Armyworms are devastating Asia's crops, but researchers have a plan to save them

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Credit: AI-generated image (disclaimer)

A very hungry caterpillar is rampaging through crops across the world, leaving a trail of destruction in its wake. The fall armyworm, also known as Spodoptera frugiperda (fruit destroyer), loves to eat maize (corn) but also plagues many other crops vital to human food security, such as rice and sorghum.

This invasive eating machine originated in the Americas, where it was first described in 1797, but in the last few years it has gone global. It was reported in Africa in 2016 and has now reached China, spreading across two continents, west to east, in just three years. Entry of the pest into this part of Asia matters because so many people live there and in nearby regions, and there is already huge pressure on the area's food production systems.

But there is hope. My colleagues and I are researching ways to stop the pest that don't rely on damaging pesticides and could be adopted around the world.

How the fall armyworm crossed the Atlantic from its native range in tropical and subtropical regions of the Americas is unknown. Perhaps it was through long-distance migration of moths, possibly blown by winds, that then laid eggs in Africa. Or perhaps it was through trade of contaminated produce already containing eggs and hungry caterpillars.

Yet while the means of entry is unknown, the outcome is clear. Crops—and livelihoods—are being ruined. The armyworm can destroy as much as 50% of a producer's crop, and the effect on small farmers growing crops to feed their families is terrible.

What's more, because adult moths can travel hundreds of kilometres, the pest rapidly spread across most of sub-Saharan Africa wreaking havoc as it went. It's estimated that crop losses in 12 African countries could be as high as US$6.1 billion a year.

But it didn't stop there. In July 2018, it was found in Karnataka state in India, the first reported infestation in Asia. By December 2018 it had spread to Thailand, and it's still going, now reported in over half the provinces of China.

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It is quite remarkable that fall armyworm has managed to cross two continents in such a short space of time. There are vast swathes of crops now vulnerable to the pest and it has now spread too much to be eradicated so its populations have to be managed.

The immediate reaction in many places has been to use pesticides, but the fall armyworm is well known for its ability to evolve resistance to these. And more powerful, general insecticides could kill helpful insects that are natural enemies of the pest. However, using some more natural defences may actually be a feasible strategy, as well as more environmentally friendly one.

Four-part solution

In collaborative research with the International Centre of Insect Physiology and Ecology in Kenya, my colleagues and I are developing four ways to increase resilience to the pest. First, we are assessing the natural resistance levels of crops to determine which varieties are more robust against attack by the pest. Early results show that damage can be partly reduced this way.

Second, we are attempting to drive pests away from the main crop by interspersing it with a crop that they dislike because it releases repellent odours associated with an already damaged plant. And third, we're planting what are known as attractive trap plants to lure the worm to alternative locations. This technique is known as a "push-pull" companion cropping system and is currently used successfully against stem-borer pests. Early results show substantial reductions in fall armyworm infestation in push-pull system fields.

Fourth, we are attempting to attract local predators of the pest, such as parasitic wasps that will kill it by laying their own eggs inside the caterpillar. To do this, we are using attractive companion crops and others that release a cry for help signal—an odour released by the plant when it is attacked to summon bodyguard insects.

Our research requires a detailed understanding of the predators and parasites that are the key natural enemies of the invasive fall armyworm. So a major part of our project is trying to understand the current pest and predator relationship where the crops are being grown. We are working closely with local farmers to develop the system.

Our hope is that this strategy of combining attempts to resist, expel, trap and kill the fall armyworm should provide a novel cropping system that can withstand attack. While our project is based in Kenya, we hope that

similar approaches can be used in Asia and across the world.

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