

# Simple, Safe, Sure: A new approach for managing banana wilt in highland zones of South Kivu, DR Congo

*Single Diseased Stem Removal recommended as innovative practice for Xanthomonas Wilt control*

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**Photo:** Left of the path, a healthy banana plantation in Kabamba, South Kivu. Right of the path, the plot of an absentee farmer is heavily infected with banana wilt. Despite the proximity of banana bacterial wilt, the farmer on the left is able to control the disease effectively using Single Diseased Stem Removal.

## Key messages:

- **Banana wilt remains a serious threat to farmer livelihoods in South Kivu, and previous efforts to control the wilt have had limited impact. Many farmers do not correctly or consistently apply the currently recommended management steps, which includes complete mat uprooting**
- **Single-diseased stem removal (SDSR) negates or complements the need for complete mat uprooting and massively reduces the farmer effort required to control banana wilt. Disease incidence of less than 2% within 3 months is possible, regardless of initial starting incidence**
- **In highland areas of South Kivu, east African highland banana types dominate and insect vector activity is low, thus banana wilt spreads slowly. Consequently, individual farmer management of wilt is usually possible. This reduces the need for collective action which is very difficult to implement effectively.**

## Introduction

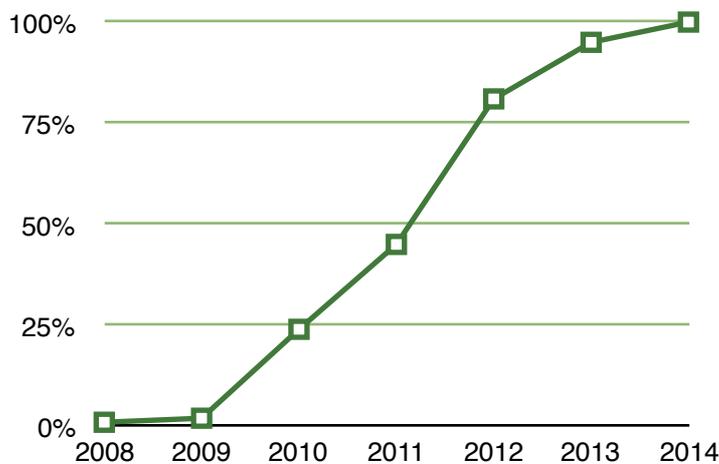
Xanthomonas wilt of banana (XW), or simply banana bacterial wilt, is a devastating bacterial disease constraining banana production in South Kivu, DR Congo. Present in the province since 2002, it continues to challenge the livelihood security of poor rural households for whom banana plantations underpin food security and generate a large proportion of household income. Some territories in South Kivu have seen banana production declines of between 20 and 100 percent and revenue losses up to US\$1,600 per hectare per year. XW affects all banana varieties, and there is no known cure or resistant banana cultivar.

A XW management package has been widely disseminated to agricultural extension actors in South Kivu since 2007. The package consists of practical steps for controlling and preventing the spread of the disease. If XW is present, farmers are recommended to remove plants showing disease symptoms by uprooting the entire associated mat.

The complete uprooting of diseased mats has been reported by many farmers as too tedious to implement, and farmers are often reluctant to remove an entire banana mat when only one plant shows disease symptoms, all the more so if the plant is bearing a banana bunch. Further, studies of technology diffusion have shown that adoption of particular techniques depends on the perception that farmers have of the technique's effectiveness.

In the case of XW in South Kivu, farmers have sometimes received inconsistent information about the ways the disease is transmitted and controlled. For example, some farmers were informed to cut down infected plants and heap ash on the stump. When these techniques failed, some farmers interpreted this as meaning the disease is not able to be controlled.

Other farmers realized that individual efforts to control the disease were not very effective if their neighbours did not control as well. The reason was that fields where the disease was not controlled remained a source of infection for neighbouring farms. As a result, XW management out-scaling efforts in DR Congo have, by and large, not been very successful.



