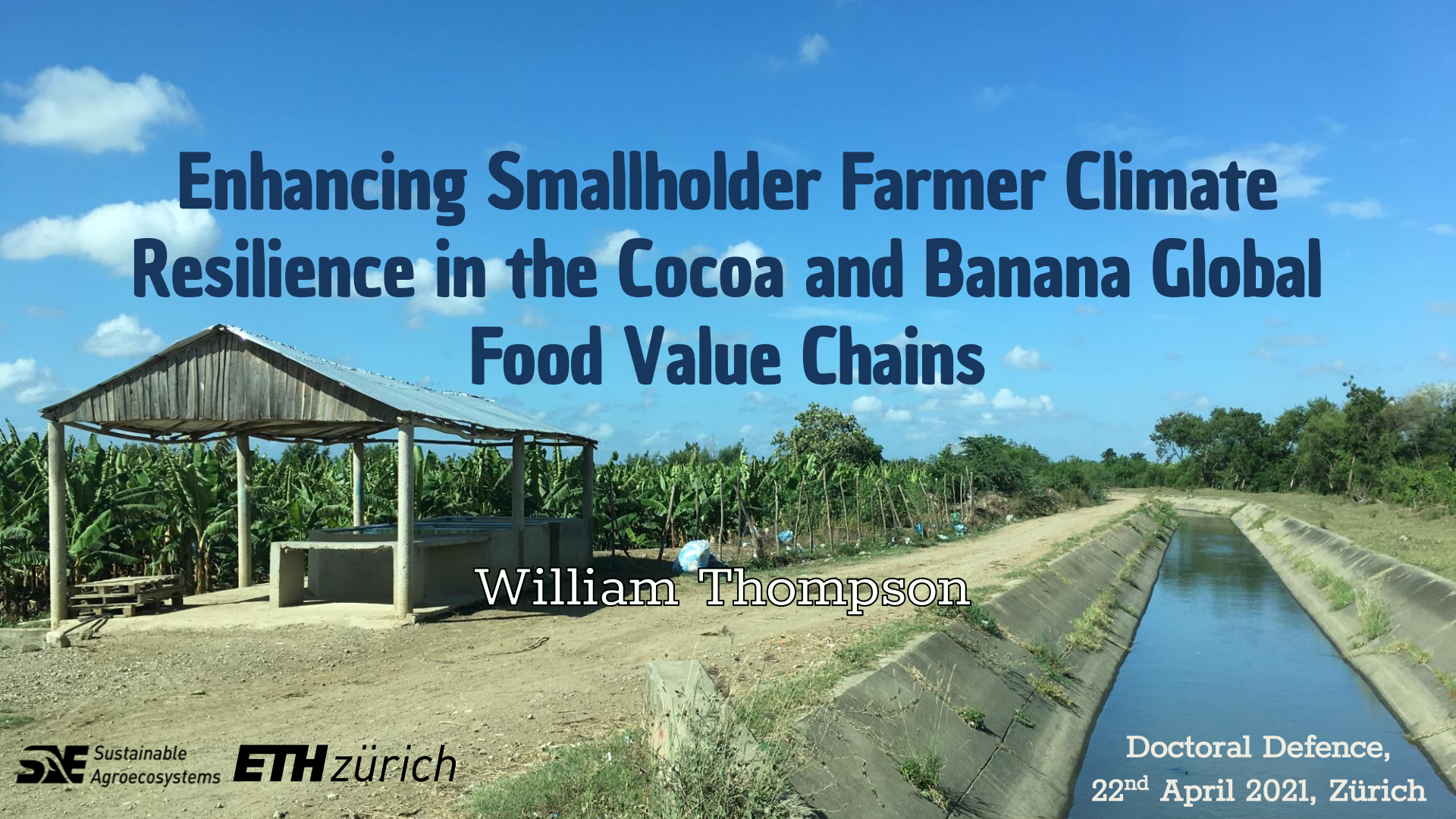
# Enhancing Smallholder Farmer Climate Resilience in the Cocoa and Banana Global Food Value Chains

