

# Understanding and mitigating cadmium uptake in cacao beans in Latin America

*Lucia Buvé, NICOLE Foundation, executive director*

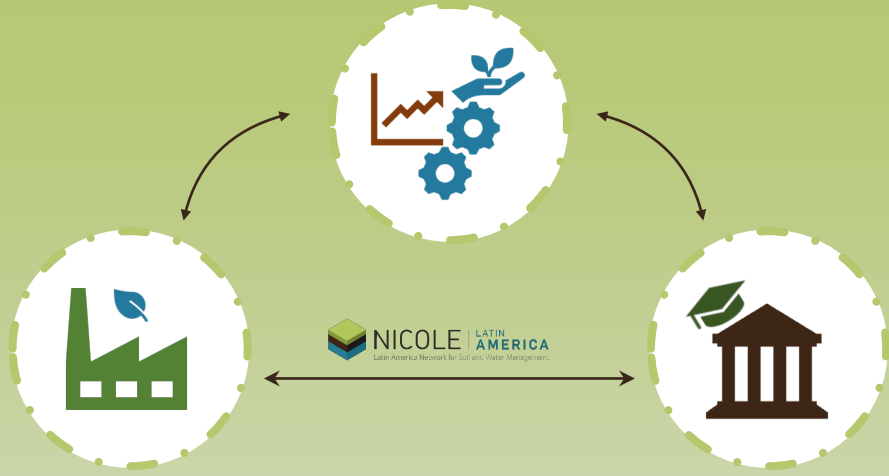


# PILOT STUDIES ON HEAVY METALS IN AGRICULTURE

*Mitigating cadmium in cacao beans  
in Latin-America*

Lucia Buvé  
NICOLE Foundation





+

**EKOS BRASIL**  
ADMINISTRATIVE SUPPORT



**PROJECT  
FOCUSING LATIN  
AMERICA  
2021-2023**

EUROPE



# INTRODUCTION AND CONTEXT

- In 2019, EU Regulation 488/2014 came into force, setting maximum levels for cadmium chocolate-based end products. Normally, EU-regulations come immediately into force, but time was given for research

Product	Maximum level mg/kg wet weight
Milk chocolate with <30% dry cocoa solids	0.10
Chocolate with $\geq 30\%$ <50% cocoa solids	0.30
Chocolate with $\geq 50\%$ dry cocoa solids	0.80
Cocoa powder sold to the final consumer or as an ingredient in sweetened cocoa powder sold to the final consumer (drinking chocolate)	0.60

- The EU regulation had of course a direct consequence on the quality/Cd content of cacao in some producing countries, prohibiting the export to the EU-market if thresholds are exceeded
- Blending was allowed (60kg bags)



# INTRODUCTION AND CONTEXT

- The problem occurs mainly in Latin-American countries where indeed thresholds are exceeded in a systematic way, despite that Cd concentrations in the soils are not higher than background concentrations seen in other regions.
- A lot of EU-funded projects (KUL, prof. E. Smolders) were launched to find solutions to mitigate the uptake of Cd in the cacao trees :
- Cd appeared to be mostly of natural origing, with a high bio-availability in young volcanic soils
- Several amendments were tested, including in field trials : biochar, lime, zeolites.
- Results were not very conclusive, the problem appeared to be very complex
- Current research is now focusing on ways to remove Cd during the fermentation process



# PROJECT GOALS

- Assess and propose mitigation measures to the presence of cadmium (Cd) in cacao beans based on conceptual models developed for the Eastern Lowlands (Trinidad & Tobago) and in the state of Manabí (Ecuador)
- Contribute with FAO to implement actions of the agenda set for the GlobalSOilPartnership18



# METHODOLOGY

16

Meetings with FAO  
*between 2021 & 2023*

+

- Internal team meetings
- Exchange of information and materials with local contacts
- Thorough literature review
- Participation in technical events

