MICROBIAL RESOURCES FOR MOZAMBICAN AGRICULTURE

Use of arbuscular mycorrhizal fungi (AMF) as a sustainable alternative to chemical input in cotton production

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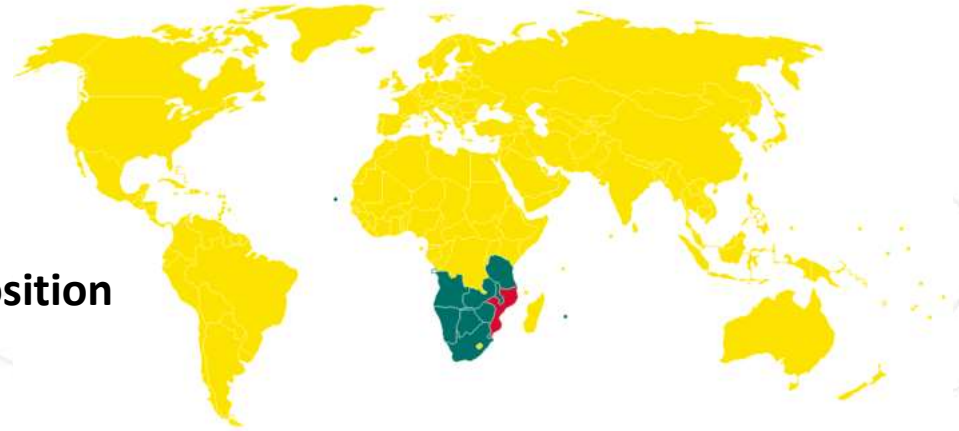
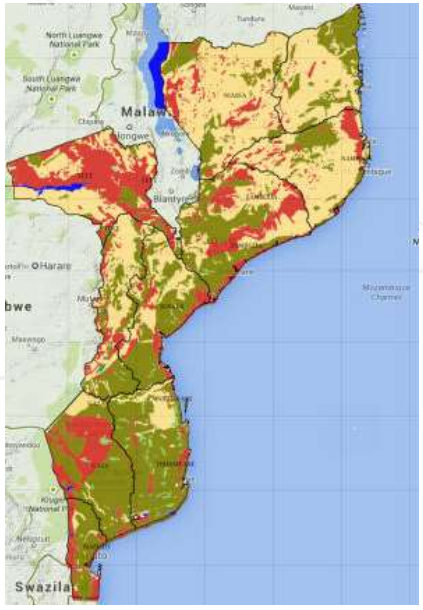
February 2021

Mozambique: geographic position



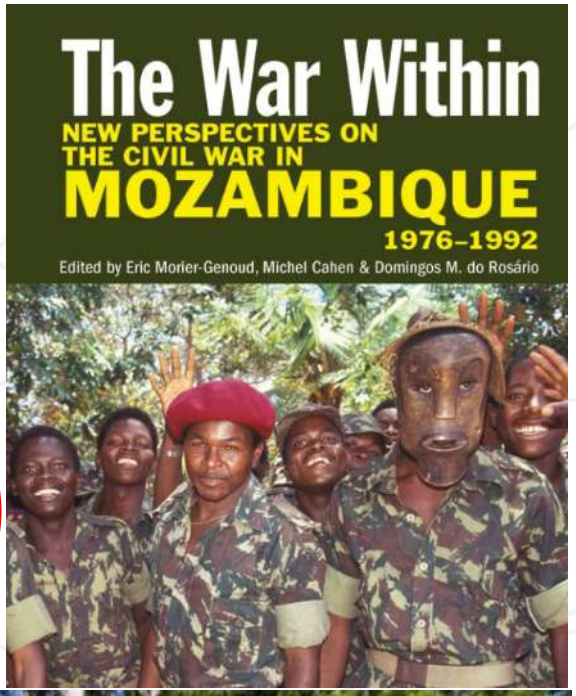
Covered by woodlands



Per year:

- **Produces > 70,000 tons**
- **Exports > €8M**

BIOTIC AND ABIOTIC FACTORS



MAFAP SPAAA

Monitoring African Food and Agricultural Policies

Suivi des politiques agricoles et alimentaires en Afrique

ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR COTTON IN MOZAMBIQUE

OCTOBER 2012

iied

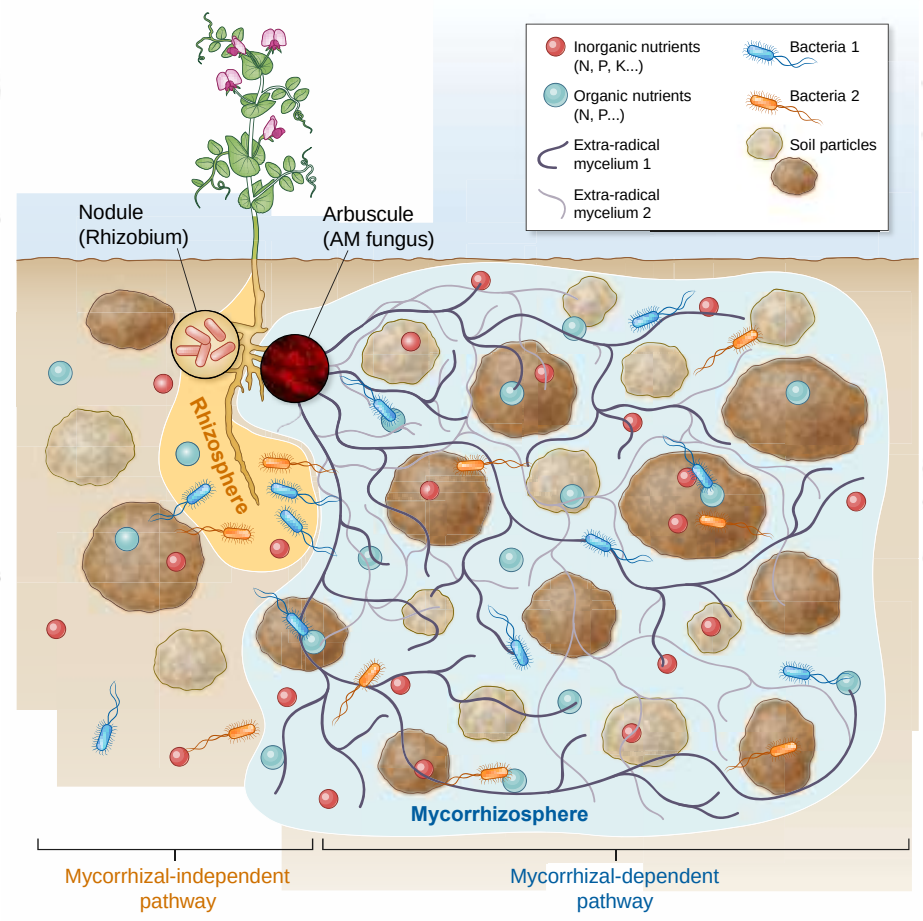
Sustainable agriculture for small-scale farmers in Mozambique