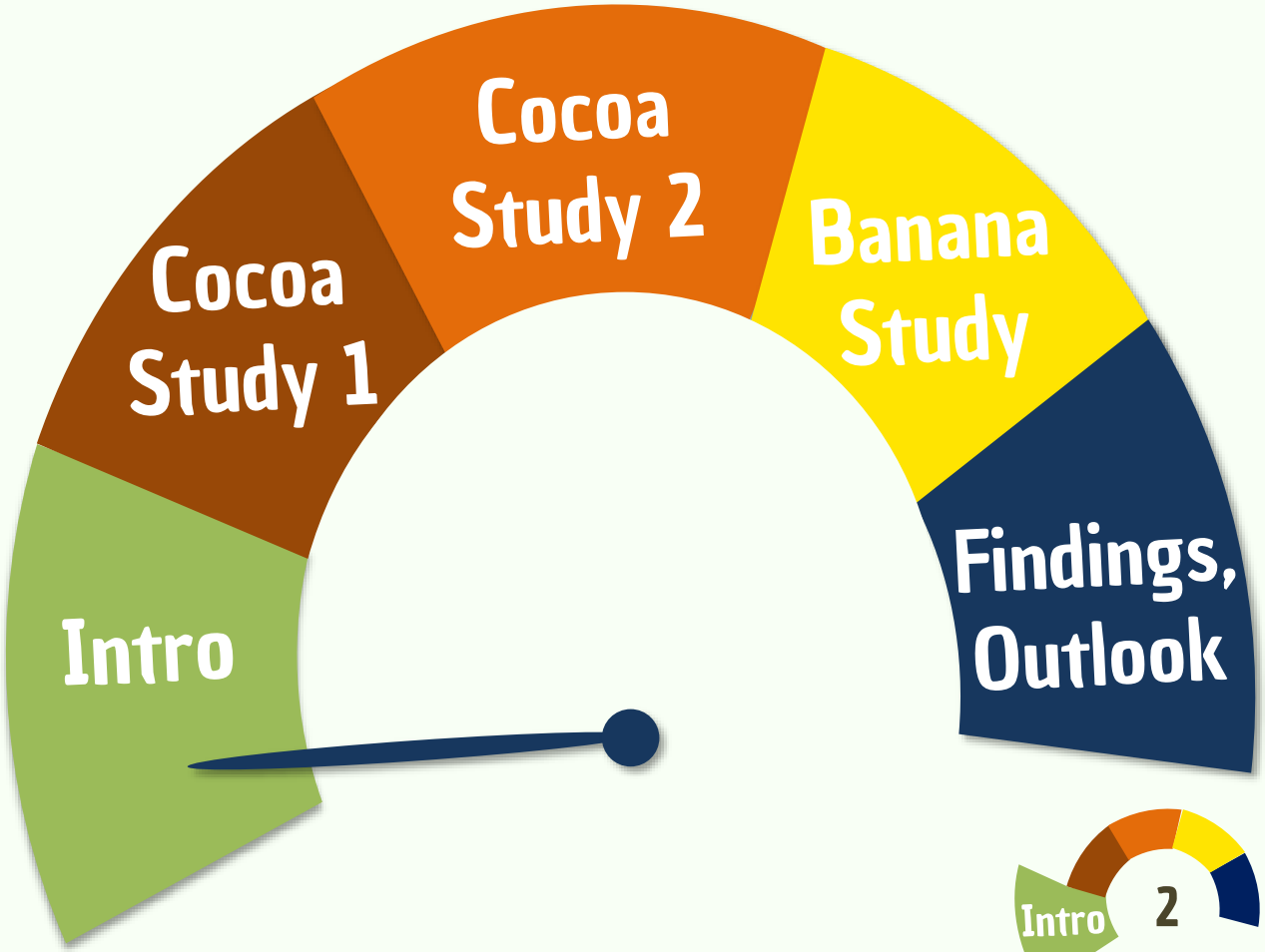


William Thompson

Sustainable Agroecosystems ETH zürich

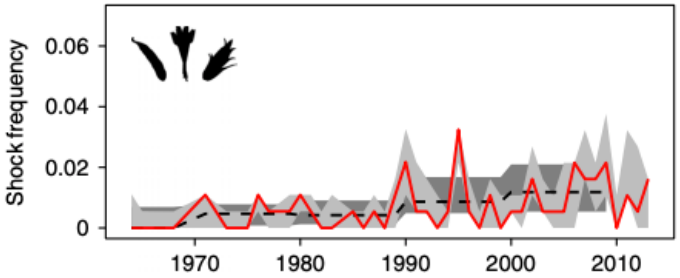
Doctoral Defence,
22nd April 2021, Zürich

# Overview of Today's Presentation

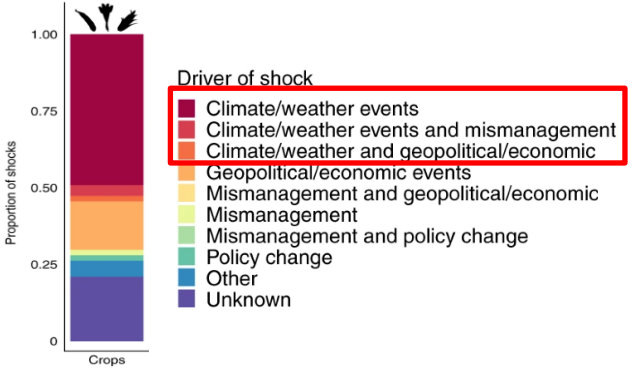


# Climate Threat to the Global Food System

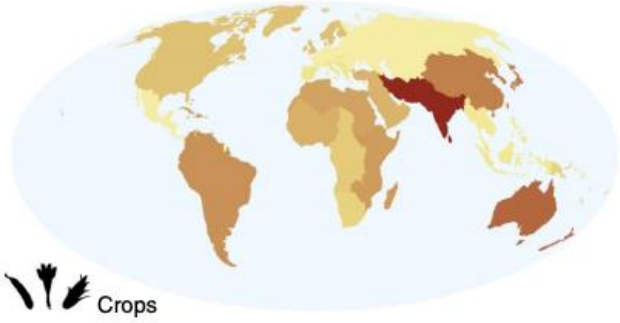
### a) Increasing frequency of shocks (and stressors) to global crop production




### b) The majority of shocks are climate driven




### c) Shocks predominantly in the Global South to smallholder production




### d) Impacts are diverse but ultimately severe

- 2020 Droughts in Haiti, Pakistan and Zimbabwe led to acute food insecurity for 10 million people (FSIN, 2020)
- 2005 - 2015 $96 Billion agricultural losses from natural disasters in low-income countries (FAO, 2018)

Adapted from Cottrell et al. 2019

# Smallholders in Global Food Value Chains

**Globalisation has led to increased smallholder participation in Global Food Value Chains (GFVCs):**


**Increasingly acknowledged that upstream actors in GFVCs must source responsibly, with enhancing smallholder climate resilience a key component:**

**Ban Ki-Moon (2021)** "*Investing in climate resilient agriculture is essential to elevate more than 500 million smallholder farmers around the world*"

**Resilience:** *"...the ability to cope with shocks and to keep functioning in much the same kind of way. It is a measure of how much an ecosystem, a business, a society can change before it crosses a tipping point..."* **Walker (2020)**

# Research Objectives

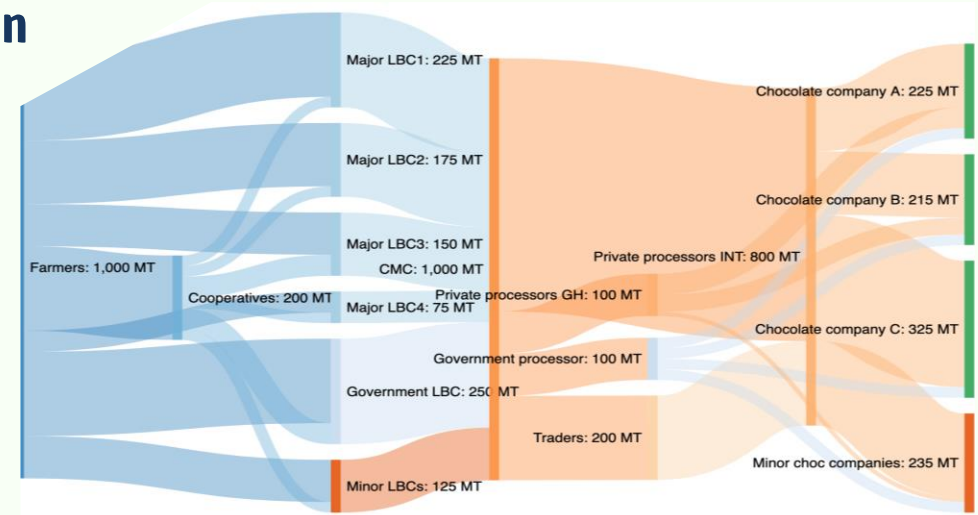
1.
Define with stakeholders "climate resilience" of smallholder farmers in global food value chains

