Why it's so critical to continuously monitor and manage plant diseases

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Most of us understand the critical importance of monitoring the spread of diseases. And it is as important for plant diseases as it is for humans.

Plant disease epidemics are often hidden from view, unlike human viral disease outbreaks. Yet food and forest production systems, as well as native environments around the world, are just as threatened by emerging epidemics. That is why the UN has made 2020 the International Year of Plant Health.

It is estimated that pests and pathogens destroy between 10% and 40% of food production globally.

There are ways to deal with this problem, starting with biosecurity and plant health management systems. But this is yet another system that's been put under tremendous pressure by the emergence of COVID-19. Under restrictions on human movement—necessary to curb the virus' spread—the field and laboratory work that are crucial for surveillance and management of plant diseases has been severely curtailed.

Research and specialist services delivered by universities, for example, have in many cases temporarily closed or are operating at minimal levels. Missing even a few months could mean missing a key moment in a pest's life cycle and a chance to intervene and slow its further spread. The pressure on government funding that is required to sustain these systems is also threatening to bring these programmes to a standstill.

Plant diseases require as much attention now as ever to ensure that food systems are in place in the next season. There are also serious implications for forestry and the environment more broadly.

Under threat

Plant health epidemics can be caused by viruses, bacteria, fungi, nematodes or insects. Many of these organisms originate in one part of the world and rapidly spread to threaten food crops or trees globally. They often jump from a host plant on which they do not cause

significant epidemics, to a different plant that does not have resistance to them.

Global biosecurity systems are under pressure to deal with the scale of the problem. For example, trade in plants and plant parts is known to be a major pathway of spread of pests and pathogens. But even well-resourced systems in the US cannot cope with the inspection of billions of plants traded annually. The problem is bigger in developing economies, including many in Africa, because of a lack of capacity.

Biosecurity relies on four things: prevention (at port of entry); preparedness (early detection, diagnostics and control); response (to contain and eradicate or manage plant pests and diseases); and recovery (systems for regulating eradication, management or restoration).

Unfortunately, insect and fungal pests can spread naturally across borders. Once a pest is introduced into one country a whole continent's food, forestry and native systems could be threatened. An example is the fall armyworm, which was first reported in West Africa in 2016 and spread across the continent, reaching South Africa one year later.

Estimates in 2017 put potential losses in maize production in Africa to this pest at between US$ 2.4-6.2 billion. Such production losses could lead to food insecurity in many African countries.

Plant health crisis examples

There are hundreds, if not thousands, of pests and pathogens threatening African countries already. Here are just three examples:

On a main food crop: Maize lethal necrosis disease is caused by the joint infection of more than one virus and can completely devastate a maize crop. The disease first emerged in Kenya in 2011; it has since spread to

surrounding countries with devastating yield losses. It is critically important to track its spread, identify outbreaks and attempt to eradicate or restrict its movement. Identification requires highly specialised laboratory analysis to confirm the identity of the viruses.

In plantation forestry: The Sirex woodwasp is native to Europe, but has caused billions of US Dollars damage since it was introduced in New Zealand around 1900 and eventually around the world. A biological control programme that uses a parasitic nematode to sterilise the wasp is widely applied, and has saved the South African forestry industry hundreds of millions of Rand. This programme depends on thorough national monitoring of the wasp infestation levels and the timely release of the biological control nematode.

On native, urban and agricultural trees: The Polyphagous Shot Hole Borer is a tiny ambrosia beetle that introduces a fungal symbiont into trees on which its offspring will feed. The beetle originates from South East Asia, but is spreading around the world. In South Africa it has been recorded from more than a 100 different tree species, and fruit crops such as Avocado. It can kill some mature trees in a matter of months.

Tracking of spread, physical removal of infested trees and the development of biological control are all urgent needs and require specialist knowledge and laboratory support for identification. Monitoring also includes citizen science initiatives in urban areas, and requires researchers to travel to confirm new infestations.

All of this has been set back by restrictions on human movement designed to contain the spread of COVID-19. Researchers must now work out how to catch up, and plan for the coming years in which the virus is likely to continue being a global concern.

What should be done?

Firstly, an assessment is needed of the impact of the original COVID-19 responses on plant health biosecurity systems, so as to plan for coming months and years. We would argue that in future, existing biosecurity systems must remain in full operation. Field surveillance and management of potential biological threats to plant production systems and ecosystems cannot be relaxed or restricted. This can be done safely, in line with global guidelines around protection from the virus.

Secondly, it is critical to recognise that the future of food security is linked across borders. Weak biosecurity in one country threatens neighbouring countries and whole continents. It is important to review regulations and their implementation to secure food supply, industries and the environment. Countries also need strong research funding and capacity.

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