

# Research in West Africa

***Laboratory of Tropical and Subtropical Agriculture and  
Ethnobotany (LTSAE)***

***Plants and Crops Department***

***Faculty of Bioscience Engineering***

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# Main research interests (LTSAE)

## agronomy/(integrated) plant production

- ◆ food/medicinal **plant production**
  - ◆ **agroforestry**
  - ◆ production **ecology**
  - ◆ ethnobotany, sustainable use of NTFPs and new crop development
  - ◆ agricultural **water management**, including salt and drought stress of plants in (semi-)arid regions (eco-physiology, plant-water relations), and **water harvesting techniques**
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# Main research interests (LTSAE)

## socio-economy of (plant) production systems

- ◆ **micro-finance** and market integration of small-scale farmers in developing countries
  - ◆ **value chains**: SWOT analysis, and value chain optimization
  - ◆ **sustainability**
  - ◆ **feasibility studies**
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# Focus on (West) Africa

**Ivory Coast:** ecology/pollination/production  
optimization of cacao

**Nigeria:** plantation crops: oilpalm (x cacao)

**Senegal, Mali x Benin:** baobab and tamarind:  
crop and market development

Regional: the **Great Green Wall initiative:**  
support of FAO-run initiatives, NGOs  
(Entrepreneurs without Frontiers, Hommes et  
Terres,... (Mali, Burkina Faso)

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# Generic spin-offs and service provision

**Beyond Chocolate** initiative: sustainable livelihoods from cacao production

**Ghent Africa Platform**

**Consultancies for private firms, (bilateral/(inter)national) cooperation,...** (Puratos, SIAT/Presco,...)

**Collaboration with AfricaRice, IITA,...** local universities

**Collaboration with x review of regional agricultural research coordination (FARA, CORAF,...)**

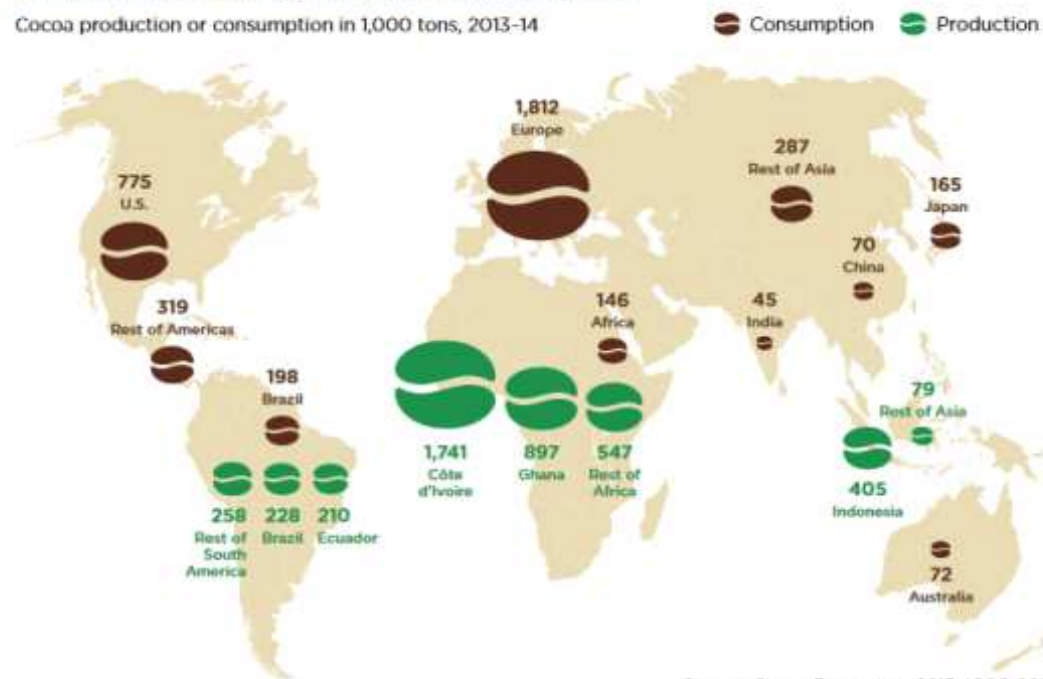
at any moment, ~ 10 **PhD** students from Africa

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## example: Cocoa Crop Production

### Global cocoa production and consumption

Cocoa production or consumption in 1,000 tons, 2013-14



Source: Cocoa Barometer, 2015; ICCO 2014.

