

# Deforestation, certification, and transnational palm oil supply chains





# Presentation Outline

## 1. Introduction

## 1. Background

## 2. Methods

## 3. Results

## 4. Conclusions



Image from [SEI](#)



Image from [Betterfood UK](#)

## 2. Background

# **The driving research question:**

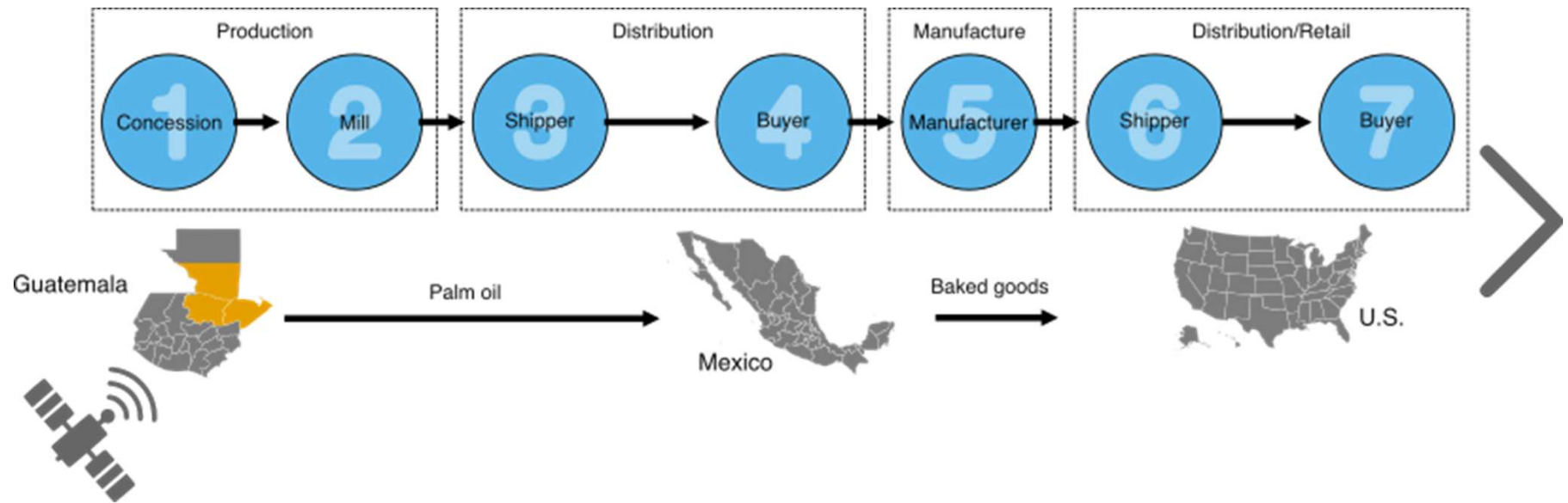
**To what extent is (RSPO-  
certified) palm oil production  
and trade associated with  
measurable impacts on land-  
use patterns (i.e., the  
alteration of forest  
landscapes) over time (2009-  
2019)?**

# Guatemala: Palm oil's latest frontier

- Historically produced in Southeast Asia
- Highest productivity per ha globally
- Projected to become the world's third largest palm oil producer, after Indonesia and Malaysia, by 2030<sup>1</sup>

