Heliopolis University
for Sustainable Development

# SUSTAINABLE DEVELOPMENT FOR GLOBAL IMPACT

## SCIENTIFIC CONFERENCE

## 23 - 24 SEPTEMBER

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SUSTAINABLE DEVELOPMENT FOR GLOBAL IMPACT
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# Long-term comparison trial in the tropics: the way towards ecological sustainability

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Sustainable Development Pillar:
**Ecology**

biore association | BHARAT
Sys Com India
FiBL

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## Introduction

- Study Sites and Systems
- DOK trial and SysCom India LTE
- Core data collection

## Research Results

- Soil Organic Carbon (SOC)
- Fungal community
- Natural enemies

# Introduction

# SysCom program

## Study Sites and Systems

| Organic vs conventional as monoculture or agroforestry<br>Focus Crop: Cocoa | Organic vs conventional at low and high input level<br>Focus Crop: Maize | Organic and biodynamic vs conventional with/without GMO<br>Focus Crop: Cotton |
|---|---|---|

- Long-term experiments (LTE) of FiBL since 2007 in Kenya, India, Bolivia
- SysCom = "Farming **Sys**tems **Com**parison in the Tropics" – comparing organic and conventional farming systems

# Long term comparison studies

## DOK and LTE

### DOK trial

- Since: 1978
- Location: Switzerland
- Treatments: biodynamic (D), organic (O) and conventional (K), Mineral (M)
- Crops: wheat, potatoes, maize, soya and grass-clover

### SysCom India LTE

- Since: 2007
- Location: India
- Treatments: biodynamic (BD), organic (ORG), conventional (CONV), Bt-conventional (Bt-CONV)
- Crops: cotton, wheat, soybean, chickpea

# SysCom India LTE

**Farming systems:**

- Bt-Conventional (GMO cotton)
- Conventional
- Organic
- Biodynamic

**2 year rotation crops:**

- Soybean
- Wheat
- Cotton
- 2nd Wheat or Chickpea

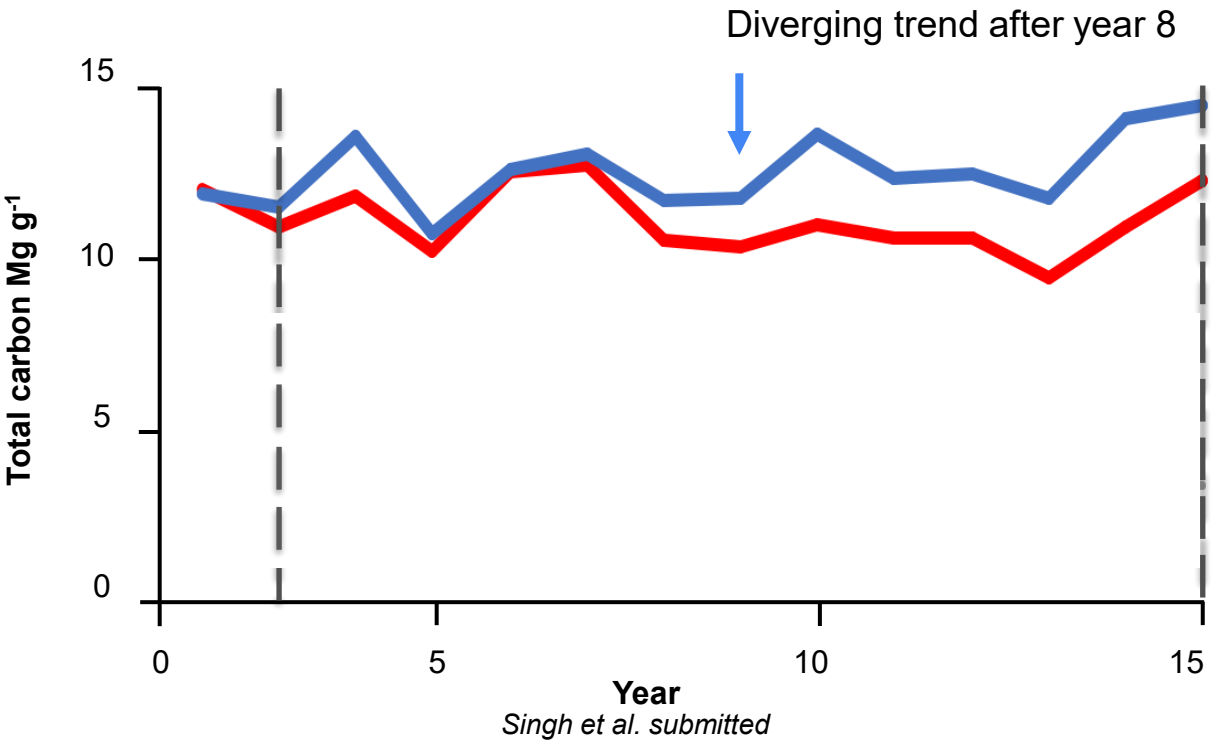
# Long term comparison studies- Introduction

