

Objectives

- Provide an eco-efficient way of managing Moko disease in plantain and frogskin disease in cassava using clean seed and resistant genotypes.
- Evaluate and standardize plantain and cassava seed production technology using thermotherapy chambers for subsequent scaling up of its use in plantain- and cassava-growing regions of Colombia and Brazil.
- Improve the system used to diagnose plant health by implementing qPCR-based molecular diagnostic assays.
- Establish new partnerships and strengthen existing ones between research-oriented organizations in Colombia and Brazil.

Results and Impacts

- Built four thermotherapy chambers to produce clean cassava or plantain planting material in Colombia (3) and Brazil (1) (*Figure 1*).
- Raised efficiency of production to 60% in plantain and 90% in cassava, compared to traditional farming systems (*Figure 2*).
- Increased the availability of seed of commercial genotypes for farmers with an estimated monthly production of about 90 plantain plants and 150 cassava plants per square meter.
- Implemented qPCR-based molecular assays for detection of plant pathogens in planting material (*Figure 4A*).
- 7,000 plantain farmers and 750 cassava farmers accessed clean planting material, reducing agrochemicals by 40%, increasing efficiency in production, reducing costs, improving livelihoods, and reducing risk of plant disease dissemination.
- Propagated tolerant genotypes to favorably impact the environment and human health (*Figure 3*).
- Nursery entrepreneurs and Phytosanitary National Plant Protection Institutions had improved their production and certification processes, respectively.
- Disseminated results through three capacity strengthening events (*Figure 4B*), six print publications, and ten online publications to facilitate the development of educational tools in cassava and plantain producing regions across the world.



Fig 1.



Fig 3.



Fig 2.



Fig 4.

Figures: 1. Thermotherapy chambers built in Colombia and Brazil, 2. Mass production of plantain and cassava planting material in thermotherapy chamber guarantees the phytosanitary quality of planting material available to farmers. 3. Plantain and cassava planting materials planted by farmers has a lower incidence of Moko and Frogskin disease. 4. Capacity building activities with technicians and researchers for molecular diagnosis of cassava and plantain diseases based on qPCR. Technicians and farmers also accessed the thermotherapy chambers.

Lessons Learned and Bottlenecks

- For the construction of thermotherapy chambers in different locations and/or countries some adjustments may be necessary, however, the basic conditions studied (temperature, humidity and photoperiod) are guaranteed.
- To cover the top of the thermotherapy chamber a transparent polyethylene film was used. However, this material is not durable and it lasted less than two years in the thermotherapy chamber built in Colombia. To solve this problem, we changed to a cover made of polycarbonate.
- Due to difficulties in finding a specialized company with capabilities to build the thermotherapy chamber proposed in the project, and originally developed in Colombia, the project required and additional six months to construct the thermotherapy chamber in Brazil.

Remarks and Next Steps

- National Research Institutions, the private sector and farmers associations in Colombia, Brazil, Panama, Nicaragua, Ecuador, Peru, Salvador, and Costa Rica have showed their interest in the results of this project.
- Farmers will continue with the production of clean planting material.
- There is an interest to adapt this technology for other crops.