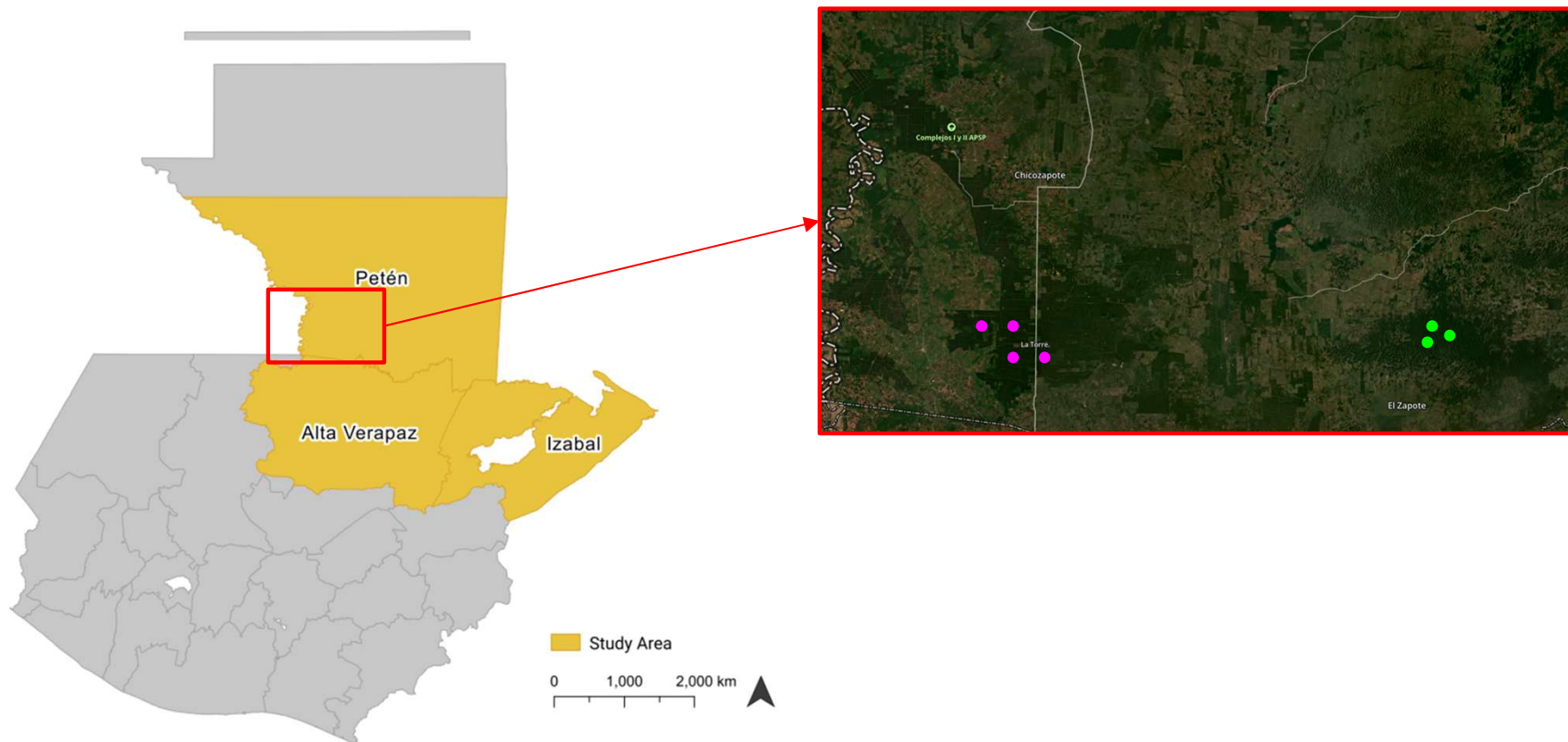


1. Tropical Forest Alliance. (2019). A “commodity-first” approach to identifying landscapes for private sector engagement.

