21º CONFERENCIA INTERNACIONAL SOBRE PALMA DE ACEITE

21st International Oil Palm Conference

Replanting strategies and technologies for sustainable oil palm production

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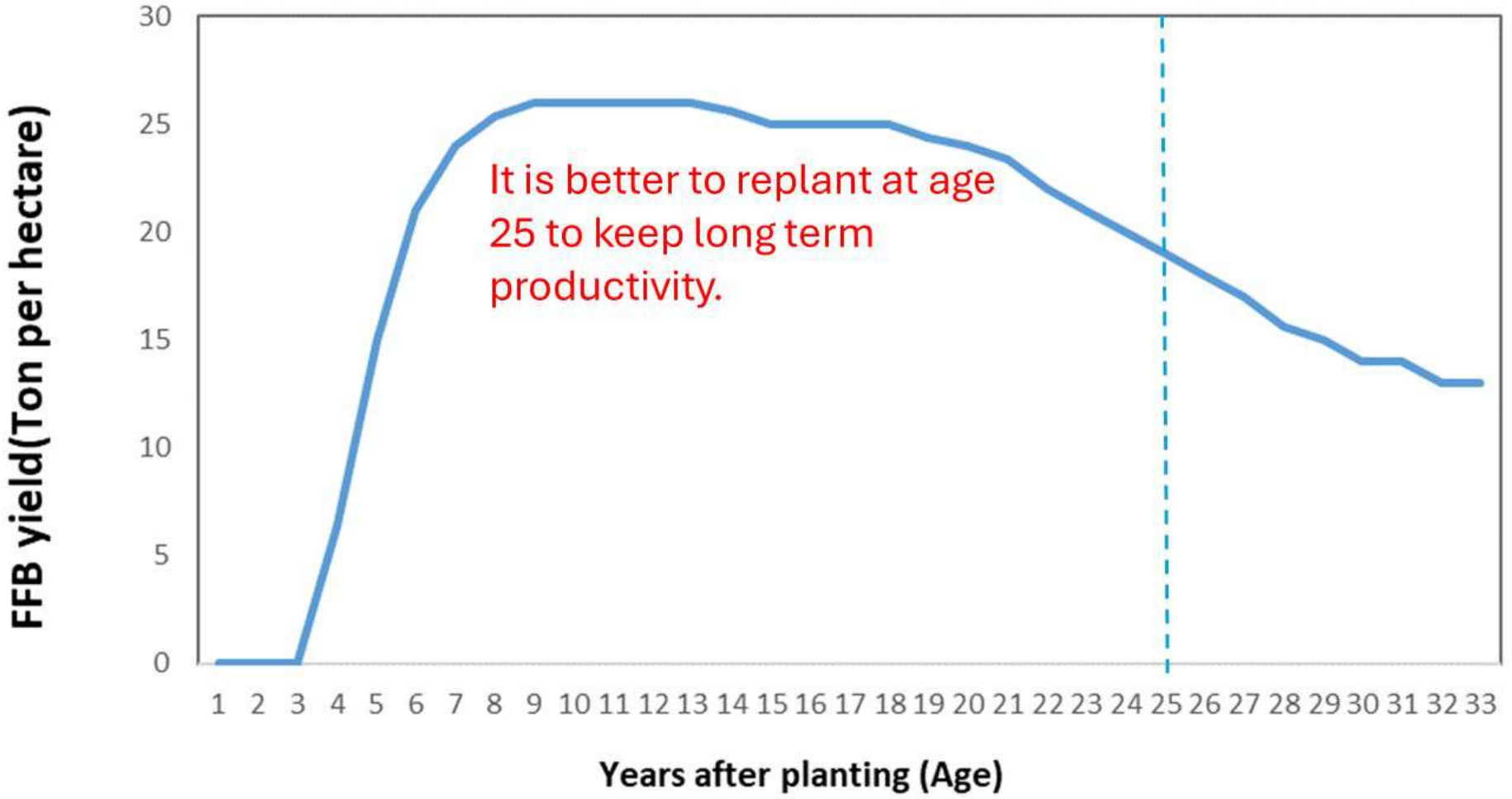
Outlines

- Overview of oil palm replanting
- Effective replanting strategies to maintain high productivity at the landscape scale
- Economic returns of different replanting strategies from the perspective of smallholder farmers
- Spatial distribution of aging oil palm plantations across Colombia
    - Considerations for replanting efforts