2.
Assess the climate resilience of smallholder farmers and its determinants in global food value chains

3.
Assess and explore opportunities to enhance smallholder climate resilience in global food value chains

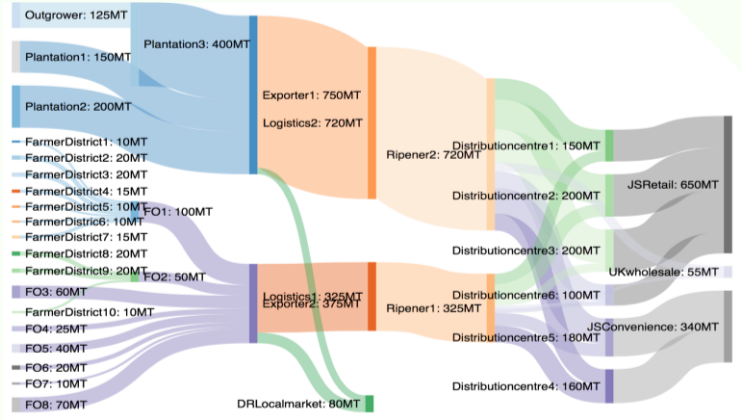
# Ghanaian (-Swiss) Cocoa Value Chain

- Globally significant producer
- Exclusively smallholder production
- Medium to low sustainability initiative coverage
- State controlled marketing




# Dominican Republic (-UK) Banana Value Chain

- Regionally significant producer (Globally for Organic)
- Mixture of smallholder and large plantation production
- High sustainability initiative coverage
- Private marketing






Sustainable Agroecosystems ETH zürich

# Methodological Overview

**Resilience Framework Development**
- Resilience framework conceptualisation

**Stakeholder Co-Generation of Climate Threats And Resilience Indicators**
- Value chain platform establishment
- Value chain stakeholder workshops
- Farmer focus groups
- Semi-structured value chain interviews

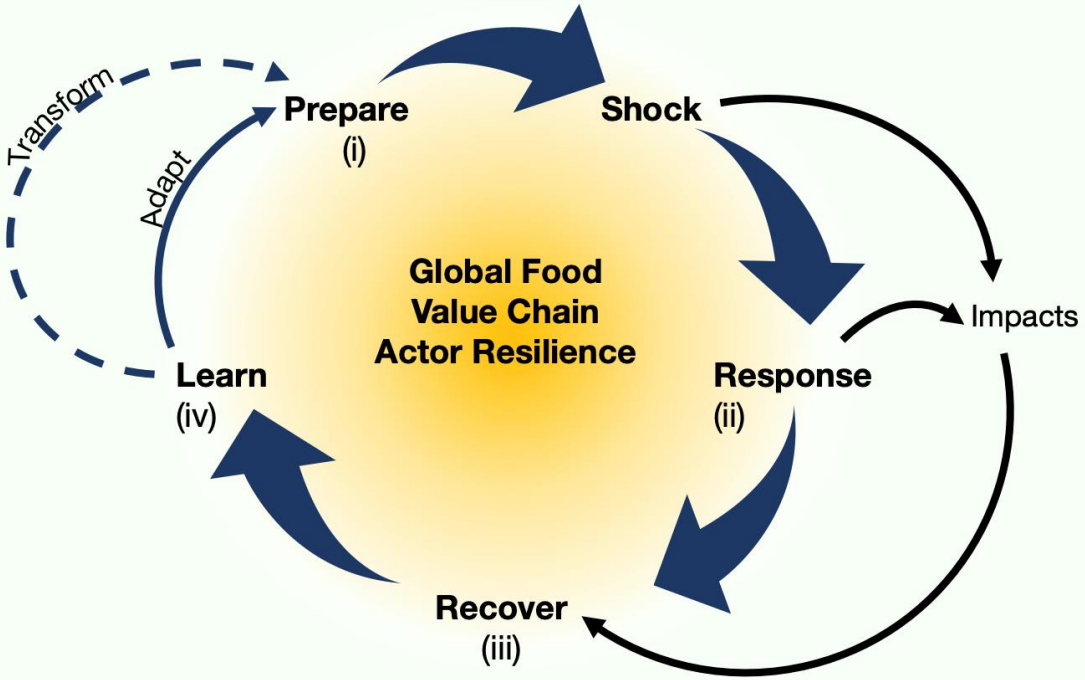
**Resilience Assessment Data Collection**
- Socio-economic data collection
- Biophysical data collection
- Remote sensing data collection
- Trade data collection

**Biophysical Analysis**
- Shade tree cover and diversity
- Flood damage
- Soil analysis

**Statistical Analysis**
- Factor and regression analysis
- Causal inference of certification role

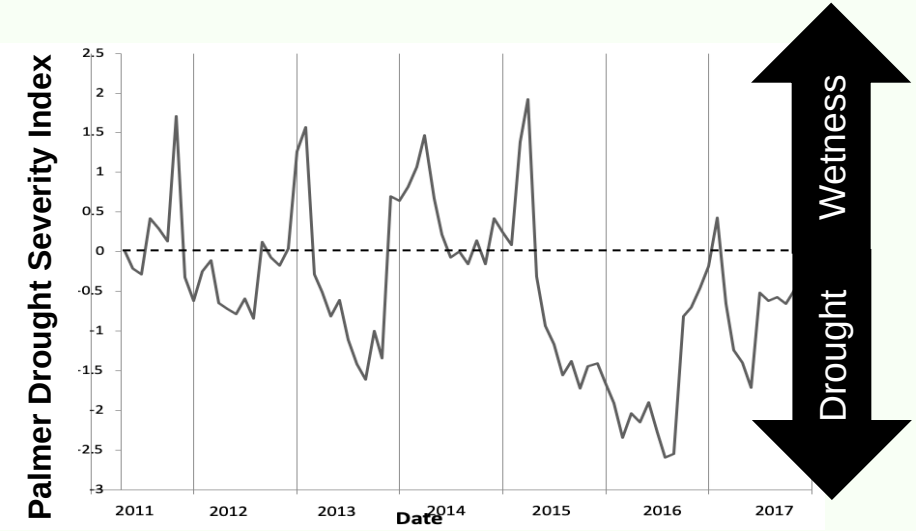
**Stakeholder validation and recommendations**
- Bi-lateral stakeholder validation
- Recommendations to industry

