



# Beyond Abandonment: Risk-Reduced Banana Production on TR4-Infested Soils

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## Issues/challenges

- **Fusarium Wilt TR4 continues to spread** despite widely adopted biosecurity, hygiene, and containment practices.
- **Many measures are strongest at the farm perimeter** (people, vehicles, tools, planting material), **but TR4 establishment is plant-driven: infection initiates at roots** and progresses via the vascular system.
- **Water-mediated movement** (irrigation, drainage, runoff, flooding events) can **bypass perimeter controls** and create repeated exposure at the root zone.
- **Climate variability and extreme rainfall** (stronger storms, flooding, earlier/longer wet seasons) can increase water movement across farms and blocks, raising infection pressure in ways that classical entry-focused biosecurity cannot fully mitigate.
- Once fields are contaminated, eradication is rarely feasible; producers often face **block abandonment and land-use shift to new areas**, increasing **environmental pressure and economic burden**.

## Actions taken

- Implemented EcoClearProx (ECP) as an additional biosecurity layer applied via irrigation, designed to act where existing concepts have limited reach—at the plant.
- Demonstrated activity against *Fusarium oxysporum* f. sp. *cubense* TR4 in vitro (conidia and chlamyospores) across 0.01–1% (v/v) and 15–300 min exposure conditions.
- Tested a preventive irrigation protocol under high inoculum pressure in a field setting.
- **TRIAL CONDITIONS** (24 months)
  - Abandoned plantation, highly TR4-infested soil (Location: Banga, South Cotabato, Philippines)
  - 336 Tissue-cultured Cavendish (Grande Naine)
  - Monthly preventive treatment vs. Untreated Control

## Key results

### SPORE ERADICATION



**100%**

spore eradication in water sources across tested concentration- time conditions (0.1% (v/v) ~200 min; 1% (v/v) <30 min).

### INFECTION RATES



Infection Level

**-40%  
REDUCTION**

Preventive protocol resulted in significant reduction of infection rates.

### RESILIENCE



Prolonged incubation period observed.

**+ 1.5 MONTHS**

### HARVEST EFFICIENCY



Treated plants matured in 9 Weeks vs. Control group 10 Weeks.

**FASTER ROI**

### DISEASE SUPPRESSION



Symptom reversal observed in 24 infected plants.

**SYMPTOM REVERSAL**

## Conclusions

- TR4 management is constrained by a structural gap: **perimeter biosecurity does not fully control water-mediated exposure and the root-zone “last meter” where infection establishes.**
- **Irrigation-applied ECP adds an operational security layer** at the plant interface—**complementing** (not replacing) hygiene, quarantine, and containment—aimed at reducing exposure in the water-to-root pathway.
- As a **fully biodegradable** product, it is well suited for integration into existing irrigation systems in banana-producing regions.
- This supports a shift from “prevent entry only” to **perimeter + pathway control**, with potential to prevent TR4 infection on infested soil on and slow abandonment-driven land expansion while resistant cultivars scale.

Untreated Control



Plants treated with EcoClearProx solution