Overview of oil palm replanting

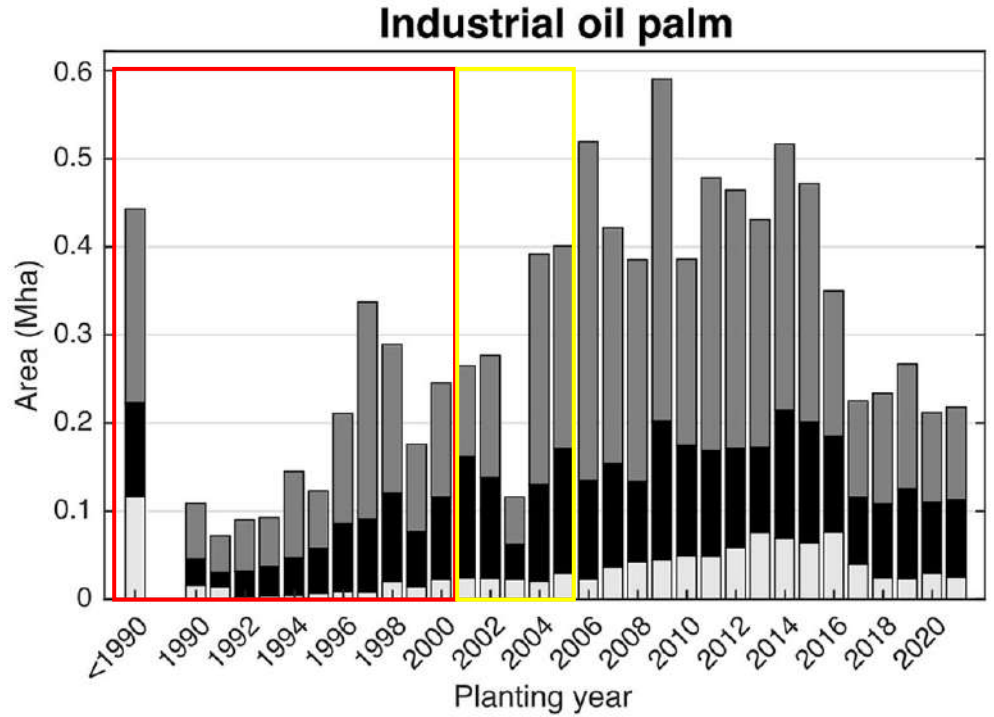
- The global expansion of oil palm plantations during the 1990s and early 2000s has created a growing proportion of aging palms with declining yields, particularly in major producing countries such as Indonesia, Malaysia, and Colombia.
- Timely replanting is critical for sustainable oil palm production, as it mitigates yield decline, maintains economic viability, and reduces land-use pressures, thereby supporting both economic sustainability and environmental conservation.
- Despite its importance, replanting is often delayed due to high costs, the income loss during the immature phase, limited access to finance and quality seedlings, land tenure and legal constraints, and insufficient technical support.

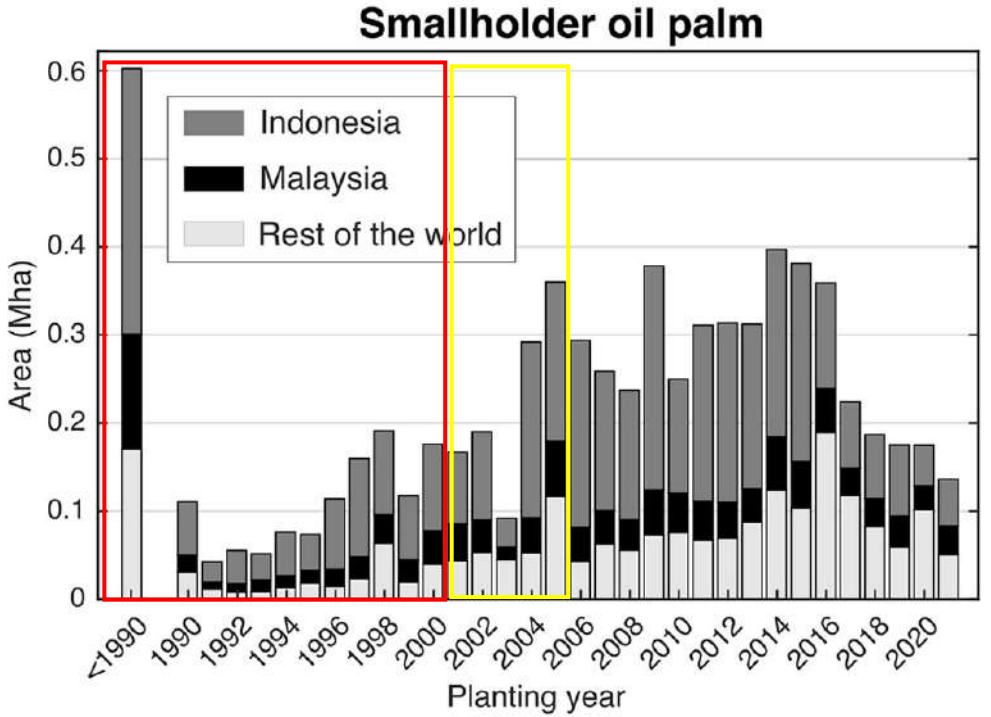
Optimal replanting age



However, it may be still profitable from 25-30 years.

Planting year for industrial and smallholder plantations from 1990 to 2021





Descals, et al(2024)

In 2021, over 1 million hectares of oil palms were aged more than 30 years, including 0.6 million hectares under smallholder plantations. If these aging palms are not replanted promptly, worldwide oil palm yields may decrease.

What replanting strategies are most effective in maintaining consistent, high productivity at the landscape scale, given the existing aging structure of oil palms?