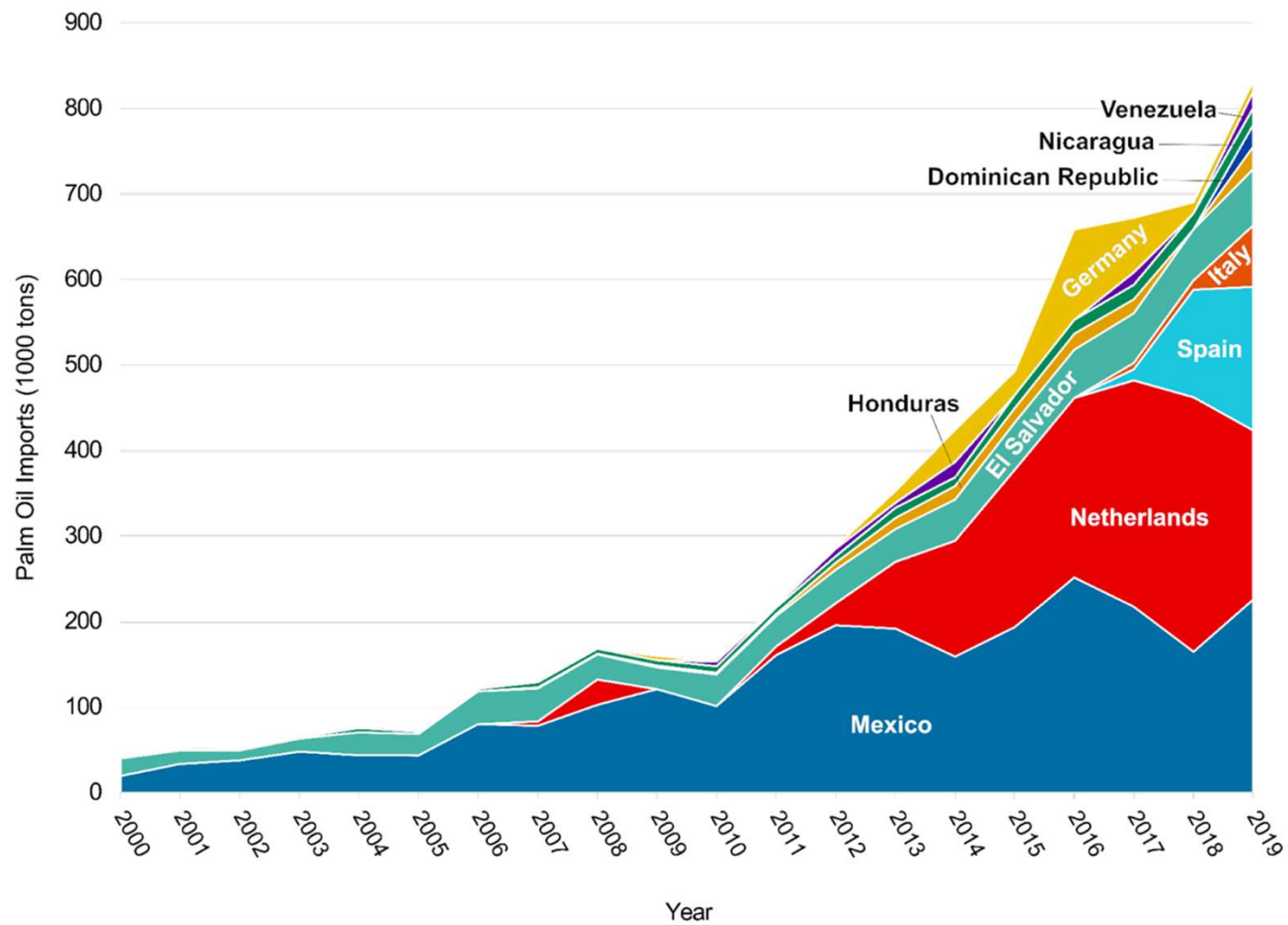


### 3. Methods





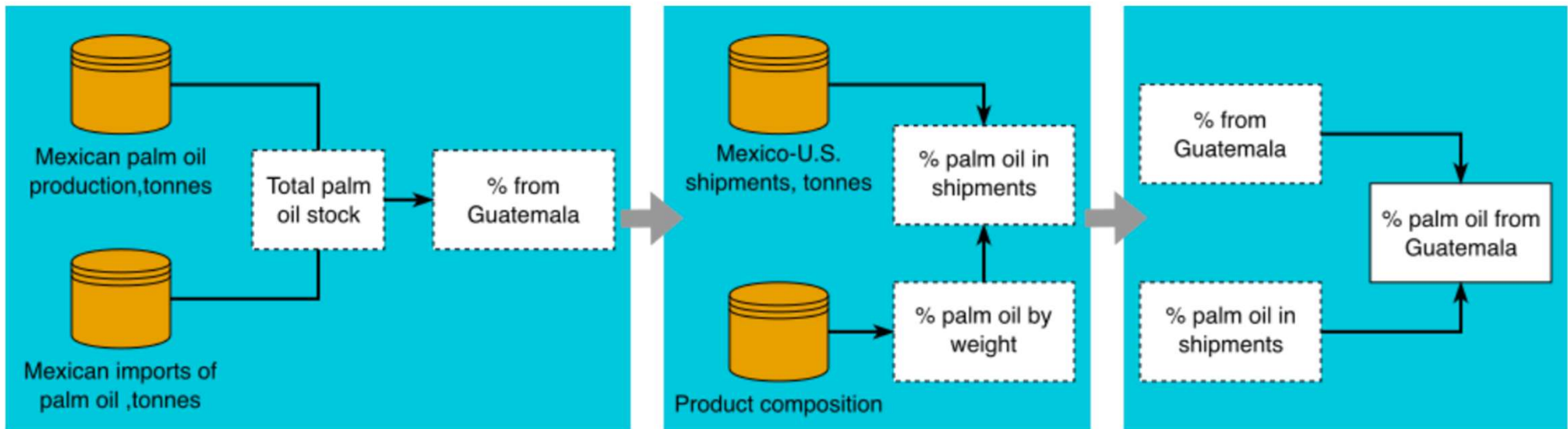
### 3. Methods



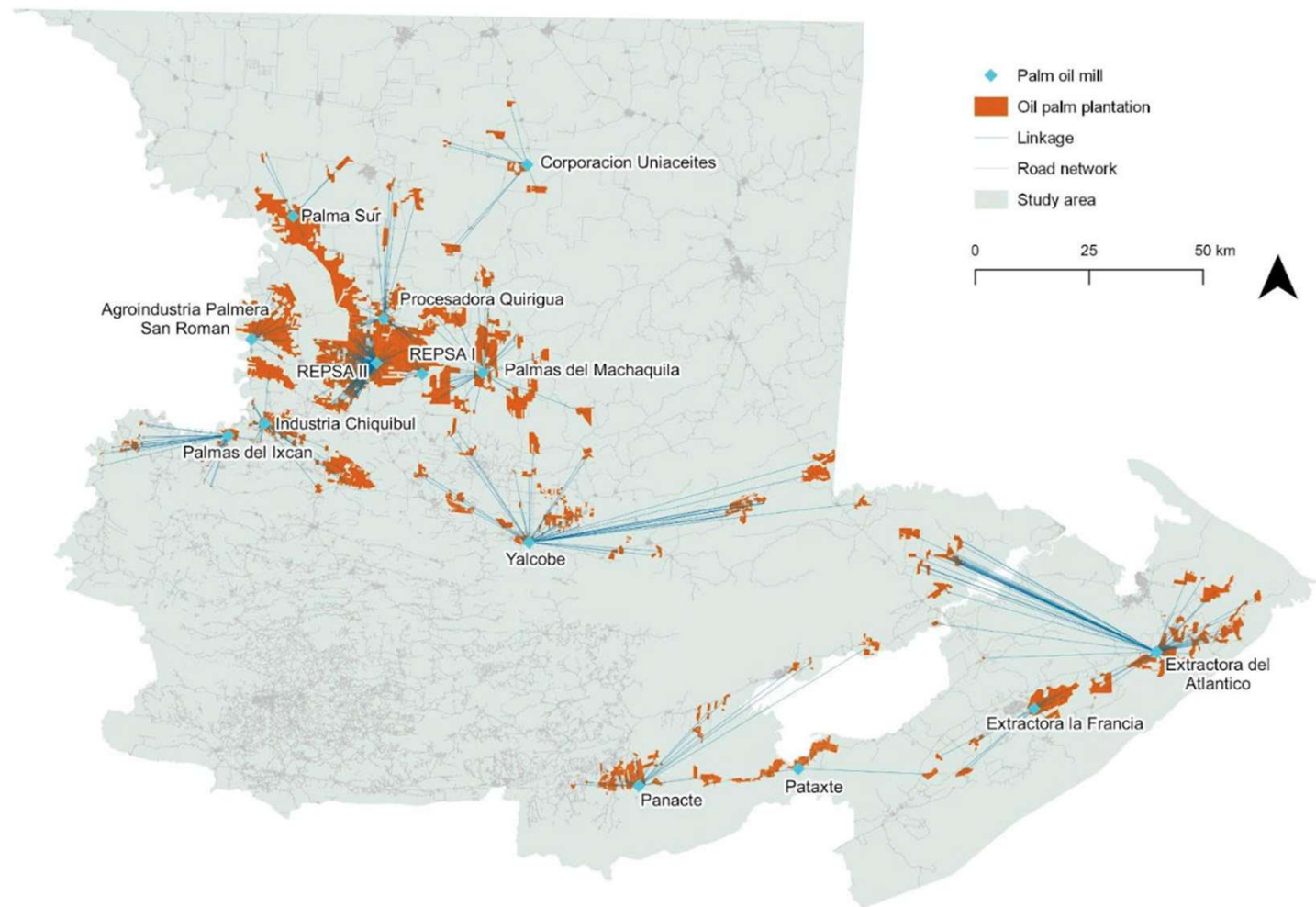
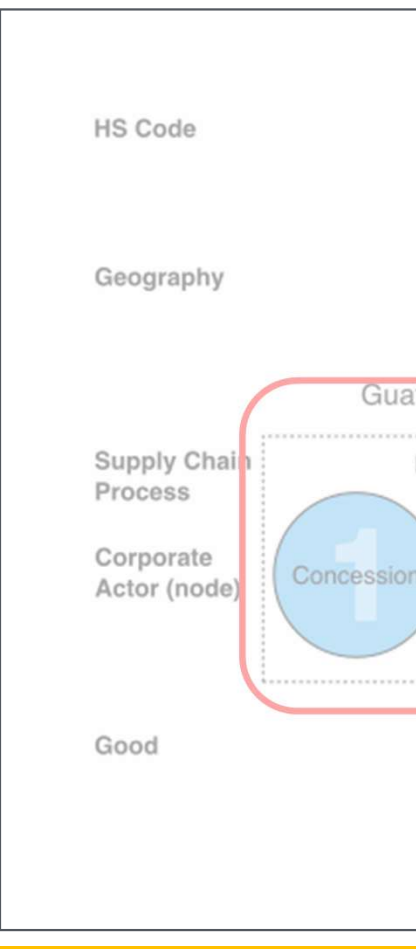
Nodes

