



## Environmental impacts of crop diseases

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### ABSTRACT

**Introduction and objective:** Agriculture is the main livelihood activity for millions of inhabitants globally, but most importantly in developing countries. Through direct impacts on livelihoods of farming communities, pests and pathogens that destroy crops also affect the environment. The adverse effects can occur through loss of crop cover, thus exposing soil to erosion, change of crop varieties or farming systems leading to net negative environmental effects or abandonment of farming activities, with accompanying collapse of activities that protect the environment. Some of the negative consequences of crop pathogens that have been observed in diverse farming systems in across east and west Africa are presented below.

**Methodology and results:** Between 2003 and 2007 numerous extensive surveys were carried out on fungal tuber rot diseases of cassava and yams in Nigeria, Cameroon and the Democratic Republic of Congo, and on *Xanthomonas* bacterial wilt of banana in the Great Lakes region of East and Central Africa. The surveys aimed to identify the pathogens causing these crop diseases, estimate the yield losses realized,

document farmer responses and explore various measures to combat the diseases. In addition to the above, negative consequences of crop diseases on the environment were noted.

In the humid forests of central and west Africa, major environmental destruction was noted through destruction of forest cover as farmers practice shifting cultivation. Although this practice partly aims to exploit variations in soil fertility between forested and non-forested soils, farmers also aimed to move their crops to soils that had been fallowed for longer periods and thus were assured to be pathogen free. In areas with dense populations, annual establishment of new plantations from existing forests leads to extensive loss of plant cover, thus exposing soil to degradation and also loss of forest biomass that is crucial as CO<sub>2</sub> sink.



Photo 1: Cassava tuberous roots extensively rotted after attack by fungal pathogens.



Photo 2: Cassava tuberous roots heavily attacked by root and tuber scales.



Photo 3: Destruction of forest land to create new farming area where soils are more fertile and without pests and diseases.

In areas where banana plantations were destroyed by *Xanthomonas* wilt, massive erosion was observed especially where farms are established on steep hillsides. Although exposure of soil upon plant death in itself leads to erosion, there were situations where the erosion appeared to be aggravated by farmers' intervention to manually uproot the diseased plants thus disturbing the soil, making it loose and thus much easier to wash away.



Photo 4: A banana bunch (left) and plants (right) destroyed after infection by *Xanthomonas* wilt.



Photo 5: Banana plants uprooted after attack by *Xanthomonas* wilt leaving soil on the hillsides exposed to erosion. Alternative crops,

e.g. sweet potato seen on the right are not as effective in preventing erosion.

In some countries, due to loss of means to earn a livelihood, some farmers turned to cultivation of other crops, especially those that have high market value and demand, e.g. vegetables and fruits. Most of the alternative production occurred on wetlands in valleys, where water is easily accessible for year round production. In the absence of crop diseases that disrupt normal agricultural productivity, such wetlands would otherwise be conserved. These wetlands are important for sustaining ecosystems, and their loss through economic exploitation eventually leads to loss of biodiversity.

In other areas, alternative economic activity involves cutting down trees to harvest timber or charcoal, which is associated with extensive destruction of trees. In east D.R. Congo, an increase in households that own large saws for cutting trees has been observed, with a proportional increase in the number of trees being cut down annually.

Loss of banana has also been associated with changes to alternative crops, e.g. sorghum for income or Colocassiae for food. These crops are not as well suited to the steep and often hilly landscapes that require protective measures against erosion. Sorghum or Colocassiae lack the strong root systems or canopy cover provided by banana plants to protect soil from runoff effects. Increased cultivation of these crops thus leads to increased soil erosion.



Photo 6: Trees harvested for timber in areas where bananas have been destroyed by *Xanthomonas* wilt in DR Congo.



Photo 7: Collocasiae and sorghum (background) plants on hillsides where banana plantations were previously destroyed by *Xanthomonas* wilt.

Conclusion and application: Although it is often not well appreciated, crop diseases adversely affect the environment in numerous ways. Therefore, measures to address crop pathogens and pests should not only aim to address food security or economic losses felt by farmers, but should also consider ways and means of mitigating negative impacts on the environment.