# Biocontrol of Fall Armyworm: The Chain Reaction that Led to Regional and Cross-Continental Management


(Left) Laouali Karimoune, (center) Peter Malusi, and (right) Laouali Amadou scope for fall armyworm pests in Niger.

Millions of people around the globe depend on maize, the fall armyworm's favorite food. They also depend on cotton, sorghum, rice, and hundreds of other crops the invasive pest devours. The fall armyworm, which reached Africa in 2016, is a destructive, yet resilient pest – it thrives in hot climates, feeds at all plant stages, is resistant to many chemical pesticides, and travels and reproduces rapidly. It took just three years for the pest to inflict over $10 billion in losses in Africa alone. It now resides in nearly every country in sub-Saharan Africa, and reached Asia in 2018.

**Solving the Problem**

When a pest moves as quickly as the fall armyworm, measures to control it need to be one step ahead of its spread. Virginia Tech's Feed the Future Innovation Lab for Integrated Pest Management looked at ways to catalyze previous programs and partnerships to combat the pest.

In 2018, the IPM Innovation Lab's collaboration with the Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet involved working with scientists in Niger to implement augmentative biological control against the pearl millet headminer, a pest that attacks the country's staple crop.

Augmentative biocontrol involves mass-multiplying and releasing natural enemies to mitigate a damaging pest. To assist the team in Niger in improving their mass-production skills, the IPM Innovation Lab sent one of its technicians to Egypt for training.

"Upon returning from that training, I demonstrated to my coworkers in Niger how to better approach and implement the process," said Laouali Karimoune, a technician for the International Crops Research Institute for

the Semi-Arid Tropics in Niger. In trials of releasing natural enemies against the pearl millet headminer, increases in yields reached 34 percent.

Enter: the fall armyworm. The pest had begun to upend farming communities throughout East Africa, where the IPM Innovation Lab leads several projects.

After finding seven potential natural enemies for the fall armyworm, the program landed on two – *Trichogramma* species and *Telenomus remus* – known to be effective in suppressing populations of the pest in Central and South America. Based on the program's collaboration on the pearl millet headminer in Niger, the IPM Innovation Lab could replicate the same mass-production method against the fall armyworm. In fact, both pests' natural enemies could be reared on the same alternative host, a rice meal moth, which cuts costs in half.

**Making Connections**

The IPM Innovation Lab sent Peter Malusi, a technician for the International Centre of Insect Physiology and Ecology in Kenya, to Niger to receive training on the mass-production technique.

"With a pest invasion like the fall armyworm's, knowledge-sharing helps us to act as quickly as possible," said Muni Muniappan, director of the IPM Innovation Lab. "Combatting the pest using biocontrol reduces chemical pesticides, but it's also most effective when as many regions as possible implement the process."

Malusi followed up his training by teaching the mass-production technique to researchers throughout East Africa, leading to the development of numerous centers dedicated to mass-producing natural enemies of the fall armyworm. The "satellite" centers connect with small-scale farmers, medium-to-large scale farmers, value chains, and agriculture and rural advisory services in order to release them against the pests.

Trials in Kenya and Tanzania show that both natural enemies the IPM Innovation Lab is introducing have the potential to mitigate nearly three-quarters of fall armyworm eggs in the fields, which would make significant impacts on global food security in the region.

**Multiplying Connections**

In 2020, the IPM Innovation Lab was awarded a 3-year, $1.4 million-dollar award in Nepal, collaborating with the Nepal Agricultural Research Council and International Development Enterprises to introduce biocontrol against the fall armyworm, based on the program's history with the pest. The same natural enemies found in Africa that attack the pest are also found in Asia.

The project involves cooperating with large-scale farmers, farmers of rice mills, maize seed and poultry feed-producing companies, cooperatives, and others in developing hubs for mass-producing natural enemies to be used against the fall armyworm. Several researchers have already been trained on mass-production.

This is the first time augmentative biocontrol has ever been implemented in Nepal. As reliance on chemical pesticides increases in the country, with significant impacts on food and water resources, biocontrol is a sound alternative against a pest as formidable as the fall armyworm.

"Our initial instinct to improve scientific capabilities in Niger set off a chain reaction we could have never predicted," said Muniappan. "This is valuable evidence for the myriad of ways in which collaborative research can be catalyzed for countless efforts to improve livelihoods and crop production."