A scoping report

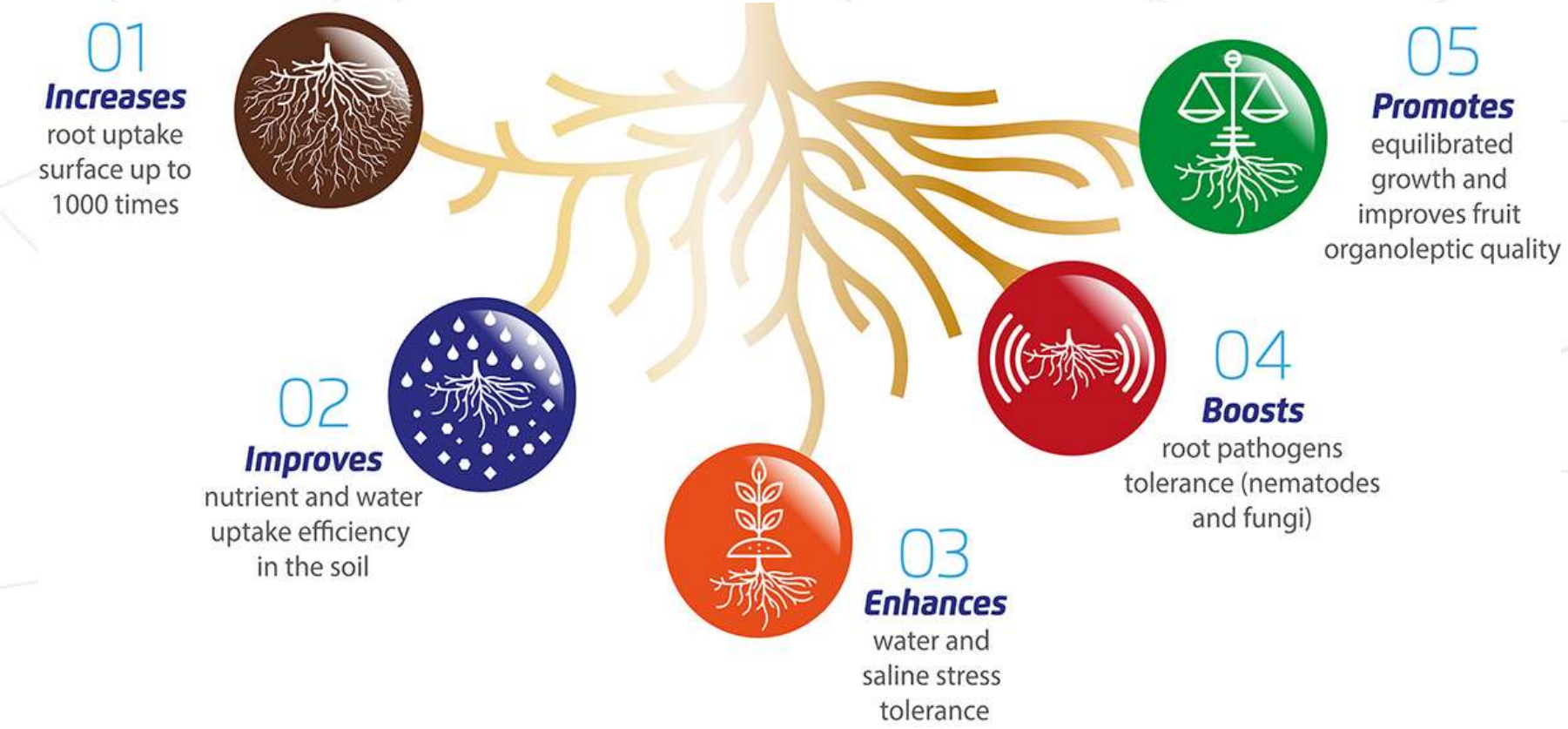
Laura Silici, Calisto Bias and Eunice Cavane

BCI Better Cotton Initiative
bettercotton.org

BIOFERTILIZERS!!



