An urgent call to action to contain the outbreak of Fusarium wilt Tropical Race 4 affecting bananas in Africa

The outbreak and rapid on-farm spread of Fusarium wilt (Panama disease) Tropical Race 4 (TR4) in a Cavendish banana plantation in northern Mozambique has revealed a lack of preparedness and a limited capacity to respond to the first incursion of TR4 on the African continent. The continued spread of the pathogen beyond the current infested area could have far-reaching consequences for the whole continent. The soil-dwelling fungus is widely recognized as the greatest threat to banana production, especially to the international trade dominated by Cavendish cultivars but also to a wide range of equally susceptible local banana cultivars.

Banana is the fourth most important food crop in Africa in terms of production quantity. While dessert types are becoming increasingly popular, more than 75% of all bananas in Africa are starchy cooking types that play a crucial role in food and income security for millions of people. It is not currently known how many of the local cultivars will react to TR4 infection. What we do know is that financial losses due to TR4 have been estimated to be as high as 121 million USD in Indonesia and a staggering 253 million USD in Taiwan. In northern Mozambique, it is estimated that the affected farm has already lost more than 7.5 million USD due to TR4 and that over 500,000 plants (more than 300 ha) have been affected by the pathogen. The farm is losing around 15,000 plants/week (about 5.5 ha), translating to about 235,000 USD/week.

The purpose of this brief is to make the case for investing in a containment strategy to reduce the threat that TR4 poses to Africa’s emerging banana export industry, as well as to the production of susceptible banana cultivars for local and regional markets. The two main pillars of such a strategy are stopping banana production in the affected farms and taking measures to avoid the spread of the pathogen beyond the farms.
Background

Fusarium wilt was first observed in northern Mozambique’s Matanuska plantation in February 2013. The cause of the disease was identified as TR4 by scientists at Stellenbosch University in South Africa, and the news of the incursion into Africa was made public in November 2013. On the advice of scientists, heavily infested areas were isolated and biosecurity measures were introduced. Regular surveys in the Matanuska plantation revealed that the disease was spreading rapidly, and by September 2015 the number of diseased plants had risen to more than 570,000 out of a total of more than 2.5 million plants. The rate of spread of the disease suggests that the fungus had been present in the plantation before 2013. In 2014, TR4 was confirmed in a second plantation of export bananas, 150 km north of the original outbreak.

The pathogen

In bananas, Fusarium wilt is caused by strains of the *Fusarium oxysporum f. sp. cubense* (Foc) fungus. Foc strains are traditionally classified into four races based on their pathogenicity to reference cultivars. TR4 causes Fusarium wilt in Cavendish bananas grown under tropical conditions. It also infects cultivars susceptible to races 1 and 2. This is one of the primary reasons TR4 is considered the greatest threat to banana production. Another reason is that it persists in infested soils for decades, making it impossible to continue growing susceptible bananas in such fields. The pathogen cannot be controlled chemically, while biological and cultural control approaches have only been partially effective. Resistant cultivars provide a solution to the problem of growing bananas in infested soils. However, they do not prevent the fungal spores present in the soil from being moved around and contaminating other farms.

The threat to banana production in Africa

Africa accounts for more than a quarter of the global production of bananas*, with 8 countries among the top 20 producers. More than 75% of the bananas grown are starchy types that play an important role in food and income security, especially in East Africa where in places people eat as much as 1 kg of bananas a day. Meanwhile, dessert types are becoming increasingly popular with farmers. Cavendish banana production increased by 53% since the beginning of the century and now account for 20% of all bananas grown in Africa. Even though only 10% of these bananas are traded internationally, the quantities exported grew by 54% between 2000 and 2013, a period during which Mozambique became the continent’s third largest exporter. East African farmers also grow dessert and juice types that are susceptible to TR4. The most popular are Gros Michel and Pisang Awak.

It is not currently known how the two main groups of cooking bananas – East African Highland Bananas and Plantains – will react to TR4 infection. In a field trial conducted in the Philippines, only one Plantain cultivar did not show any signs of Fusarium wilt after 72 weeks (a relatively short time given the perennial nature of most banana production), whereas the proportion of diseased plants varied between 1 and 5% in 7 cultivars. It reached 32% in a local cultivar whose identity needs to be verified.