# A Framework for Assessment of Climate Resilience in Smallholder GFVCs



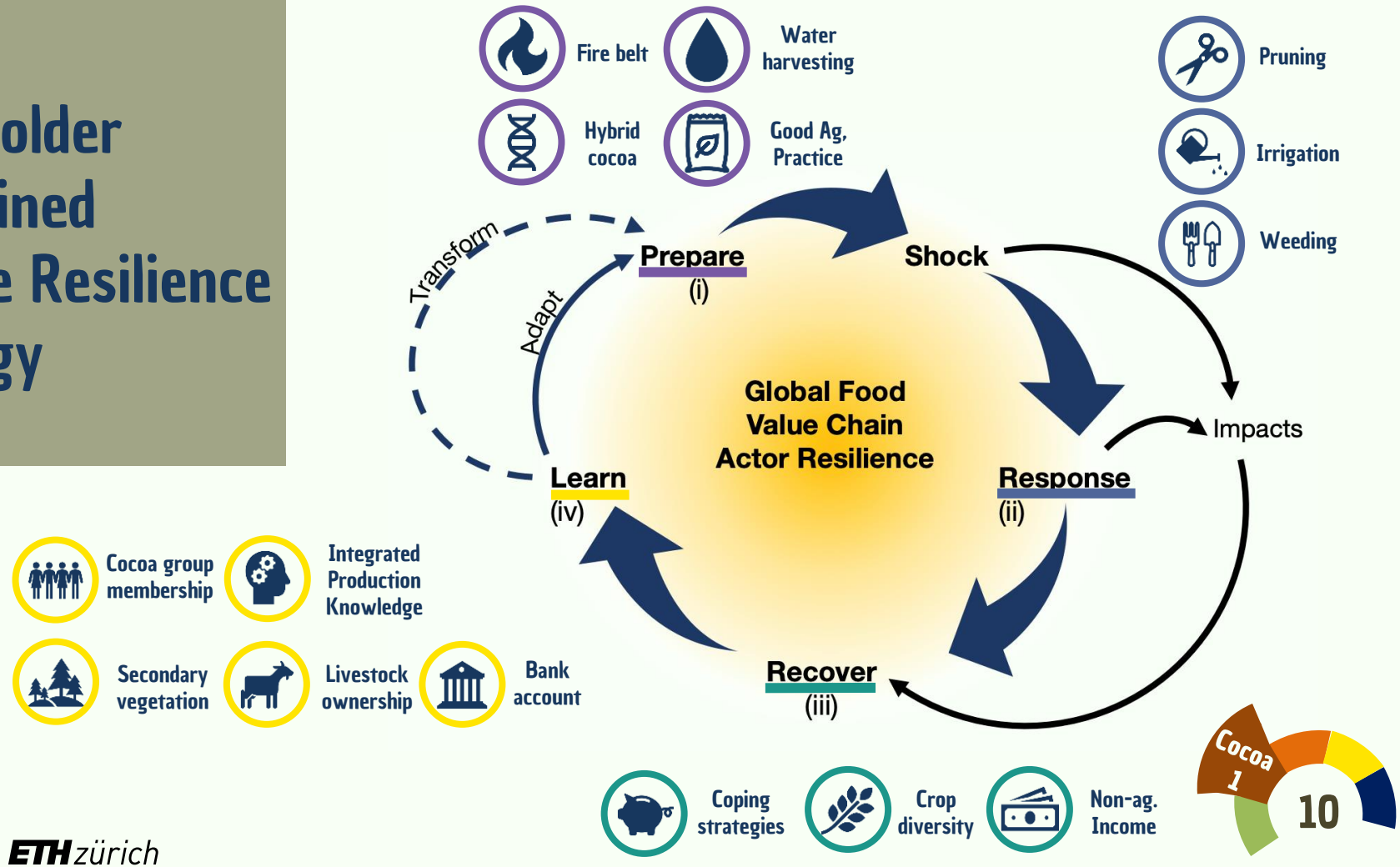

From Thompson et al. (in submission)

# Case 1:
# Ghanaian Cocoa
# 2015-16 Drought




Thompson et al. (in review)

# Cocoa Stakeholder Co-defined Climate Resilience Strategy



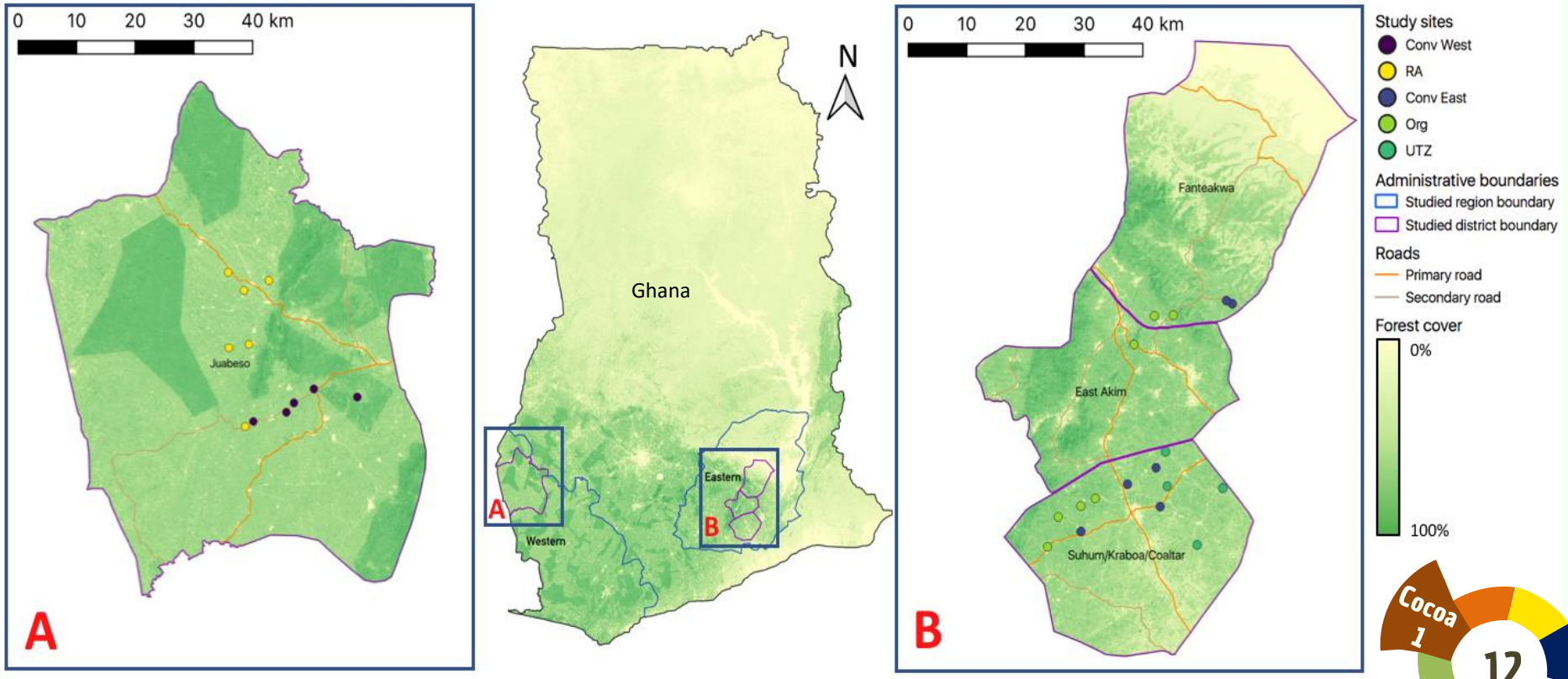

Sustainable Agroecosystems ETH zürich

# Research Question 1

## Does sustainability certification impact the climate resilience of smallholder farmers?



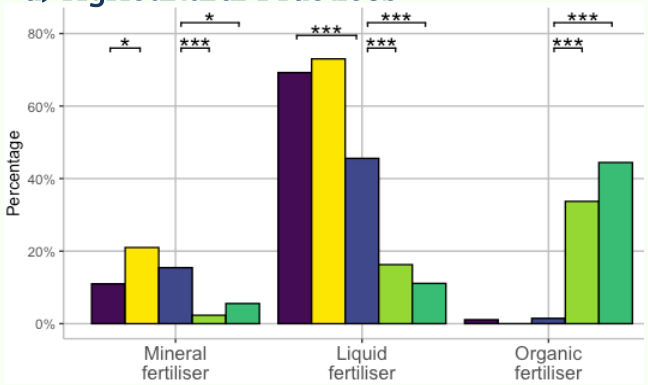
# Resilience Assessment of Certified vs Non-certified Farmers