AMF main benefits

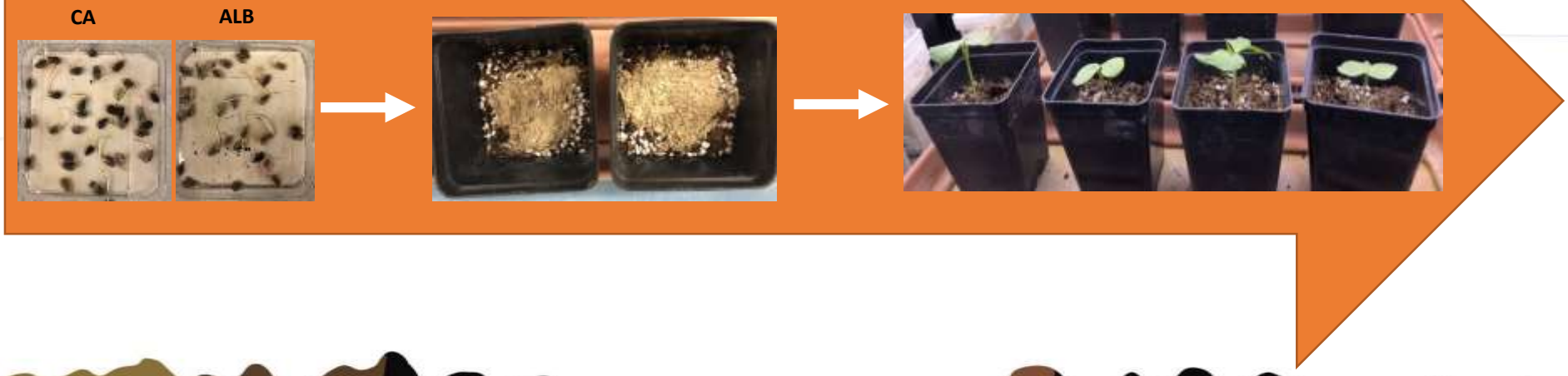


Main objectives:

- Evaluate growth on different substrates;
- Test two cotton varieties in order to verify their ability to be mycorrhized;
- Evaluate AM fungal effect on cotton growth;
- Identify AMF present in Mozambican cotton cultivated soils;

3 VARIABLES

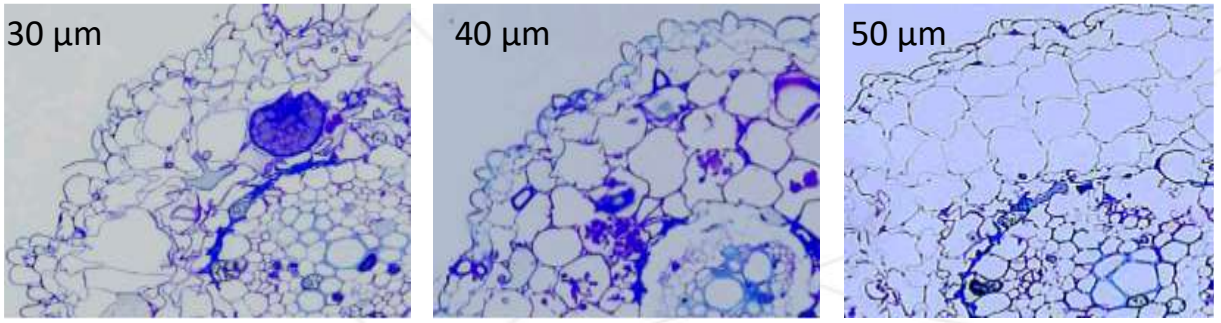
Substrates	• Sand • Soil
Cotton varieties	• CA 324 (CA) • ALBARSZ 9314 (ALB)
Inocula	• MycAgro Lab • Micosat F Radinet • Micosat F SEMI