**SITE VISIT**

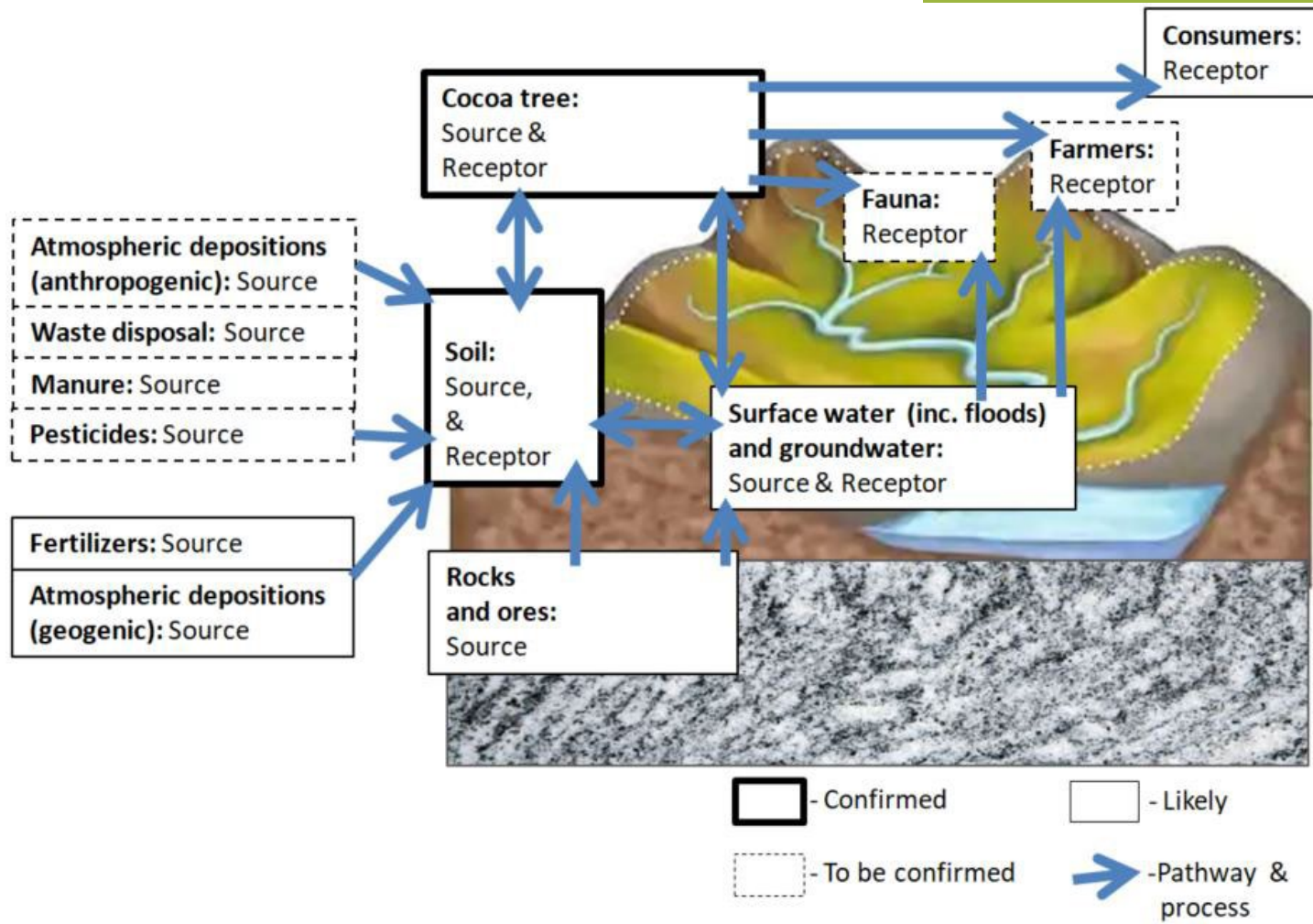
*Trinidad & Tobago (Jan-Feb 2023)*



Interviews, assessing local contacts, refining the information obtained by literature review