Global cocoa area (Mha)	10
Share (%) of global arable land	0.7
Share (%) of global permanent crop area	7
Global production (1000 tonnes)	4450

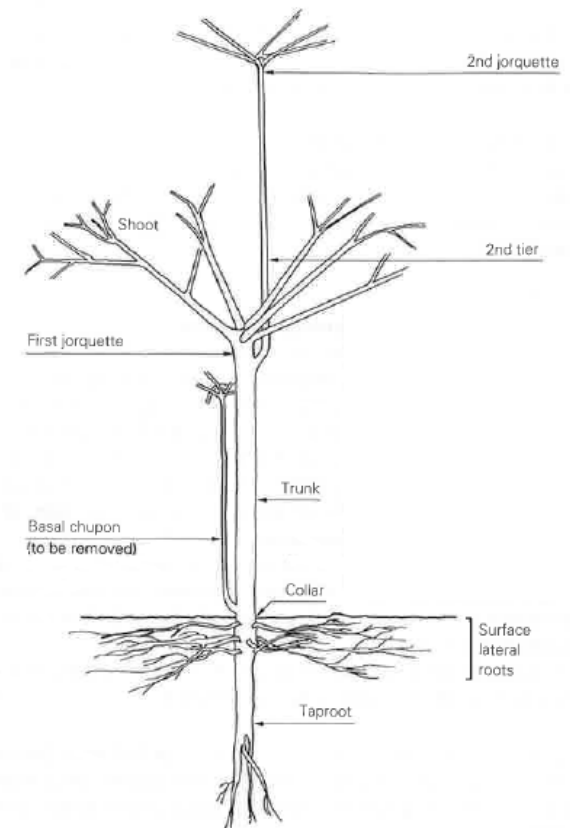
## 7 countries produce 88 % of world's cocoa

Country	Area (1000 ha)	Production (1000 t)	Share of world production	Yield (kg ha <sup>-1</sup> )
Ivory Coast	2,851	1,472	32 %	516
Ghana	1,684	859	19 %	510
Indonesia	1,701	657	15 %	386
Cameroon	724	292	7 %	403
Nigeria	838	236	5 %	282
Brazil	720	214	5 %	297
Ecuador	454	178	4 %	391

