can do any damage.

FuturaGene is not the first to modify crops to withstand saline soils. In 2001 a team at the University of California, Davis, developed plants that stored salt where it cannot cause damage. Unsurprisingly FuturaGene thinks its method is better. "If you stop the salt getting into the plant in the first place, it will be much stronger," said Dr Ruggiero, who claims his plants can tolerate soils four times more salty than conventional plants.

Ultimately FuturaGene hopes to develop plants so hardy they can be irrigated with sea water, although the reality is a long way off.

Carlo Leifert, a plant scientist at the Tesco Centre for Organic Agriculture at Newcastle University, UK, says GM is the wrong way to go. "It's by no means a long-term solution. The Americans are the worst with respect to sustainable soil management. They are creating a problem, then looking for a technological fix to get 10 or 20 years more profit out of the same land."

The FuturaGene trials will show whether GM is at least one way to tackle the problem. If the plants perform well, they will have to go through intensive testing with the US food and drugs administration. Then, public opinion may play the final role in whether they are produced commercially. FuturaGene points out that since they are simply magnifying the effect of existing genes in the plants, instead of introducing new genes from animals or insects, the public will be less concerned about their GM crops.

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