Of Maize and Malaria

IN AFRICA, A ROBUST NEW BREED OF MAIZE YIELDS A DEADLY NEW BREED OF MOSQUITOES

BY VICKY WALTZ

FROM 1973 TO 1975, James McCann worked as a Peace Corps volunteer in Bure, a small farming village in the highlands of northwestern Ethiopia. At the time, malaria was ravaging much of the country, killing thousands, but McCann didn't bother to take the antimalarial drug chloroquine. Bure was more than three miles above sea level, and the villagers believed its chilly air and high altitude kept the insects at bay.

But when McCann, now a College of Arts & Sciences professor of history, returned to Bure twenty years later, he found a village that had been devastated by malaria. "Churches and schools were abandoned," he says. "People locked the doors of houses and said, 'They're all dead in there.'"

VERNON DOUCETTE

Epidemiologist Asnakew Kebede (GRS'08,'13) (left) and CAS Professor James McCann learned that a move away from traditional crops like barley and sorghum to maize coincided with an explosion in cases of malaria.

Deeply troubled by the tragedy, McCann set out to determine why an area that had previously had no history of malaria had suddenly become a hotspot for the disease.

During the summer of 2003, he met with epidemiologist Asnakew Kebede (GRS'08,'13), an Ethiopian Ministry of Health and World Health Organization employee, and the two traveled to twenty-one rural villages throughout the Bure district where cultivation had shifted to maize from more traditional crops, such as teff, barley, and sorghum. They found that the rate of malaria transmission among maize farmers was ten times higher than the transmission rate among those who farmed other crops.

WEB EXTRA: Watch James McCann and Asnakew Kebede talk about their research at www.bu.edu/bostonia.

"Maize pollen is an accelerant for mosquito populations," McCann says. "They just explode. You may as well be putting kerosene on a fire."

McCann knew that maize had been grown for centuries, primarily as a garden vegetable, but in the 1980s, Ethiopia's government pressed for broader cultivation. Between 1993 and 1998, maize plantings increased by 79 percent.

It was also around this time that the Ethiopian government introduced a new variety of maize, which sheds its pollen during late August and early September, weeks later than other varieties of maize and at precisely the time when temperature and moisture are ideal for mosquito breeding.

The pollen produced healthier and more mobile mosquitoes, whose evolution coincided with a slight warming of the climate, leading to what McCann describes as "a perfect storm," an ideal habitat for mosquitoes to breed and feed. Today, he says, while farmers and the Ethiopian government are aware of the connection between maize and malaria, they are reluctant to abandon the high yields of maize for lesser yields of their traditional crops.

One solution would have farmers grow a genetically modified variety of maize, whose pollen contains an insecticide that would kill mosquito larvae. But the costs of that would be beyond the means of local farmers, according to McCann.

Another possible solution would involve detasseling — removing the pollen-producing tassel from a maize plant by hand and thus preventing pollination, but that is a time-consuming process.

A third option, he says, would be to encourage farmers to grow a maize variety that sheds its pollen earlier in the season, before peak mosquito development.

But the most logical solution is to encourage farmers to grow local varieties of self-pollinating grains, such as teff, or vegetables such as red pepper, near mosquito breeding grounds.

McCann and Kebede hope to take their research beyond Ethiopia and apply it to other countries where both maize and malaria are prevalent. "Malaria is spreading to new areas of the developing world every day," McCann says. "Within the next decade, it will be the number one crop in the world. And while maize doesn't cause malaria, it most certainly accelerates it."