# CONCEPTUAL SITE MODELS

*Trinidad & Tobago*



Potential sources

Geogenic

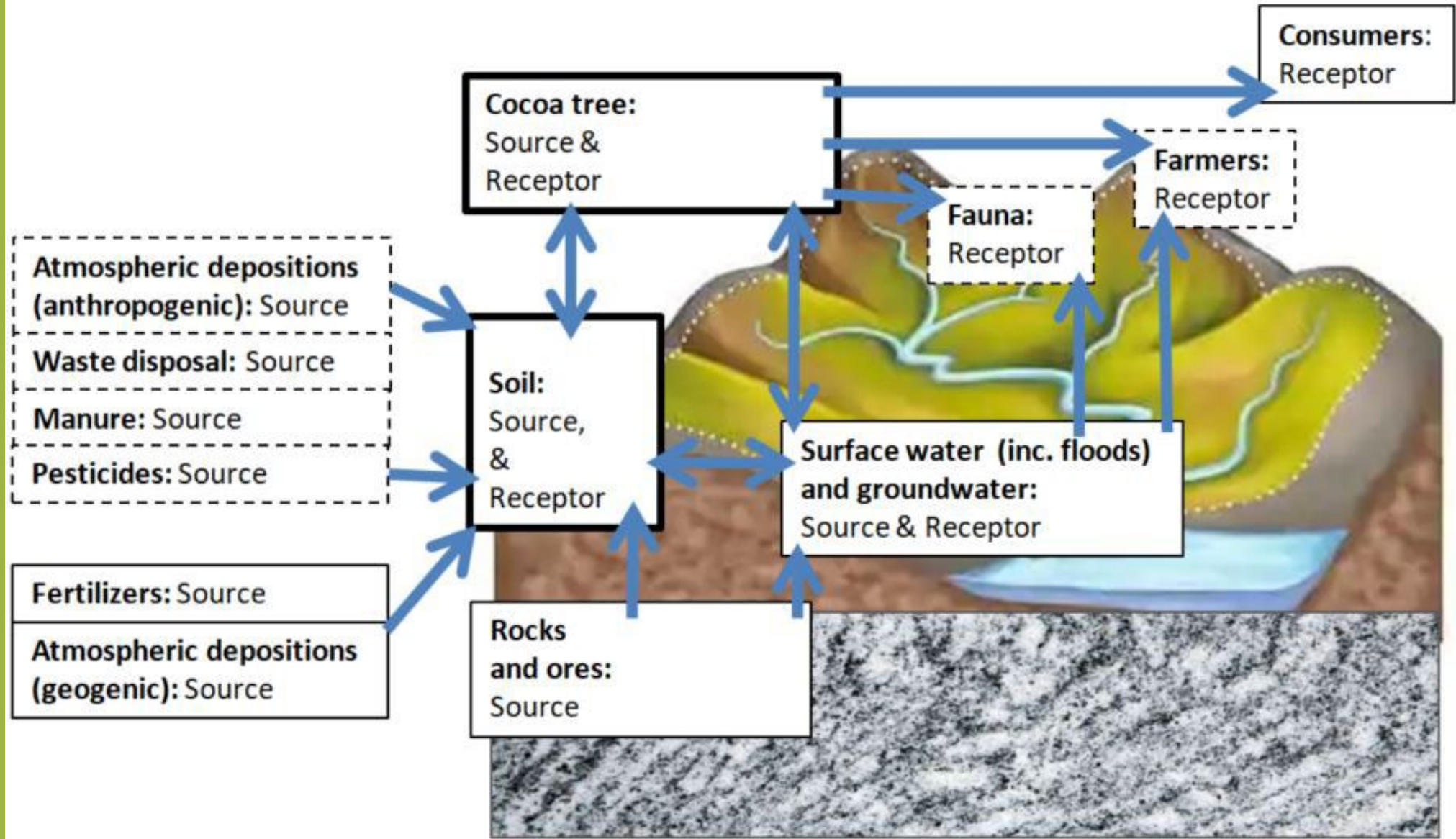
Anthropogenic

Potential receptors

Human receptors

Environmental receptors





 - Confirmed	 - Likely
 - To be confirmed	 - Pathway & process

# POTENTIAL SOLUTIONS

- Reducing Cd in cocoa and chocolate through **blending**;
- **Avoiding high risk areas** for starting new plantations;
- Minimizing the absorption of Cd by the cacao tree through **management of the soil-to-product scale (agricultural practices, etc.)** and the **basin-to-soil scale**
- Solutions should be cheap and practical : cacao farmers are not engineers



# 9 POTENTIAL SOLUTIONS: BASIN-TO-SOIL SCALE

- Evaluate and manage **surface and groundwater quality**;
- Consider and study the **geogenic (volcanic eruptions!) and anthropogenic air emissions** of Cd and/or acidic compounds;
- Evaluate impact of **flooding** and **manage occupation**;
- Analyze and monitor the import and application of **fertilizers**;
- Analyze and monitor the import and application of **manure**, especially considering Cd content and soil acidification;



## 9 POTENTIAL SOLUTIONS: BASIN-TO-SOIL SCALE

- Decrease bioavailability of Cd in the soil by applying **soil amendments**. Liquid lime and/or liquid biochar should be considered as possibilities, considering non desired side effects;
- Application of **nature-based solutions** (plants grown beside the cacao tree, such as alfalfa);
- Management of **cacao leaves** and cut wood;
- Consider the possibility of **alternative crops** to replace cacao at specific locations (plants that are more tolerant to heavy metals); even non-food crop



# PROPOSITION: EXPANDING TO NEW TERRITORIES



Sharing the methodology in international events for relevant stakeholders



Training local partners to develop conceptual site models, evaluate sources/receptors and conduct samplings



Monitoring of projects in different locations through partners and local institutions



# THANK YOU!

SERGEJUS USTINOV (SERGEJUS.USTINOV@FAO.ORG)

LUCIA BUVE (LUCIA.BUVE2@GMAIL.COM)

OLIVIER MAURER (OLIVIER.MAURER@WSP.COM)

SASHA TOM HART (SASHA.HART@USP.BR)

SANDER ESKE (SANDER.ESKES@EKOSBRASIL.ORG)

ANA CRISTINA MOERI (ANA.MOERI@EKOSBRASIL.ORG)

LUCIANA DA C. FERREIRA (LUCIANA.FERREIRA@EKOSBRASIL.ORG)



# Understanding and mitigating cadmium uptake in cacao beans in Latin America

*Lucia Buvé, NICOLE Foundation, executive director*