- Riau province, Indonesia as a case study

Riau province, Indonesia

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Spatial and temporal distribution of oil palm in Riau, Indonesia

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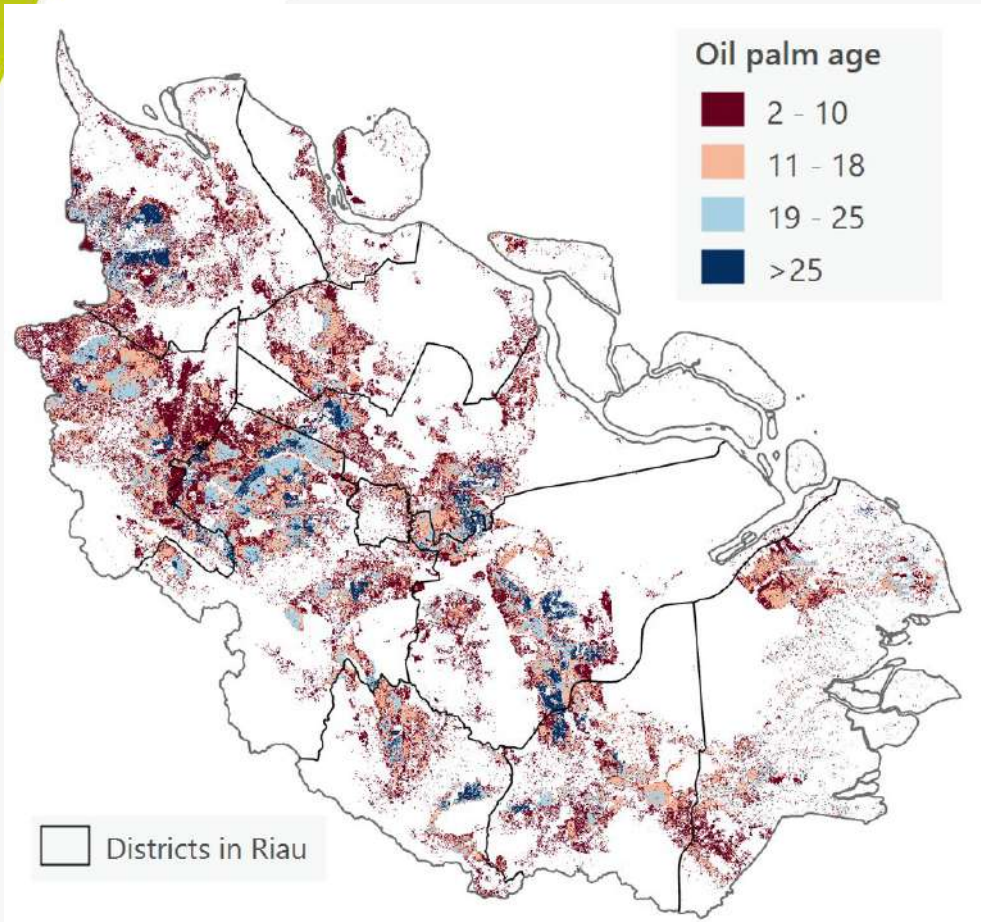
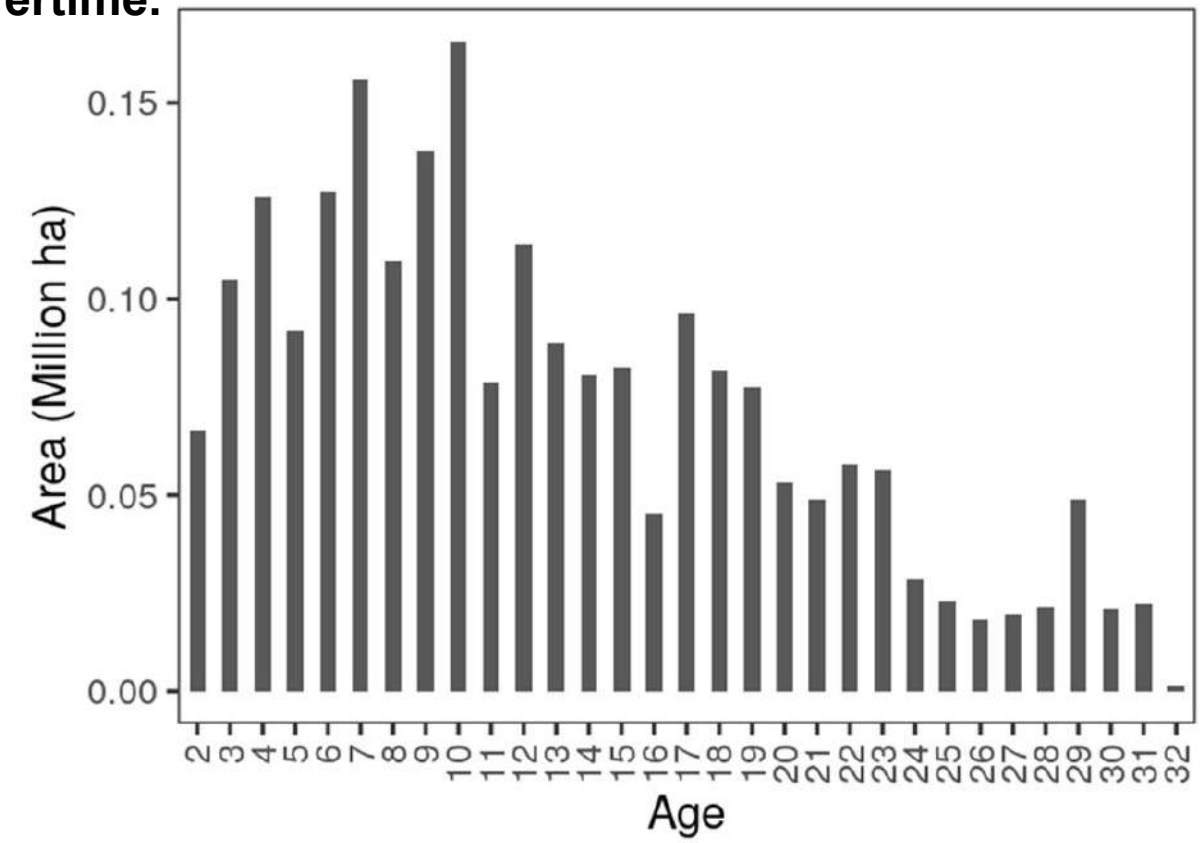
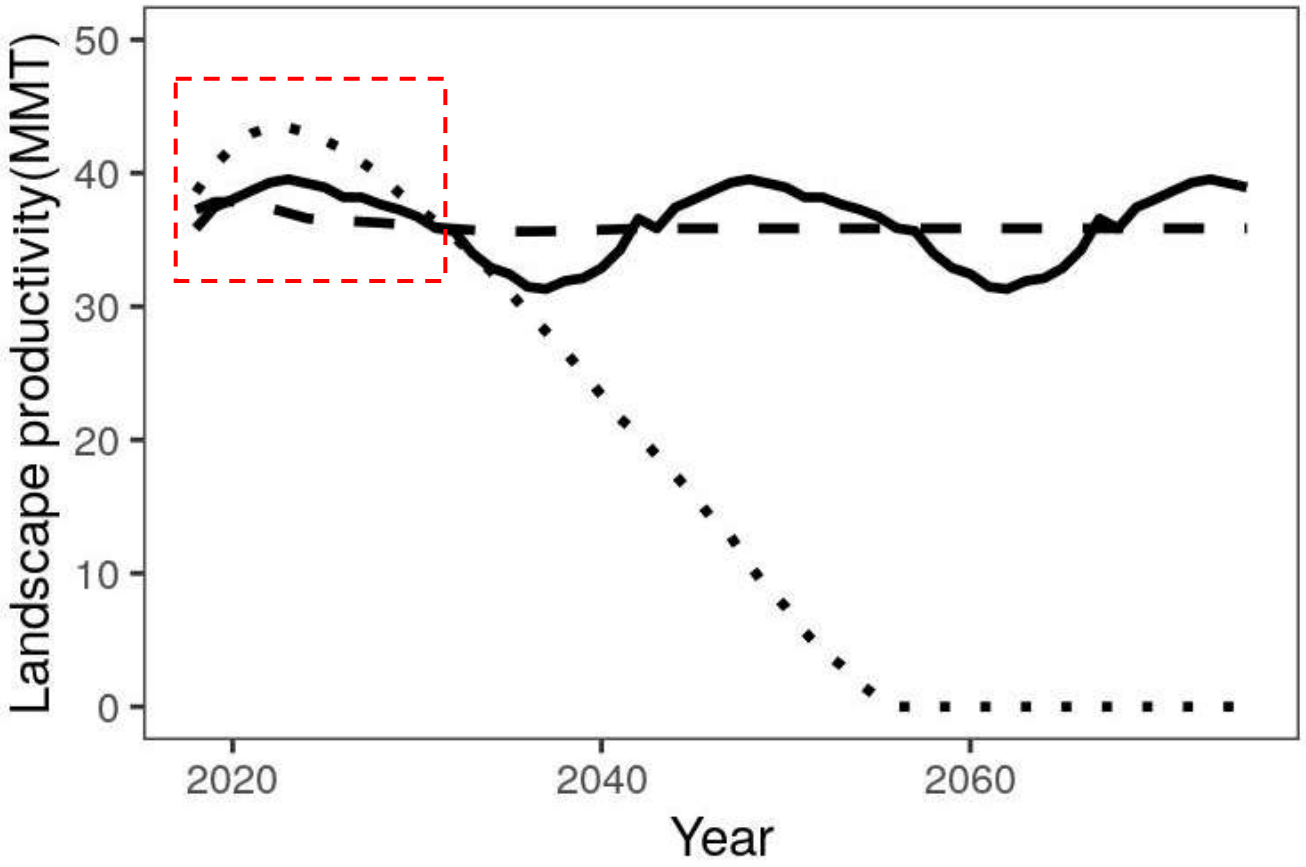