**Graph 1. Average percentage of farms in Miti, Bushumba and Kavumu villages with XW over a 6-year period.**

### Complete mat-removal is no longer a must

Research into how bacteria move within plants has demonstrated an incomplete systemic spread/movement of the bacteria in a mat. The bacteria do not invade all the physically connected lateral shoots, and the many infected shoots often have latent (invisible) infections. These plants will be fully productive and grow to bear marketable and edible bunches. This discovery led to the development of the Single Diseased Stem Removal (SDSR) technique, whereby only the visibly diseased stems within a mat are cut down at soil level. The continued removal of only the diseased plants in a field will reduce the amount of bacteria/inoculum level within the mat or field and reduce the risk of bacteria crossing to other attached healthy suckers. This brings disease incidence down to an acceptable level. The immediate removal of visibly infected plants also significantly reduces the time window for disease transmission from the symptomatic plants to nearby healthy plants by browsing animals, insects, or cutting tools.



**Photo 1. Left: a farmer's field in Katana, South Kivu in March 2013. He had cut down nearly all his banana due to XW. Right: the same field 10 months later, fully recovered after rigorous application of Single Diseased Stem Removal.**

### Fine-tuning SDSR

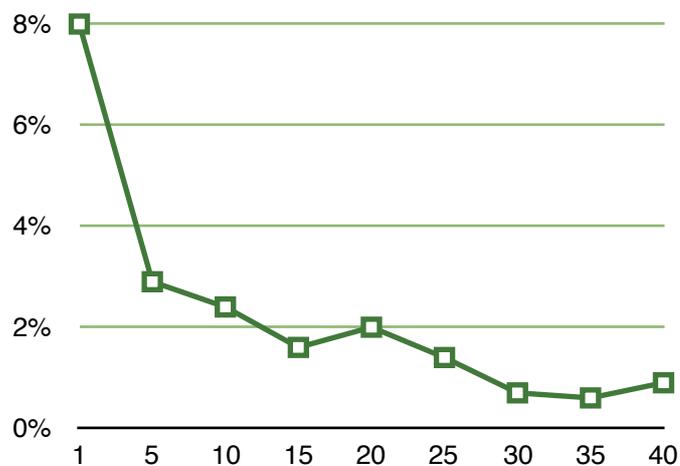
In 2013, studies were initiated at eight pilot sites in North and South Kivu to assess the evolution of disease incidence when rigorously applying the SDSR technique on affected farms, and to fine-tune this control method.

Results show that appropriate application of this novel control package brings down disease incidence from as high as 80% to below 2% in less than three months. With correct SDSR application, there will be complete banana recovery within 10 months.

Social science research was carried out in two villages in South Kivu in 2014. The objective of this research, among others, was to test various out-scaling approaches and learn how farmers applied SDSR in practice. Three farmer learning groups were established and trained in SDSR. Members were living in villages where XW was endemic, and yet it was noted that the results they achieved were very similar to those of the technical trial. It is clear that, even in situations of non-controlling neighbours, individual farmers have the ability to achieve low levels of banana wilt incidence (Graph 2). It should be noted that insect transmission is negligible in highland zones of South Kivu where east African highland banana cultivars are dominant, and browsing animals are present in low numbers. This has an important bearing on out-scaling approaches, because it implies that it is not necessary to mobilize communities in collective action against the disease. Collective action is very difficult to organize in practice because it implies that every farm in a certain area would need to be made entirely disease-free within a short time period. This requires a great deal of coordination and cooperation.

Moreover, the ability to control individually (and thus voluntarily) means investments can be made in awareness raising and SDSR training as opposed to the enforcement of control. There will always be reasons

why some farmers do not want to control banana wilt. They could be 'absentee farmers', for example, or banana may not be sufficiently important in their livelihood strategy.



**Graph 2. Average disease incidence over a 40-week period by individual farmers practicing SDR in 2 XW-endemic villages in South Kivu.**

### Concluding remarks

We recommend that SDR is promoted in South Kivu highlands and production systems with similar characteristics as a substitute for or complement to complete mat removal, which has been poorly adopted due to its high cost and labour-intensiveness. Given the many farmer misconceptions around banana wilt, extension programmes should emphasize the epidemiology of banana wilt (incomplete systemicity) and how the disease is spread. Interventions should focus on creating awareness and understanding in a maximum number of (potentially) affected farms, and extension agents should understand that not all affected banana farmers will wish to actively control against wilt on their farms. SDR needs to be applied at regular intervals (weekly) during the initial 3 to 4 months of application. Subsequently, less rigorous application can be envisaged by time-constrained farmers (i.e. every 2 weeks or monthly).

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