### 3. Methods





### 3. Methods



### 3. Methods

### PepsiCo Palm Oil Mill List 2021

The following palm oil mill list is based on information that has been self-reported to us by suppliers for the calendar year 2021. While we have made considerable effort to validate the data including through independent verification (see our Palm Oil Disclosure for more information) we cannot guarantee its full accuracy or completeness.

Some of these mills are associated with ongoing complaints that have been registered in our Grievance Mechanism and are being managed through our grievance process and / or may no longer be in our supply chain.

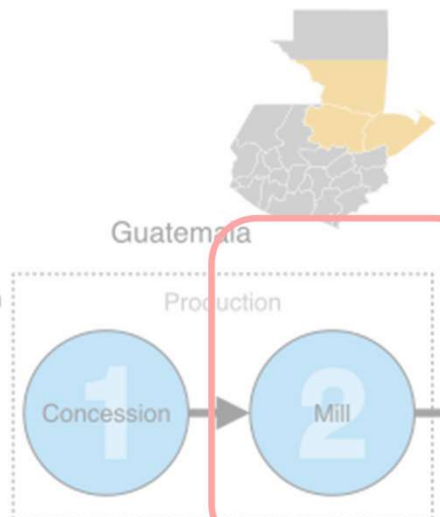
HS Code

Geography

Supply Chain Process

Corporate Actor (node)