The age distribution of oil palm in Riau is uneven overtime.



What could be the most effective replanting strategy for aging oil palms in Riau when considering productivity at the landscape level?

Landscape productivity under different replanting strategies



Replanting scenarios

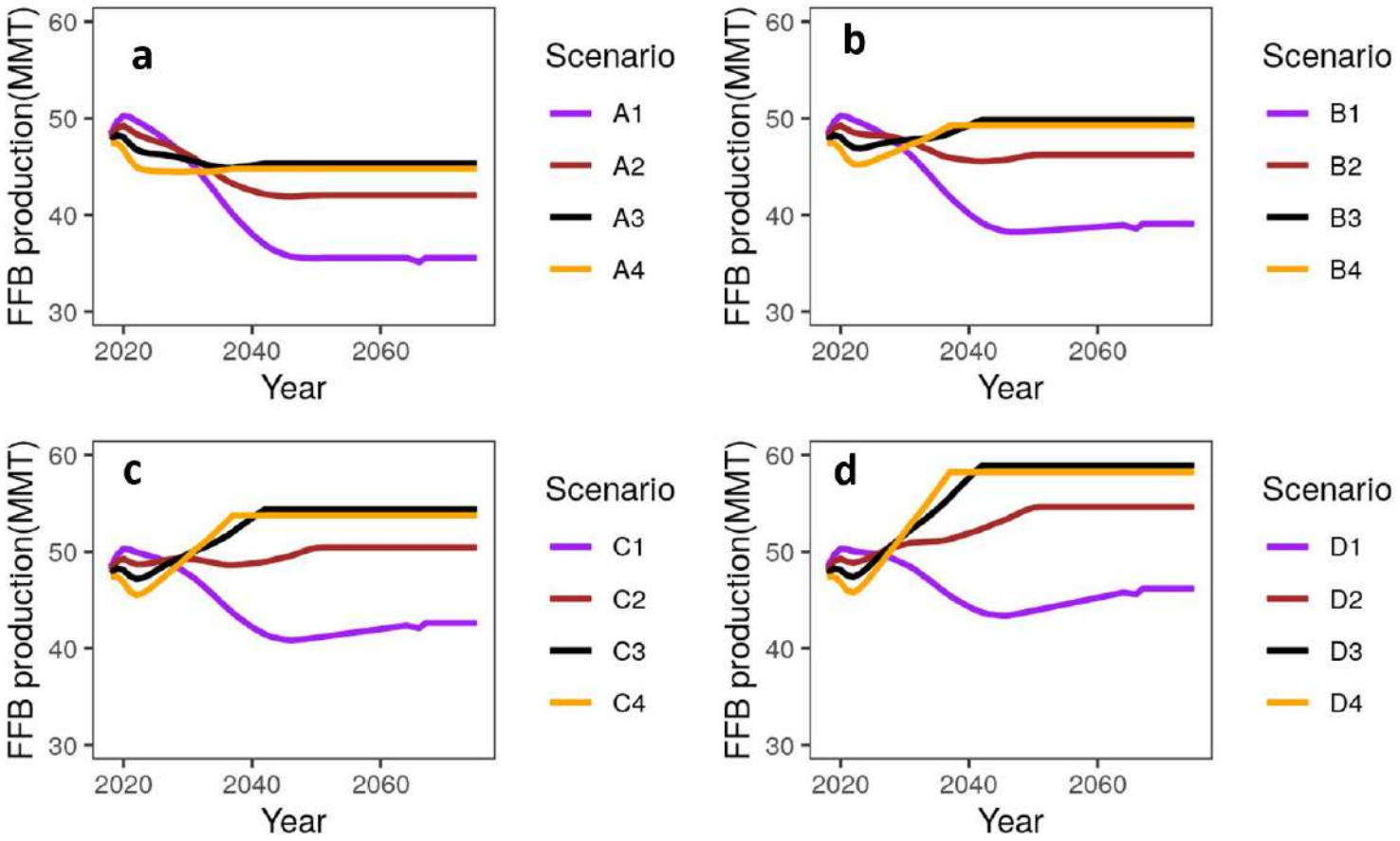
- no replantation
- replant at age 25
- replant 4% of area

In the short term, no replantation yields the highest productivity, followed by replanting at age 25, with replanting 4% of the area resulting in the lowest productivity. However, over the long term, replanting 4% of the area helps sustain a high and

Scenario analysis with different replanting rate and yield improvement

Scenarios for Replanting rate	Scenarios for yield improvement			
	0%	10%	20%	30%
2%	A1	B1	C1	D1
3%	A2	B2	C2	D2
4%	A3	B3	C3	D3
5%	A4	B4	C4	D4

Replanting 4% annually with or without yield improvement would achieve the highest and most stable landscape-level production.



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Why do smallholder farmers delay replanting even though early replanting significantly improves productivity at the landscape level?

Different replanting scenarios for smallholder farmers

Without replanting subsidies			
Certified seedling	Replanting age		
	25	30	35
No	S1	S2	S3
Yes	S4	S5	S6
Gradual replanting	S7 (25% per year after age 25)		
With replanting subsidies			
Certified seedling	Replanting age		
	25	30	35
Yes	S8	S9	S10

What methods can we use to evaluate the long-term economic returns of various replanting scenarios?

Net present value

- **Net Present Value (NPV)** is a financial metric used to evaluate the profitability of an investment by comparing the value of expected future cash flows (both inflows and outflows) to their value today.
- NPV allows smallholder farmers to compare the future income and costs of replanting in today's monetary value, accounting for the fact that money available now is more valuable than money received in the future.
- In each scenario, assuming oil palm trees are 25 years old now, we calculate NPV for the coming 25 years.

$$NPV = \frac{R_t - C_t}{(1+r)^t} - \frac{Re}{(1+r)^{w-25}}$$

Where R_t is total revenue per hectare at year t, which is equal to yield multiplied by FFB price.