*36.6 M tonnes out of a total of 133.7 M in 2013 (source FruTiTrop)*
The case for investing in containment

Since TR4 cannot be eradicated, containment is the first line of defence to minimize its impact. In countries where no immediate action was taken to contain incursions of TR4, the disease has slowly developed into a destructive and uncontrollable problem. In the Philippines, the second largest exporter of bananas, the majority of Cavendish farms on the island of Mindanao are affected by TR4. In China, the fungus has spread to all the main banana-growing provinces. TR4 now threatens neighbouring countries supplying the Chinese market, namely Laos and Vietnam. Losses to TR4 have been estimated for only a few countries: Indonesia (121 million USD), Taiwan (253 million USD) and Malaysia (14 million USD).

By contrast, an incursion of TR4 in Australia’s main banana-producing region of Queensland in March 2015 is still under control one year later. The emergency response was supported by a legislative framework that allowed for “expedient but proportionate action to be taken” to protect the country’s banana industry.

Containment of current outbreak of TR4 in Africa

TR4 has so far not been reported outside the two affected farms in Mozambique. Preventing its spread from these two farms to other regions is the most urgent action that needs to be taken to manage the threat it poses to the rest of the continent.

- A first way to do so is by preventing the build-up of inoculum levels, as higher inoculum levels increase the risk of the pathogen spreading beyond the core infestation boundary. Banana plants provide the medium in which the TR4 pathogen multiplies, and their continued production greatly increases the risk of further spread. Therefore, stopping banana production in the affected farms is highly recommended to prevent inoculum build-up and minimize the risk of pathogen spread. We thus appeal to the affected farms to consider replacing their banana plantations with alternative crops, and would offer assistance in exploring all available options to facilitate this.

- A second important step is minimizing the risk of inoculum being moved around. The TR4 pathogen is commonly spread through infected planting material, infested soil and water. No soil, plants or parts of plants should thus be taken out of the affected farms, unless done under the supervision of a specialist and with the observation of strict quarantine regulations. A significant effort should be made to prevent water from infested fields contaminating the Monapo River and wider Nampula Province. No unauthorized entry into the farms should be allowed, and it is recommended that the infested areas are fenced, with clearly visible warning signs that trespassing is not allowed. Any vehicles and shoes of people exiting the affected farms should be properly cleaned and disinfected. We appeal to the infested farms and the Mozambique authorities to fully implement these recommendations as a matter of urgency.

Effective containment of TR4 in Mozambique requires a strong shared understanding of the roles and responsibilities of government, industry and other stakeholders. Close collaboration is needed between the plantation owners and their investors, state and local governments, regional and international regulatory bodies, research organizations, and the community. Legislation needs to be reviewed to prohibit actions that lead to the spread of TR4, and mechanisms developed to ensure compliance with such legislation.

The effectiveness of the containment program will need to be monitored over time, including:

- Surveillance within the affected area to establish the boundaries of current infestations;
• Regular surveillance locally within the affected farms, area-wide in affected provinces of northern Mozambique, country-wide in other parts of Mozambique, as well as region-wide in neighbouring countries;

• Formal reporting of any new cases that may be found, and identifying the incursion path.

Beyond containment of the current outbreak

While containment of the current outbreak in Mozambique is currently the most urgent step to protect banana production in Africa from TR4, it is of equal importance that other countries prepare for a possible incursion (which could come either from Mozambique or from elsewhere).

Active surveillance programmes need to be set up in neighbouring, high-risk countries (Malawi, Tanzania, Zambia, Zimbabwe and South Africa) to assess the current status of TR4 and promptly identify any incursion.

Strategic national and regional biosecurity plans need to be developed, including:

• Raising awareness about the impacts of TR4 to the banana industry;

• Building the capacity for rapid diagnosis of TR4 using effective, affordable and robust diagnostic tools;

• Setting up a response strategy and containment plan in the event of new incursions

• Training of extension staff and production technicians in disease recognition, biology, epidemiology and management;

• Encouraging a high degree of community support through focused engagement, collaboration across private and public institutions and engagement of special-interest groups in plant disease control.

The CGIAR Research Program on Roots, Tubers and Bananas, together with the Directors General of Bioversity International and the International Institute of Tropical Agriculture, urge all stakeholders to respond to this ‘call to action’ to ensure that Foc TR4 does not cause lasting damage to the banana industry in Africa and the livelihoods of millions of Africans who depend on banana.

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