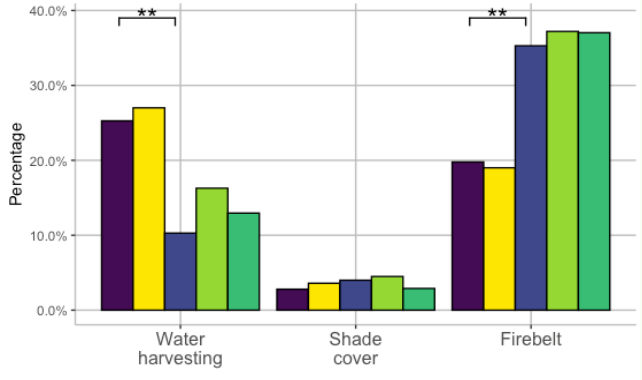

From Thompson et al. (in review)

# Certification underperforms on promoting resilience measures and strategies versus agricultural practices

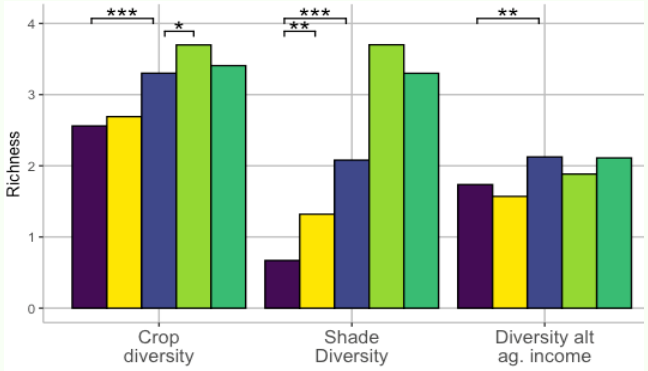
a) Agricultural Practices




b) Climate resilience measures




c) Climate resilience sub-strategies



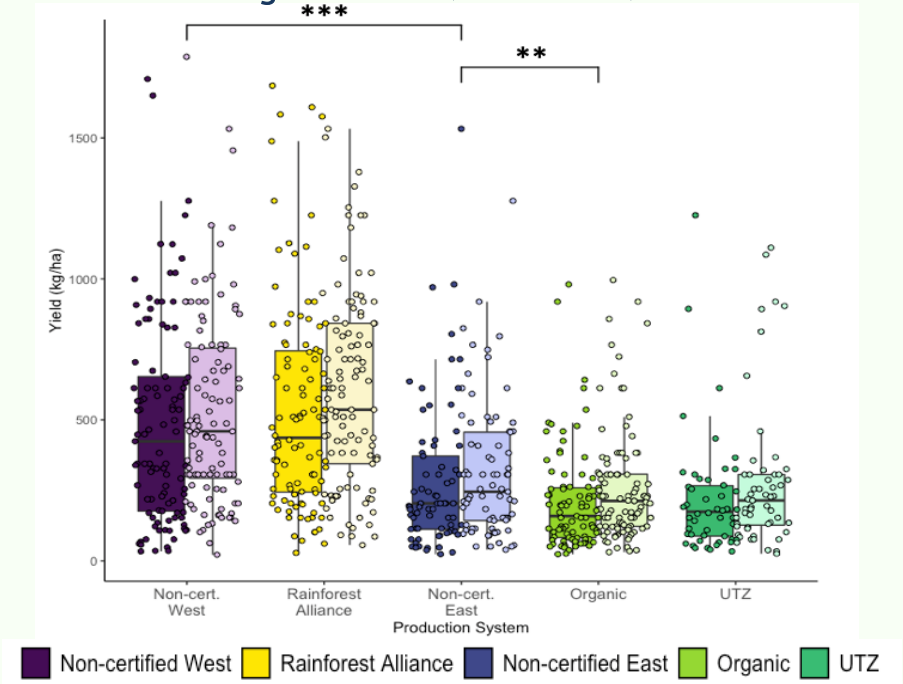

- Certification has strong impact on agricultural practices
- Certification had no impact on climate resilience measures
- Certification has limited to no impact on climate resilience sub-strategies

From Thompson et al. (in review)


From Thompson et al. (in review)

# Lack of resilience strategy uptake results in no influence on drought-driven yield losses

a) Cocoa Yields: "Normal" season (light colour) vs 2015-16 "Drought" season (dark colour)

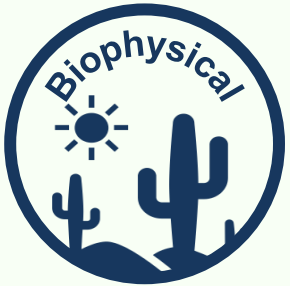



- Regional differences predominate in terms of absolute cocoa yields
- Organic farmers have lower cocoa yields
- Certification has no effect at modifying the impact of drought on cocoa yields
- However, some benefits related to "adaptability" and "transformability" related to (group membership, training)

From Thompson et al. (in review)

# Research Question 2

## What determines the adoption of climate resilience strategies by smallholder farmers?

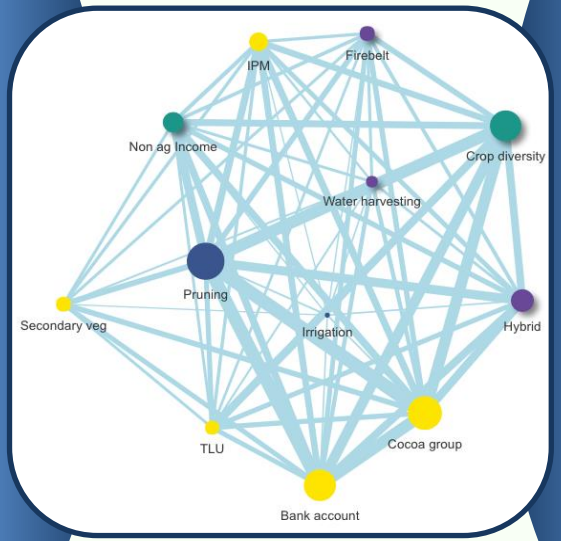




# Composite Index Synthesis

## Stakeholder defined resilience indicators

- Fire belt
- Water harvesting
- Hybrid cocoa
- Pruning
- Irrigation
- Crop diversity
- Non-ag. Income
- Cocoa group membership
- Bank account
- Livestock ownership
- Secondary vegetation
- Integrated Production Knowledge