C_t is total production cost per hectare at year t

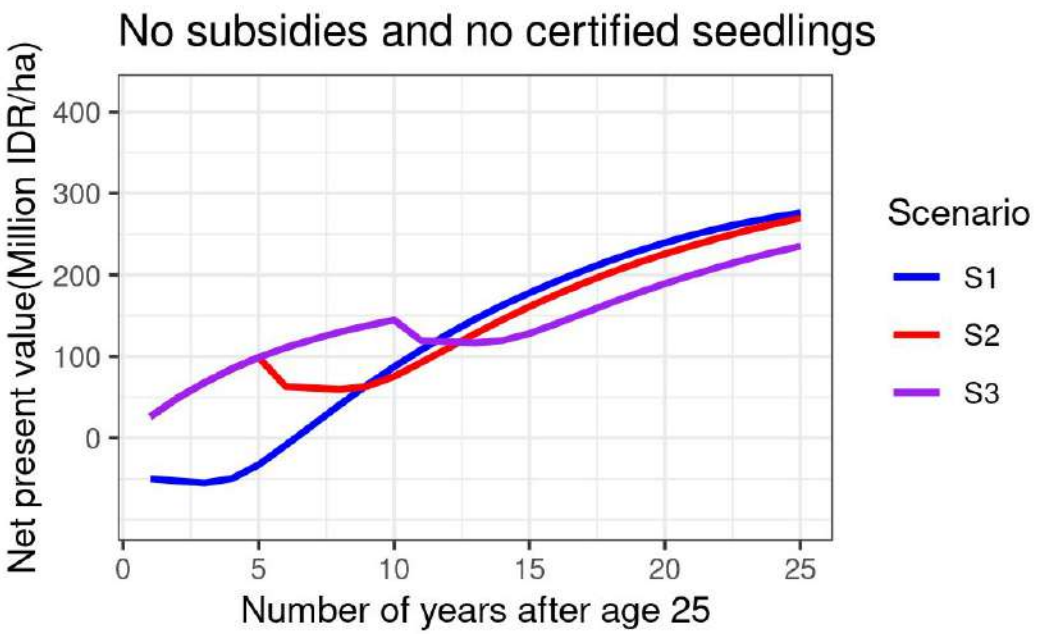
r is discount rate (reflecting the cost of capital or opportunity cost)

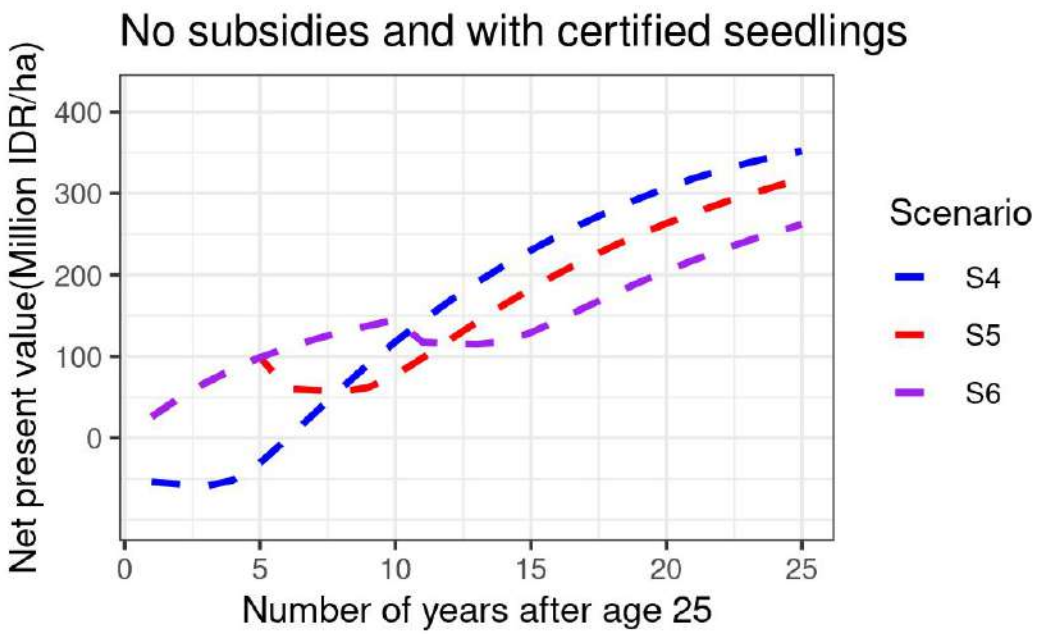
t is the number of years after age 25.

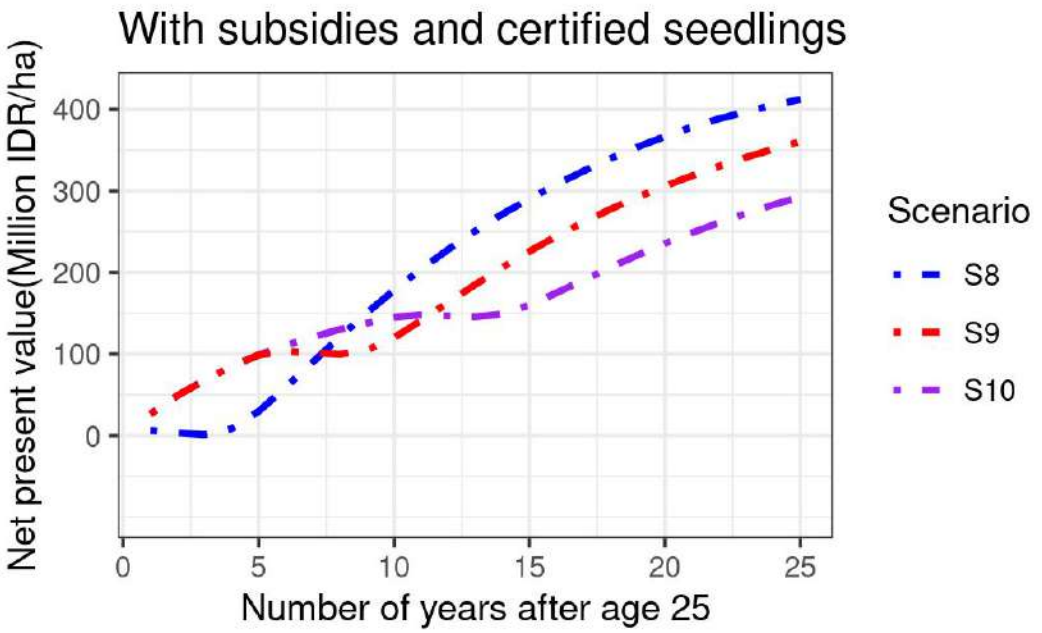
Re is the replanting cost.