45 days after

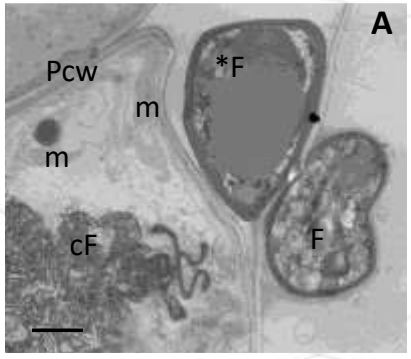
ALB	CA	CONTROL

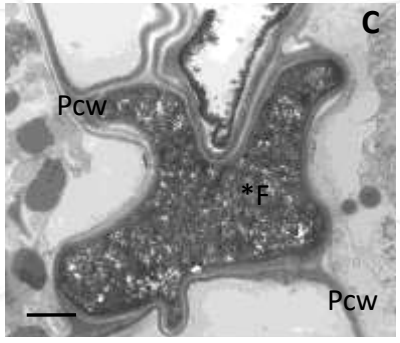
Optic microscope

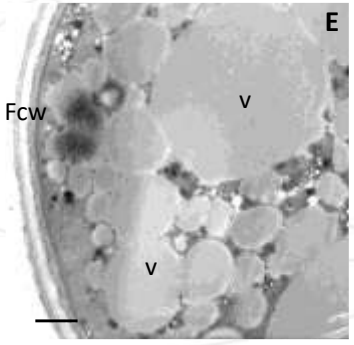


Transmission electron microscope

ALB

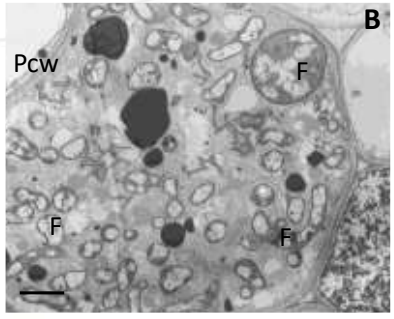


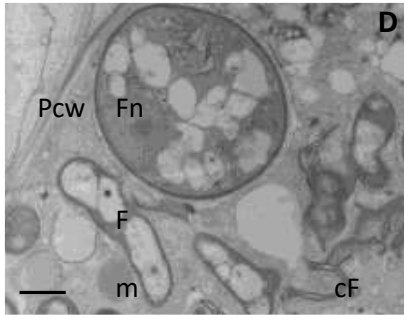


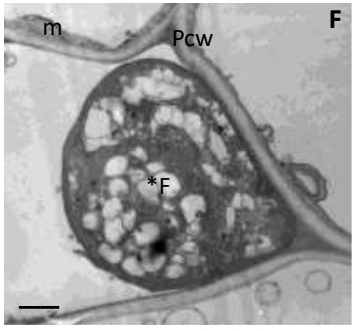


Legend:
Plant cell wall (Pcw)
Mitochondria (m)
Fungus (F)
Intraradical Fungus (*F)
Collapsed Fungus (cF)
Fungal nucleus (Fn)
Fungal cell wall (Fcw)
Vescicles (v)