## Core Data Collection

- **Productivity** – Yield, biomass, phenology
- **Profitability** – Product prices, labour and input costs
- **Product quality** – Fibre quality, nutrient content
- **Soil fertility** – Soil pH, macro- and micronutrients
- **Soil physics** – Aggregate stability, bulk density
- **Weather** – Temperature, relative humidity, rainfall,
- **Pest** – Identity, abundance/damage score (since 2022)
- **Natural Enemies** – Identity, Presence (since 2022)

# Research results

# Soil Organic Carbon (SOC)

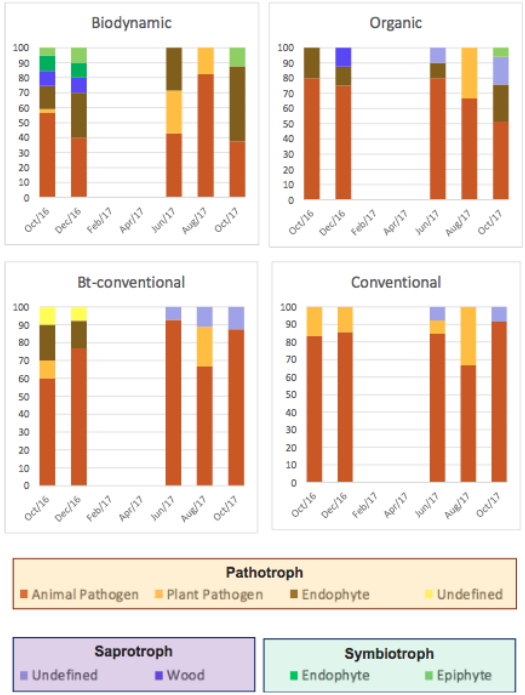


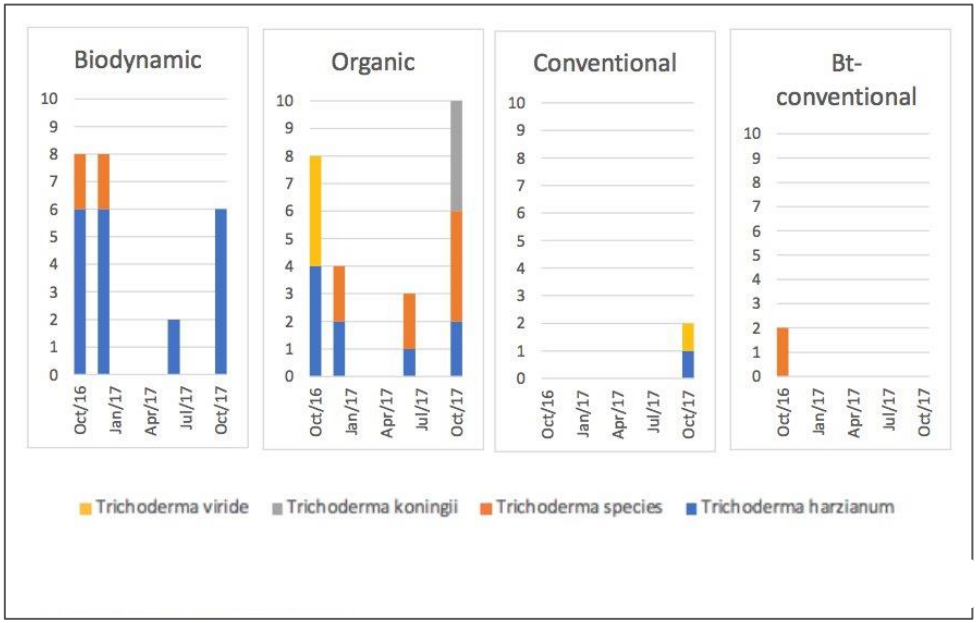

$TC_{organic\ farming\ systems}$

$TC_{conventional\ farming\ systems}$

Mathur Namya, 2025, MSc thesis, Technical University of Munich

# Fungal Community I



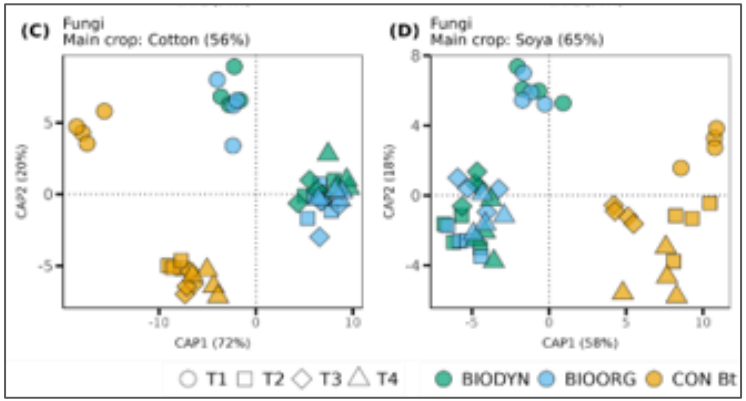



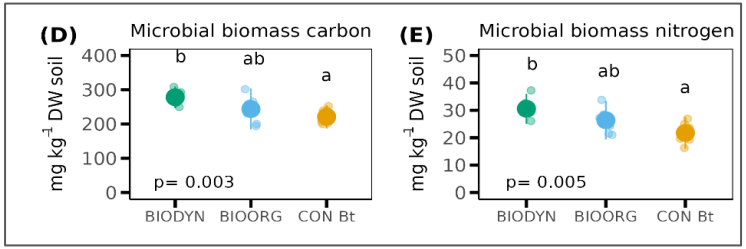

Christelle Ledroit, 2023, Socio-Ecological sustainability of cotton farming systems in Central India, PhD thesis, Coventry University.

# Fungal Community II

- Taxa identified in organic systems linked with **P mobilisation and organic matter mineralization**

- Taxa identified in conventional systems linked with Nitrifiers (i.e. potential high nitrogen loss) and pathogens (*Fusarium*)

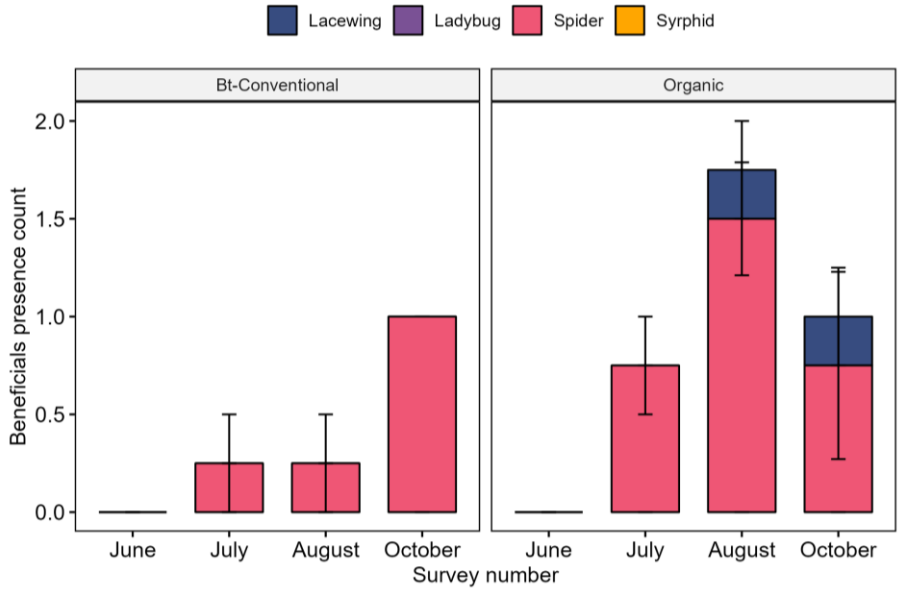



Lori et al.,, 2024, Organic farming systems improve soil quality and shape microbial communities across a cotton-based crop rotation in an Indian Vertisol, FEM Microbiology Ecology

# Natural Enemies I

- Higher abundance of **natural enemies** recorded in ORG systems, at all critical stages of cotton growth
- Higher density and biomass of earthworms recorded in ORG systems




Christelle Ledroit, 2023, Socio-Ecological sustainability of cotton farming systems in Central India, PhD thesis, Coventry University.

# Summary

Organic and biodynamic systems

- promote soil organic carbon (SOC) storage,
- enhance microbial soil quality,
- and increase below and above ground biodiversity

# Sustainability with bioRe and SysCom India

## SysCom India

- 2007: A research platform looking at Ecological, Economical and Social Sustainability in the tropics
- 2026+: A training centre based on the principles of sustainability focused on organic and biodynamic systems.

Staff offices

Conference rooms

Screenhouse

Guest accomodations

Soil lab for in-house testing

400-600 yearly visitors to research station

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LED LIECHTENSTEIN DEVELOPMENT SERVICE

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# Thank You..

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