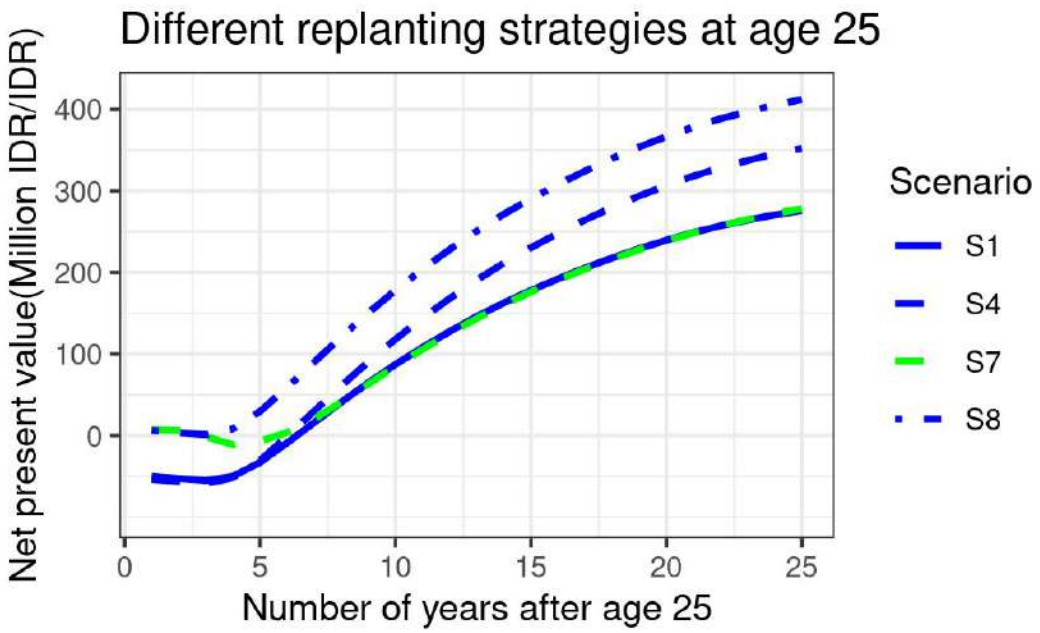
w is the replanting age.

Net present value of different replanting scenarios









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What are spatial and temporal distribution of aging oil palm in Colombia?

Oil palm in Colombia

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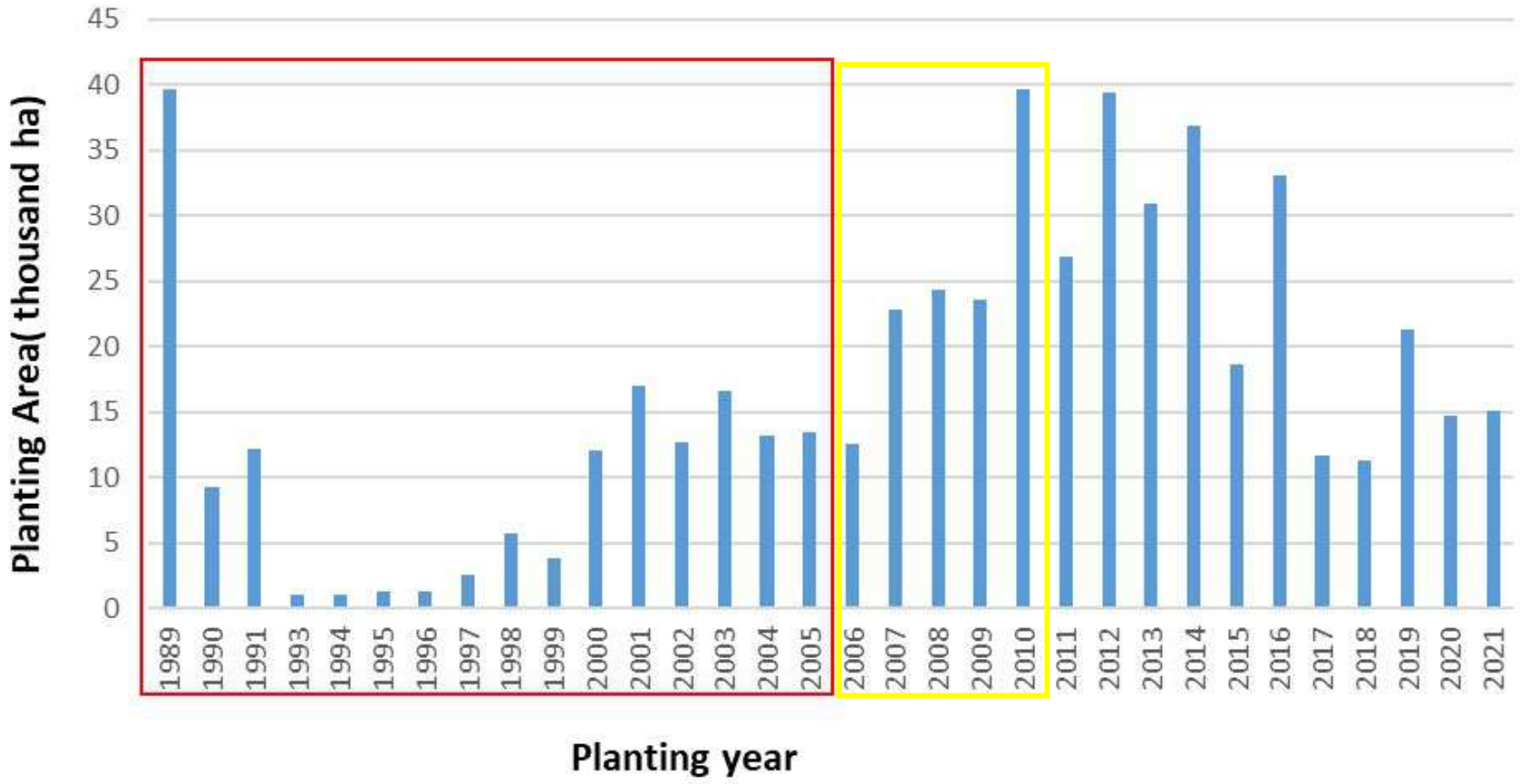
- Colombia ranks as the top producer of oil palm in South America and is the fourth largest worldwide.
- The main regions for oil palm farming in Colombia, considering both area and production, include Meta, Cesar, Magdalena, and Santander.
- Despite the growth, Colombia is also facing replanting challenges.