## Climate Resilience Strategy



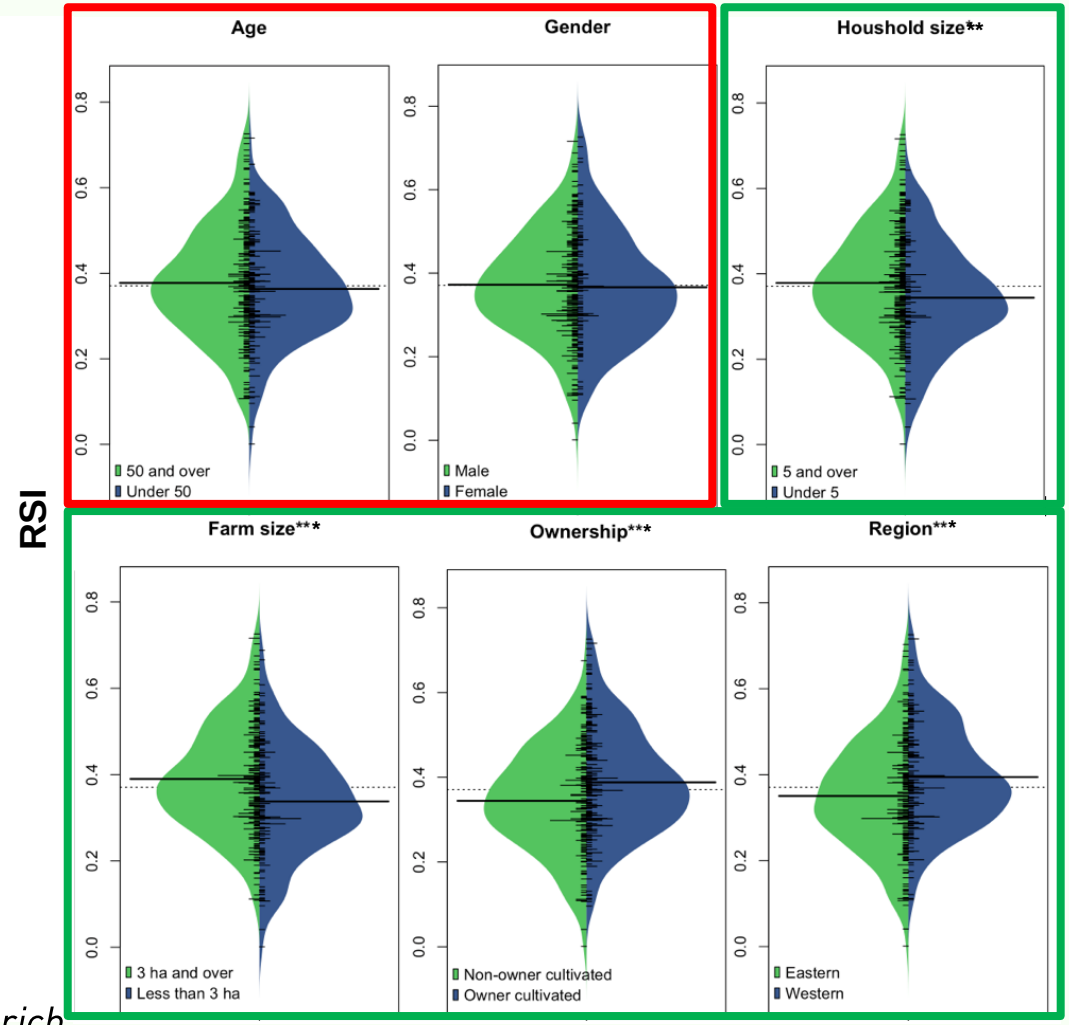

## Climate Resilience Strategy Index (RSI)


- 1.0 High strategy adoption
- 0.5 Medium strategy adoption
- 0.1 Low strategy adoption


Sustainable Agroecosystems ETH zürich

Preparation | Response | Recovery | Learning

# Climate Resilience Strategy Index (RSI)





High strategy adoption

Medium strategy adoption

Low strategy adoption

From Thompson et al. (in submission)

Sustainable Agroecosystems ETH zürich

Cocoa 2 17

# Diverse factors influence adoption of climate resilience strategies

The following factors increased resilience strategy adoption:

- Income generating capacity
- Drought training and value chain integration
- Non-cocoa agricultural market access
- Land tenure and household size
- Regional context

Cocoa farmer diversified into cabbages with irrigation, Ashanti Region, Ghana

# Case 2:
# Dominican Republic Banana
# Hurricanes Irma and Maria


# Research Questions 3

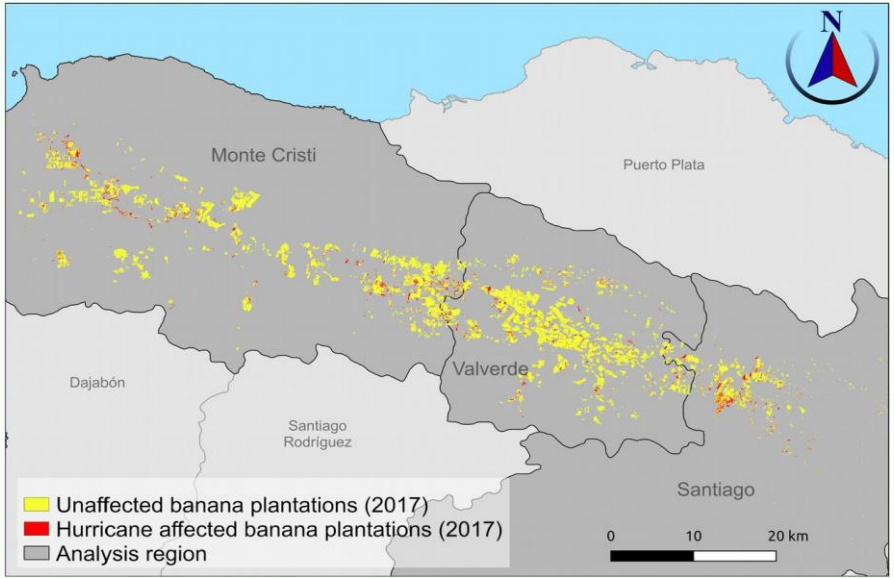
i) How are smallholder farmers in the banana GFVC impacted by hurricane induced flooding?

ii) How quickly did their production recover?