CA

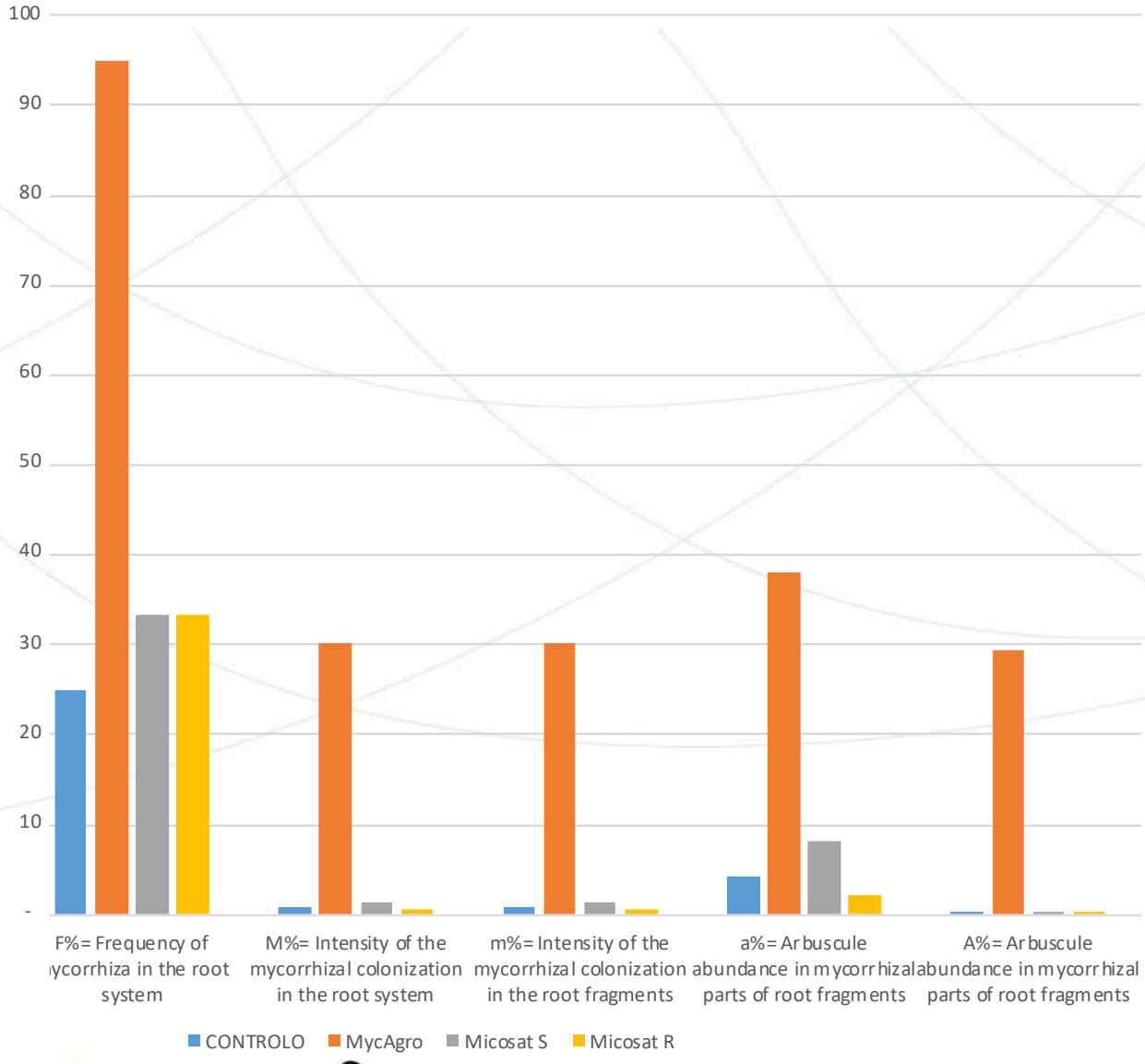






Bars correspond to:
1.4 µm in A,C,E;
2,6 µm in B;
1 µm in D;
0,8 µm in F

Mycorrization level



AMF effects on cotton growth

- Highly ramificated root system;
- Higher height;
- Less diseases;

C – Control
T – AMF inoculated

PUBLICATION:

Victorino I, Martins C., Ventura S., Quilambo O. , Girlanda M., Voyron S., Berruti A., Bianciotto V., Lumini, E. 2018. Microbial Resources for agriculture: Arbuscular Mycorrhizal Fungi in Cotton and their Potential Use as Biofertilizer X CONFERÊNCIA CIENTÍFICA, "UEM fortalecendo a investigação e a extensão para o desenvolvimento" 26-28/09/2018. Poster and oral presentation.

Sampling in Mozambique

- weed control
- manual irrigation
- no fungicide or pesticide
- different agriculture management

- tropical climate, with a long and hot summer
- average temperatures from 22°C to 36°C
- soil texture very dissimilar between three sites

- random block experimental design
  - ➢ 3 plots; 3 plants/plot

Open field soil and roots DNA extraction and amplification

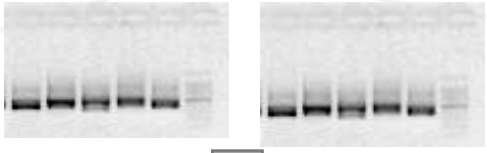
- 30 root samples
- 30 soil samples

2 soil kits

DNeasy Power Soil kit (QIAGEN)

DNeasy Plant kit (QIAGEN)

ITS2	Fungi	fITS9-ITS4



Illumina MiSeq

Root and soil fungal diversity and community structure

To conclude:

Commercial AM inocula increased root colonization and cotton yield showing to be a suitable alternative to reduce agrochemicals use in cotton cultivation. Inocula with more than one AM fungal species tend to readily infect cotton plant roots as previously described for many other plant species. For this reason, all the research efforts to select and improve local AMF propagation and use are encouraged, and by this formulate a AM fungal-based inocula..

Future steps…

- Roots and soil from cotton field:
  - ✓ Trap culture with local plant species
  - ✓ DNA extraction (Mozambique)
  - ✓ PCR amplification (Italy)
  - ✓ Paired-end Illumina MiSeq analysis (Italy)
- Selection of AMF of interest for cotton
- Testing of new AMF consortium
  - ✓ Greenhouse
  - ✓ Open field

Acknowlodgements

UNIVERSIDADE EDUARDO MONDLANE

CB·UEM Centro de Biotecnologia

IPSP Istituto per la Protezione Sostenibile delle Piante

UNIVERSITÀ DEGLI STUDI DI TORINO

DBios

Thank you!