Global Production (2016): 4.47 million tonnes

FAO data from 2016

# Botany





# Botany



## Botany - Phenology

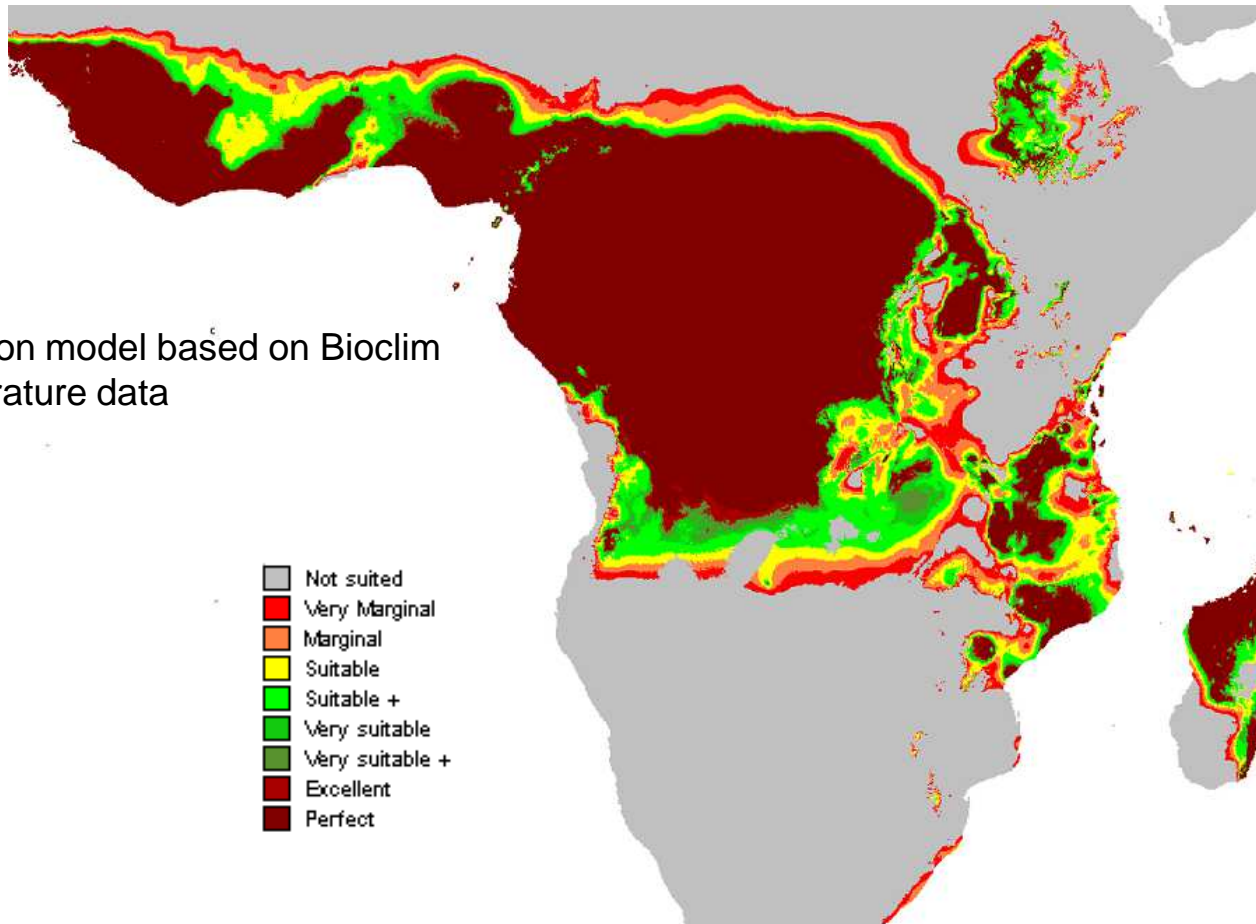


# Botany



## Ecology

Cocoa distribution model based on Bioclim  
rainfall x temperature data



## Cocoa Crop Production

- > 90 % of cocoa is produced by **smallholders** (owning < 5 ha; average: 3 ha)
- => main source income for **4.5 million farming families**
- Globally, **14 million** people work in cocoa farming





Contents lists available at ScienceDirect

Agriculture, Ecosystems and Environment

journal homepage: [www.elsevier.com/locate/agee](http://www.elsevier.com/locate/agee)

Effect of shade tree planting and soil management on rehabilitation success of a 22-year-old degraded cocoa (*Theobroma cacao* L.) plantation

Wouter Vanhove<sup>a,\*</sup>, Niels Vanhoudt<sup>b</sup>, Patrick Van Damme<sup>a,c</sup>

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Significant impact of agroforestry practices on soil *micro-, meso and macrofauna* ~ **shade**



- *Pseudomonas* sp.;
- *Bacillus* spp.
- mix of three different *Enterobacter* species; and
- *Trichoderma asperellum*

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<http://dx.doi.org/10.1080/09583157.2015.1128527>



RESEARCH ARTICLE

**Biocontrol of vascular streak dieback (*Ceratobasidium theobromae*) on cacao (*Theobroma cacao*) through induced systemic resistance and direct antagonism**

Wouter Vanhove<sup>a</sup> , Niels Vanhoudt<sup>b</sup> and Patrick Van Damme<sup>a,c</sup>

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## Cocoa research at Ghent University

### Integrated Pest and Disease Management

#### Research on

- Cocoa Pod Borer up to 50 % of pods lost in SE-Asia
- Mirids globally affect cocoa; in W-Africa, losses up to 40 %
- Stem borers locally severe, but rapidly spreading in W-Africa



Cocoa pod borer damage to pod pulp + beans



Mirid infestation (*Helopeltis* sp.)



Stem borer (moth larvae) hole



## Cocoa research at Ghent University Integrated Pest and Disease Management

- pheromones for monitoring and integrated control of CPB, stem borer moths and mirids
- more **integrated mirid control**
  - Reduced and more targeted spraying
  - Ecological modeling of mirid distribution (landscape analysis)



*Helopeltis* sp.



*Sahlbergella singularis*



*Distantiella theobroma*



# JOURNAL OF APPLIED ENTOMOLOGY

J. Appl. Entomol.

ORIGINAL CONTRIBUTION

## **Geometric isomers of sex pheromone components do not affect attractancy of *Conopomorpha cramerella* in cocoa plantations**

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## Stem Borers

- Many species: Cerambycid (longhorn beetles) and Curculionid (true weevils) beetles and Coleoptera (*Eulophonotus* sp., *Zeuzera* sp.)
- Round holes in stem and branches
- Damage to phloem and xylem tissue
- withered terminal buds and eventually tree death



## Cocoa research at Ghent University

### Pollination

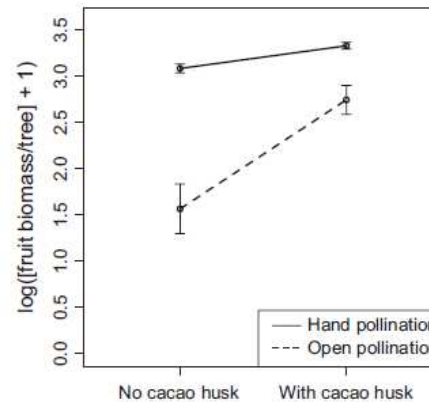
- Pesticide treatments and cocoa monocultures have decreased natural pollinator (midges)
- enhancing natural pollinator levels in the field:
  - Enhancing breeding sites
  - Mass-breeding and release



Cocoa pollinating  
*Forcipomyia* midge (male)



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Forbes & Northfield (2017).  
Ecol. Applic. 27(3), 887–899