Good



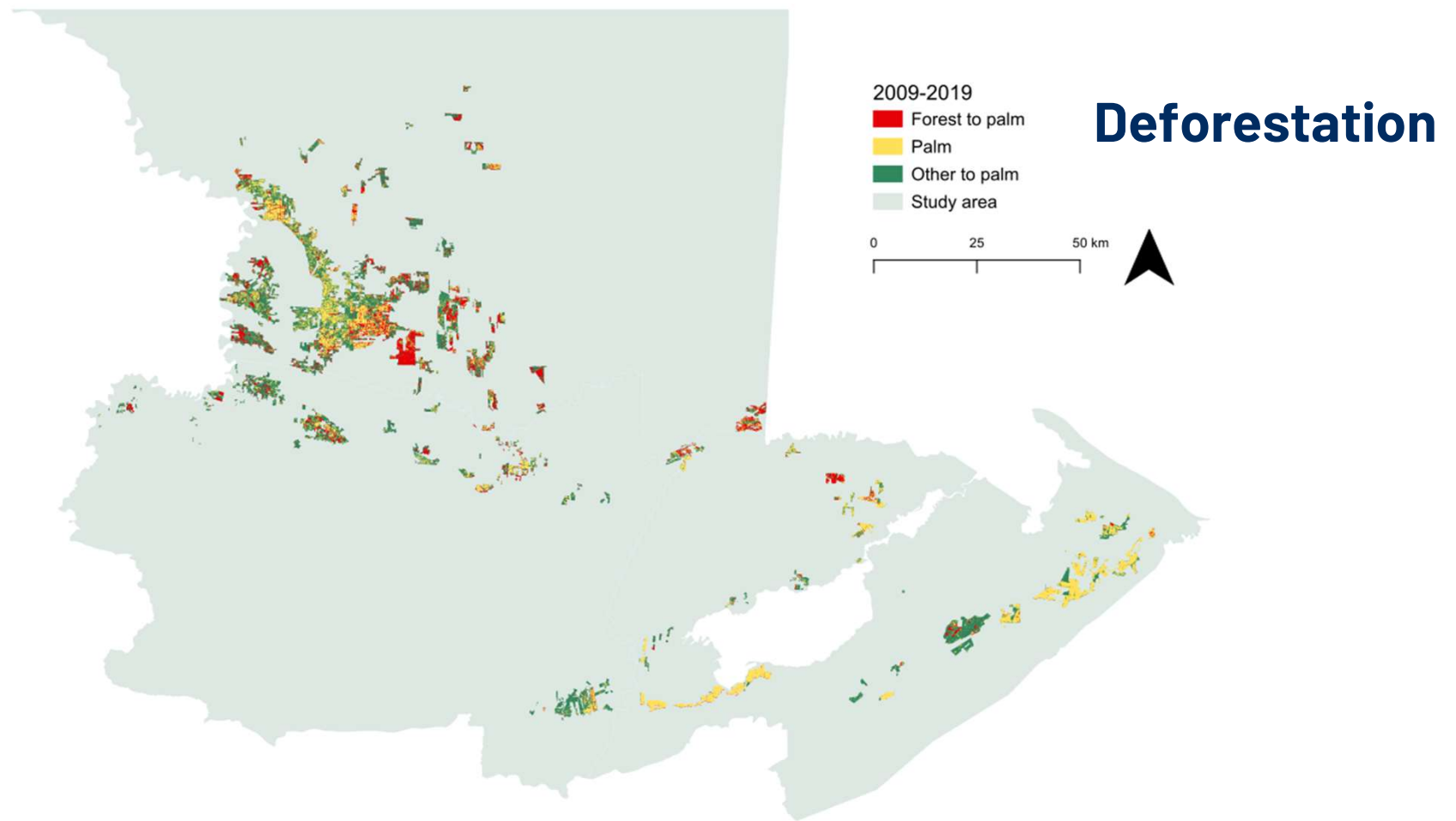
Parent Mill	Mill Name	Latitude	Longitude	Country	State / Province	RSPO Certified*
3F Oil Palm Agrotech	3F Oil Palm Agrotech	17.00352	81.46973	India	Andhra Pradesh	No
Aa Sawit	Siang	1.545386	104.209347	Malaysia	Johor	No
Aathi Bagawathi Manufacturing	Abdi Budi Mulia	2.051269	100.252339	Indonesia	Sumatera Utara	No
Aathi Bagawathi Manufacturing	Abdi Budi Mulia 2	2.11272	100.27311	Indonesia	Sumatera Utara	No
Kretam Holdings	Abedon	5.312106	117.9741	Malaysia	Sabah	Yes
Ace Oil Mill	Ace Oil Mill	2.91192	102.77981	Malaysia	Pahang	No
Agropecuaria Santa Maria	Aceites Cimarrones	3.035593889	-73.11146556	Colombia	Meta	Yes
Aceites De Palma	Aceites De Palma	18.0470389	-94.91766389	Mexico	Veracruz	No
Manuelita Aceites Y Energia	Yaguarito	3.883139	-73.339917	Colombia	Meta	Yes
Manuelita Aceites Y Energia	Manavire	3.937706	-73.36539	Colombia	Meta	Yes
Aceites Morichal	Aceites Morichal	3.92985	-73.242775	Colombia	Meta	No
Grupo Litoral	Aceydesa	15.825861	-85.896861	Honduras	Colón	Yes
Achi Jaya Plantations	Johor Labis	2.251472222	103.0513056	Malaysia	Johor	No
Adimulia Agrolestari	Segati	-0.108983	101.386783	Indonesia	Riau	No
Aditya Agroindo	Simpang Hulu Barat	-0.4393	110.23474	Indonesia	Kalimantan Barat	No
Sampoerna Agro	Aek Tarum (Belida)	-3.838981	104.971558	Indonesia	Sumatera Selatan	Yes
Aexpalma	Oleorios	-1.196146	-79.424386	Ecuador	Los Rios	No
Aexpalma	Agroinpla	-0.073315	-79.371084	Ecuador	Santo Domingo de los Tsachilas	No
Aexpalma	Atahualpa	-0.022728	-79.498034	Ecuador	Esmeraldas	No
Agri Andalas	Agri Andalas	-3.998716	102.429673	Indonesia	Bengkulu	No
Agri Cinal	Agri Cinal	-3.200972	101.630139	Indonesia	Bengkulu	No
Alcopalma	Teobroma	-0.046694444	-79.35213889	Ecuador	Santo Domingo de los Tsachilas	No
Agro Indomas	Bumi Jaya	-1.0148244	116.6895414	Indonesia	Kalimantan Timur	No
KPN Corporation	Wawasan Kebun Nusantara	1.266894	109.817129	Indonesia	Kalimantan Barat	No
Wilmar International	Agronusa Investama 2	0.27688	109.73267	Indonesia	Kalimantan Barat	No
Syarikat Ladang	Sungai Terah	4.977872	101.955083	Malaysia	Kelantan	No
Tri Bakti Sarimas	Agro Sarimas Indonesia	-0.519017	102.922797	Indonesia	Riau	No
Agro Wijaya Industri	Agro Wijaya Industri	-1.76147222	102.244	Indonesia	Jambi	No
Agro Wira Ligatsa	Agro Wira Ligatsa	0.224338	99.71557	Indonesia	Sumatera Barat	No
Agroacelte	Extractor Agroacelte	14.555208	-92.006	Guatemala	Quezaltenango	Yes
Agrocaribe	Extractor La Francia	15.46801667	-88.80420556	Guatemala	Izabal	Yes