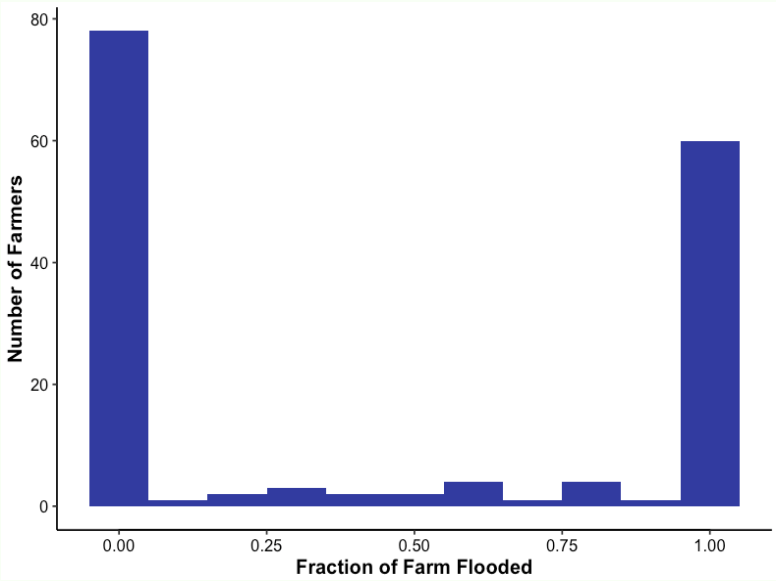
iii) What determines the speed of recovery?

# “All-or-nothing” damage makes recovery key to resilience

a) Regional flooding of banana production




b) Smallholder banana farmer flooded area




- Remote sensing indicated 11.4% of national production was impacted by the hurricane induced flooding

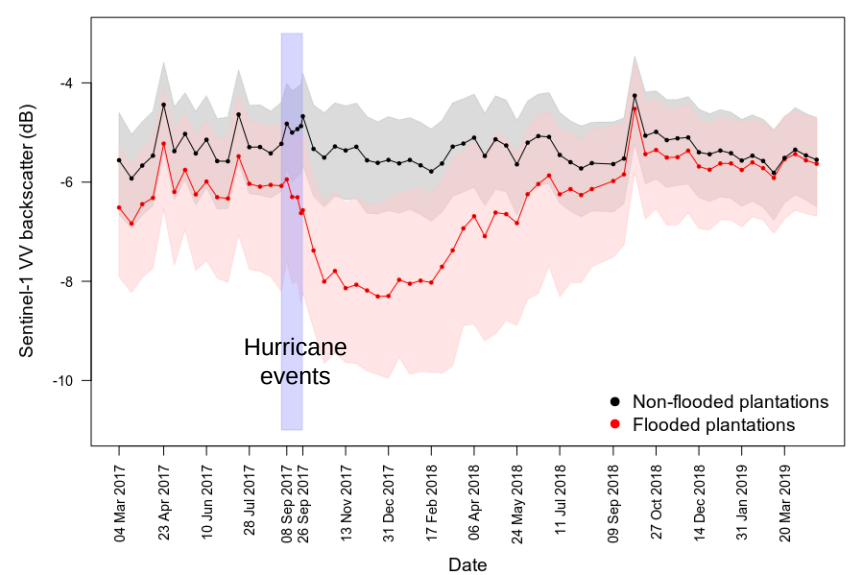
- Household surveys revealed the “all or nothing” nature of the flooding
- With farmers either experiencing catastrophi losses (90% of production destroyed) or n damage at all

Sustainable Agroecosystems ETH zürich

From Thompson et al. (in submission)

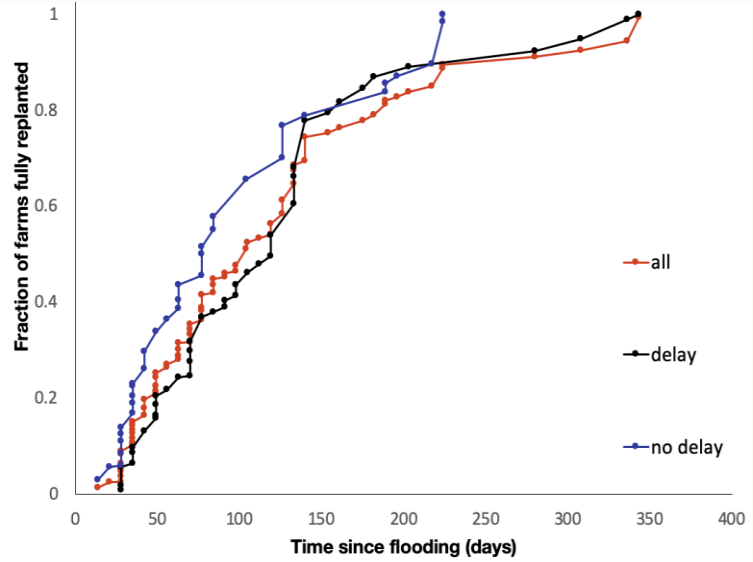
# Highly variable recovery times led to severe production deficits

## a) Regional banana production recovery




- Remote sensing revealed regional productive area recovery took 450 days

## b) Smallholder banana farmer production recovery



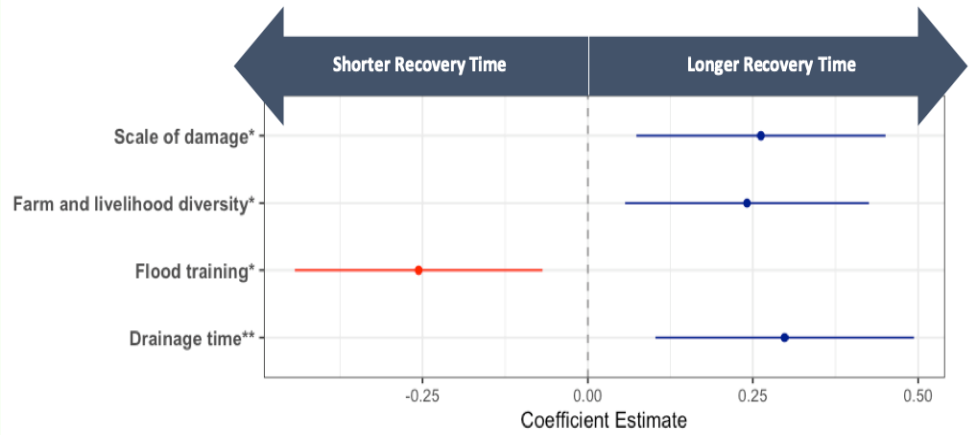

- Household surveys revealed a wide range of recovery times (7 — 351 days)

