Towards Climate Resilient Cocoa Landscapes

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- Agricultural Diversification
- Large-Scale Research Networks
- Agricultural Policy
- Ecosystem monitoring
Climate Impacts on Cocoa

• By 2050: vast areas unsuitable for production in
  • West Africa
  • Indonesia

⇒ Urgent need for climate resilient systems

Schroth et al. 2016 SciTotEnv, Bunn et al. 2018 CL Report
Diversifying for Climate Resilient Cocoa Landscapes?
AGRICULTURAL DIVERSIFICATION:
Positive effects on ecosystem services and yields

Integrating 98 Meta-Analyses
or 3 decades of research

Tamburini et al. 2020 Science Advances
Landscape Level Diversification

Maintaining 40% forest in a wildlife friendly matrix maintains biodiversity, a precursor for ecosystem services

Arroyo-Rodríguez et al. 2020 EcoLett
Farm Level Diversification

Monocultures → Agroforestry
Agroforestry systems provide higher resilience to climate change

Cocoa Pollination to buffer yield effects?

- Cocoa is pollination limited
- Hand-pollination can increase yields by 160% & income by 100%

Wanger et al. 2014 Nature; Toledo-Hernández et al. 2020 AEE,
Cocoa Pollination
to buffer yield effects?

- Cocoa is pollination limited
- Hand-pollination can increase yields by 160% & income by 100%
- Landscape and farm-level management important
- **Research gap:** understanding pollinator ecology for effective management

Wanger et al. 2014 Nature; Toledo-Hernández et al. 2020 AEE,
Toledo-Hernández et al. 2021 BiolCons
Our Solution: Automated Ecosystem Monitoring

• Modular and ML-based
• Pattern recognition components, on-board analysis, and dockings ready
• Works for birds & insects
Combining it all for Climate Resilient Cocoa Landscapes at Scale

1. Diversifying Landscapes
2. Reforesting Monocultures
3. Hand pollination for yield compensation
4. Monitoring pollinator (and other) benefits
Thank you!!!