Palm fruit → Palm oil → Palm oil → Palm oil → Baked goods → Baked goods

## 3. Methods

## Key Findings

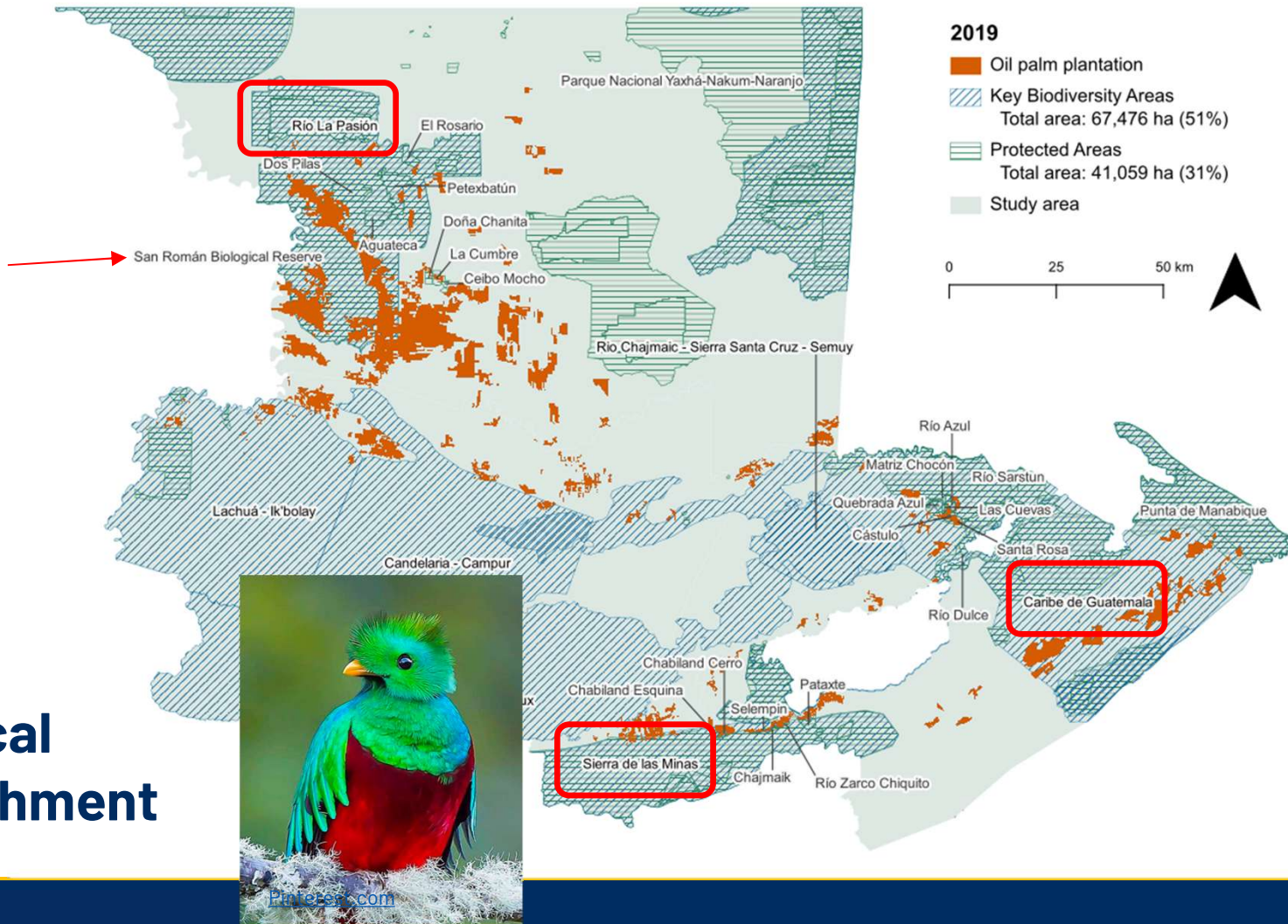
- Linked transnational supply chains that end in the US to deforestation and ecological encroachment in Guatemala
  - Pepsico, Mondelēz, and Grupo Bimbo incur deforestation risks in their palm oil supply chains
- Oil palm plantations expanded **87,325 ha** between 2009 and 2019
  - **28% replaced forestland**
- RSP0-certification did not effectively protect against deforestation or ecological encroachment