Sustainable Agroecosystems ETH zürich

From Thompson et al. (in submission)

# Topographical and livelihood factors cause heterogeneity in hurricane recovery

## a) Factors driving recovery time

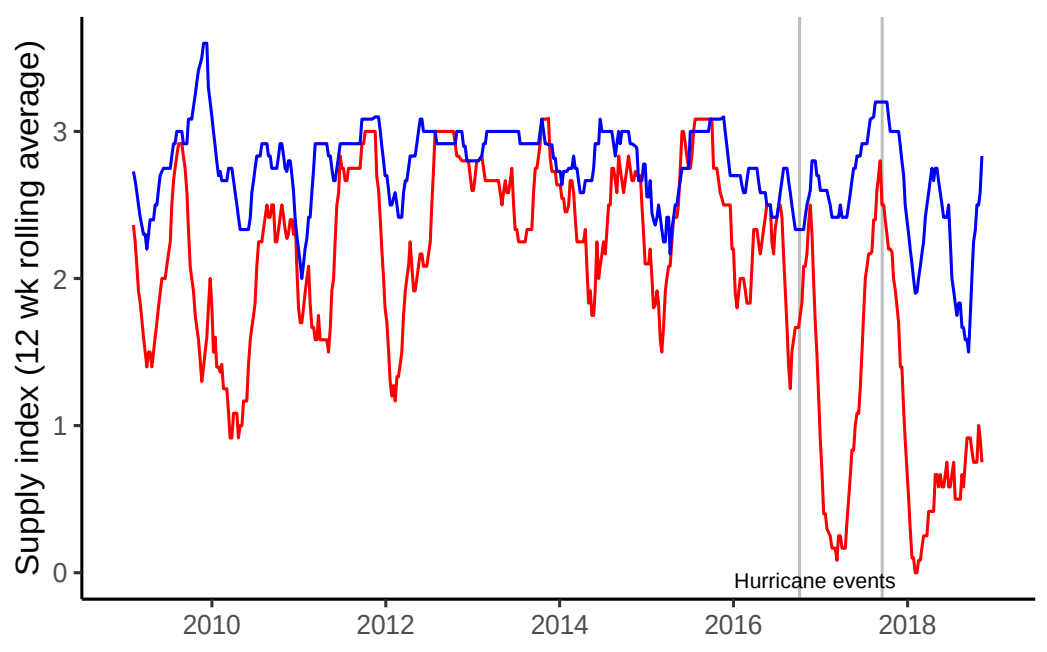



- Scale of damage, farm and livelihood diversity and drainage time increase recovery time
- Flood training decreases recovery time

From Thompson et al. (in submission)

# Importer responses led to a “double exposure” to market and climate

a) UK banana imports from Dominican Republic (red) and Ecuador (blue)




- Household surveys revealed a loss of market access for both flooded and non-flooded farmers
- Importer switching can be seen at a national scale with a reduction in imports from the DR to the UK
- DR Export recovery was prolonged and not proportional to production recovery

From Thompson et al. (in submission)

# Cross-case Findings

## The nature of climate resilience strategies in smallholder driven GFVCs — Objective 1

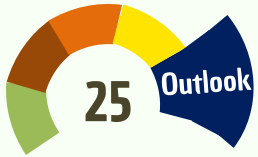
1. Generalisable strategies across diverse threats but with specificity versus key threats
2. Scale-limits to smallholder farmer agency must be overcome
3. Bundling resilience measures will be important but…
4. Resilience strategies are not, by default, benevolent

## Determinants of resilience strategy utilisation — Objective 2

5. Domestic markets key to develop climate resilient multifunctional agricultural systems
6. Sub-national context strongly moderates resilience strategy adoption and shock-outcomes
7. Participating in GFVCs is a “double-edged sword” for smallholders’ climate resilience

## Mechanisms to enhance the climate resilience of smallholders in GFVCs — Objective 3

8. Certification has potential but underperforms on the uptake of complex measures
9. Training enhances strategy uptake but targeting is key
10. Spatial planning at a landscape scale can enhance climate resilience



# Research Outlook

## Assess the costs of a lack of resilience

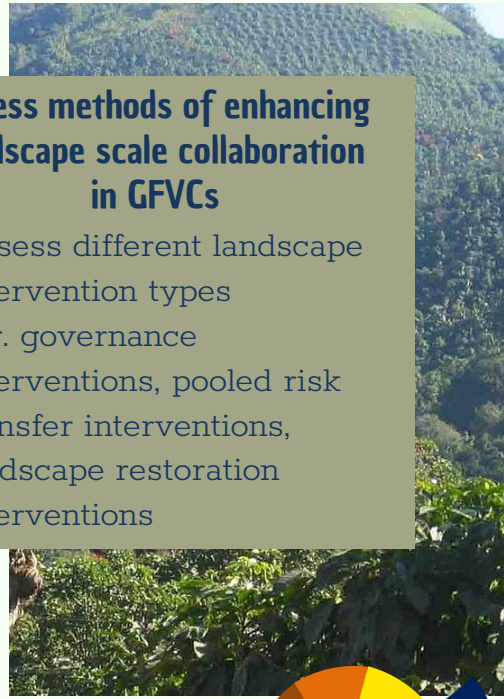
- Environmental: deforestation and climate shocks
- Economic costs for smallholders, governments and downstream GFVC actors

## Explore how to enhance multi-functionality

- What conditions promote beneficial diversification?
- E.g. RCT of domestic market interventions

## Assess methods of enhancing landscape scale collaboration in GFVCs

- Assess different landscape intervention types
- E.g. governance interventions, pooled risk transfer interventions, landscape restoration interventions



# Acknowledgements


**External examiner**
Prof. Lindsay Stringer

**Supervisors**
Prof. Johan Six
Dr Pius Krütli
Dr Jonas Jörin
Dr Wilma Blaser
Prof. Birgit Kopainsky
Dr Erik Chavez

**Masters students**
Bianca Curcio
Megan Morrow
Nadine Schweizer

**Collaborators**
Dr Evans Dawoe
Dr Solhanlle Bonilla-Duarte
Prof. Rachael Garrett
Dr Varun Varma
Prof. Dan Bebber
Dr Leon Späth
Dr Kenza Benabderrazik
Dr Elena Monastyrnaya
Anaely Aguiar-Rodriguez

**Banana and Cocoa Stakeholders**
Farmers
Banelino
Yayra Glover
Rainforest Alliance
Fyffes
Sainsbury's
Winfresh
Banamiel
Field teams


Sustainable Agroecosystems | ETH zürich | KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY | intec INSTITUTO TECNOLÓGICO DE SANTO DOMINGO | UNIVERSITAS BERGENSIS | Imperial College London | UNIVERSITY OF EXETER | World Food System Center | STIFTUNG MERCATOR SCHWEIZ

# Thank you for listening!