## 4. Results



# Ecological encroachment



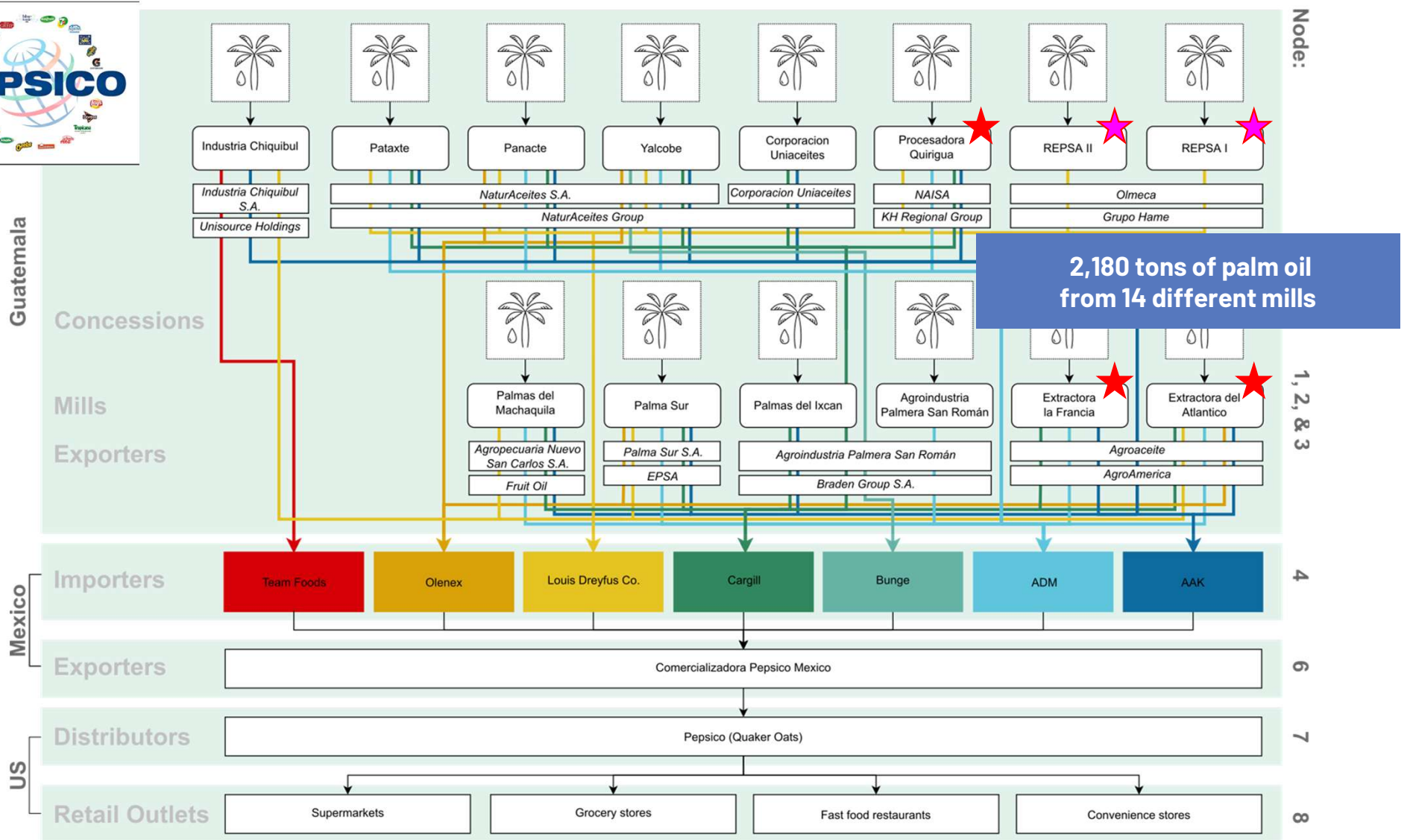
## 4. Results

Results of the spatial Lag models used to determine whether RSPO-certification is associated with heightened deforestation and ecological encroachment (\*\* =  $p < 0.01$ ; \* =  $p < 0.05$ ).

Deforestation model						
	Estimate	Standard error	z-value	P-value	VIF	95% CI
(Intercept)	51.77	320.25	-0.16	0.87		-679.45–575.90
RSPO-certification	-6.56	13.16	-0.50	0.62	2.02	-32.34–19.23
Total plantation area (ha)	0.16***	0.01	13.05	< 2.2e-16	1.42	0.14–0.19
Ecological encroachment (ha)	0.04	0.02	1.65	0.10	1.74	-0.01–0.08
Average annual precipitation, mm	0.05***	0.01	4.03	0.00	3.38	0.03–0.08
Average annual temperature, °C	-3.96	11.64	-0.34	0.73	1.73	-26.78–18.86
Distance to palm oil mill	0.00	0.00	-1.09	0.28	1.24	-0.01–0.00
Distance to pastureland	-0.02*	0.01	-1.95	0.05	1.70	-0.03–0.00
Distance to road	0.03	0.02	1.32	0.19	1.43	-0.02–0.08
Population density, # of people per pixel	-0.05	0.07	-0.65	0.52	1.38	-0.19–0.09
Slope	9.84	7.08	1.39	0.16	1.28	-4.03–23.71
Ecological encroachment model						
	Estimate	Standard error	z-value	P-value	VIF	95% CI
(Intercept)	3756.87***	1004.64	3.74	0.00		1787.80–5725.93
RSPO-certification	-38.05	39.75	-0.96	0.34	2.01	-115.96–39.85
Total plantation area (ha)	0.20***	0.05	4.00	0.00	2.48	0.10–0.29
Deforestation (ha)	0.29	0.21	1.38	0.17	2.46	-0.12–0.71
Average annual precipitation, mm	-119.10***	36.06	-3.30	0.00	1.62	-189.78–48.42
Average annual temperature, °C	-0.18***	0.04	-4.04	0.00	3.35	-0.26–0.09
Distance to palm oil mill	-0.01	0.01	-1.15	0.25	1.24	-0.02–0.01
Distance to pastureland	0.01	0.02	0.49	0.63	1.77	-0.03–0.06
Distance to road	0.10	0.07	1.41	0.16	1.43	-0.04–0.25
Population density, # of people per pixel	0.25	0.21	1.19	0.23	1.37	-0.16–0.67
Slope	-1.81	21.46	-0.08	0.93	1.29	-43.87–40.24

## 4. Results

# **Company linkages to these changes**



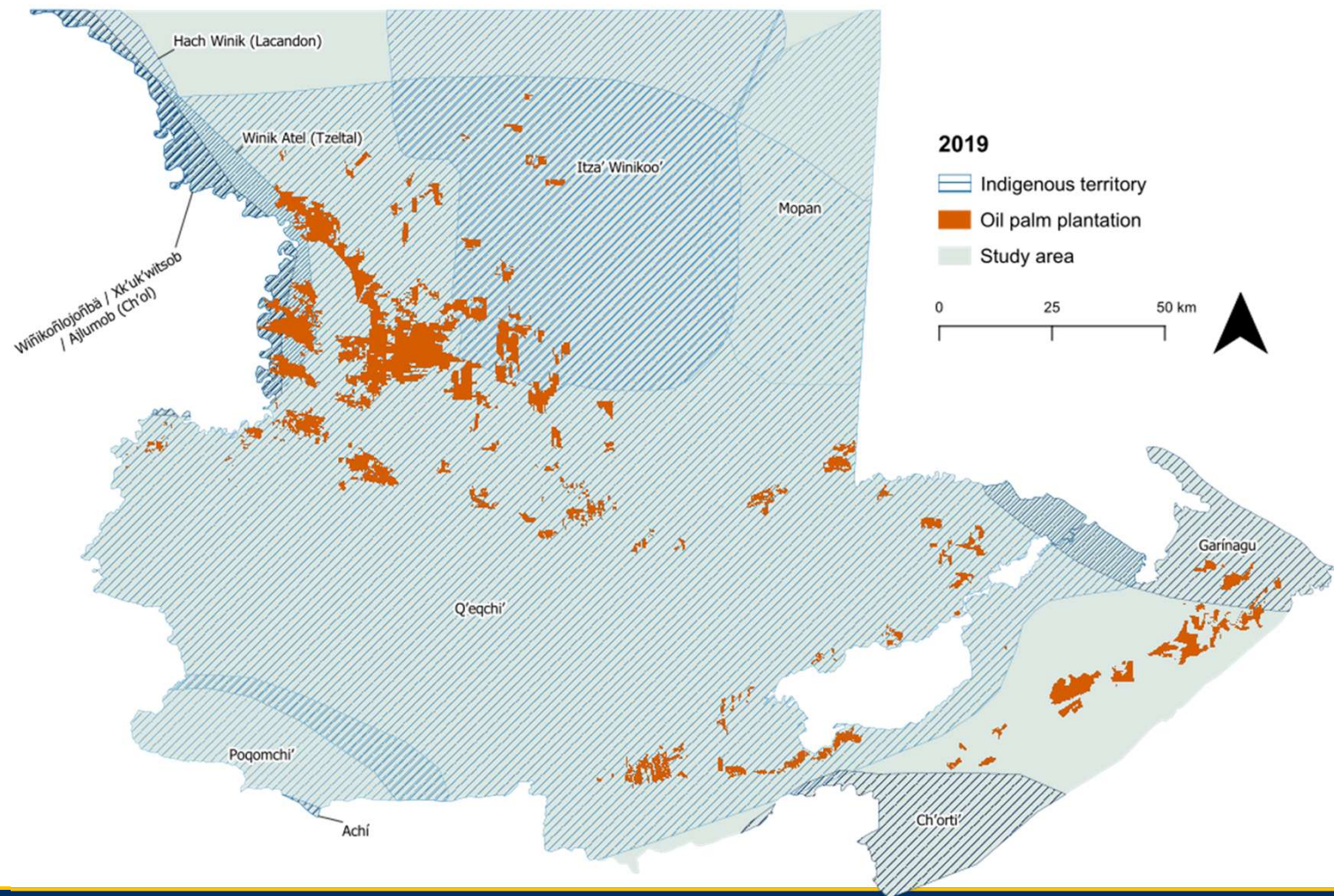
## Deforestation teleconnections

- More than 99% of the deforestation observed can be connected to the plantations supplying palm oil to PepsiCo's and Grupo Bimbo's palm oil mills and 72% to the subset of plantations supplying Mondelēz's palm oil mills.
- RSP0-certified mills collectively expanded on 3,584 ha of forestland



# Conclusions

- Length and complexity of palm oil supply chains makes it difficult to establish causal links between land use change and consumption-based drivers
- Early traceability challenges (plantation-mill linkages) hinder our ability to identify supply chain origins and establish deforestation-free sourcing
- RSPO-certification does not effectively mitigate deforestation risks



## 5. Conclusions