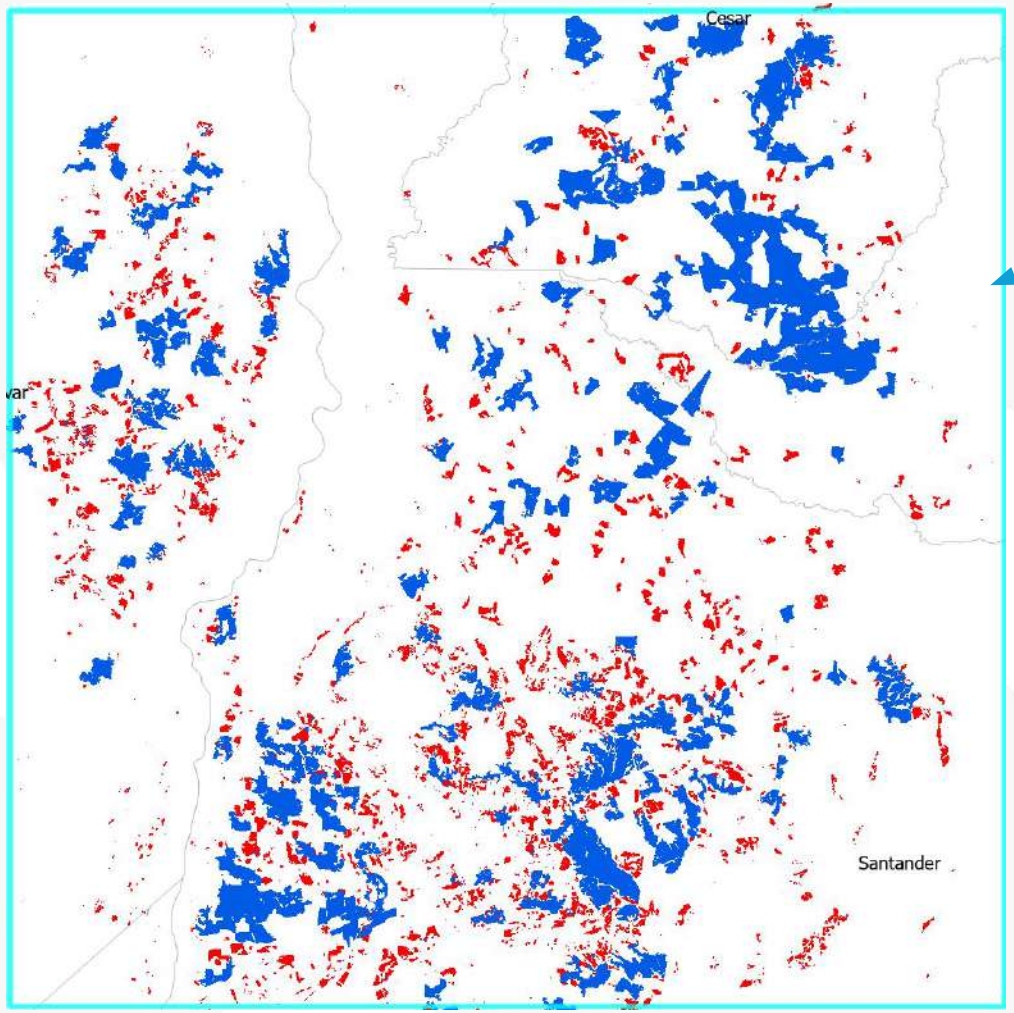
Oil palm planting year in Colombia



About 50, 000 hectares of oil palm is already 35 years old now.
About 160,000 hectares of oil palm in Colombia are due for replanting by 2030.
About 280, 000 hectares are due for replanting by 2035.

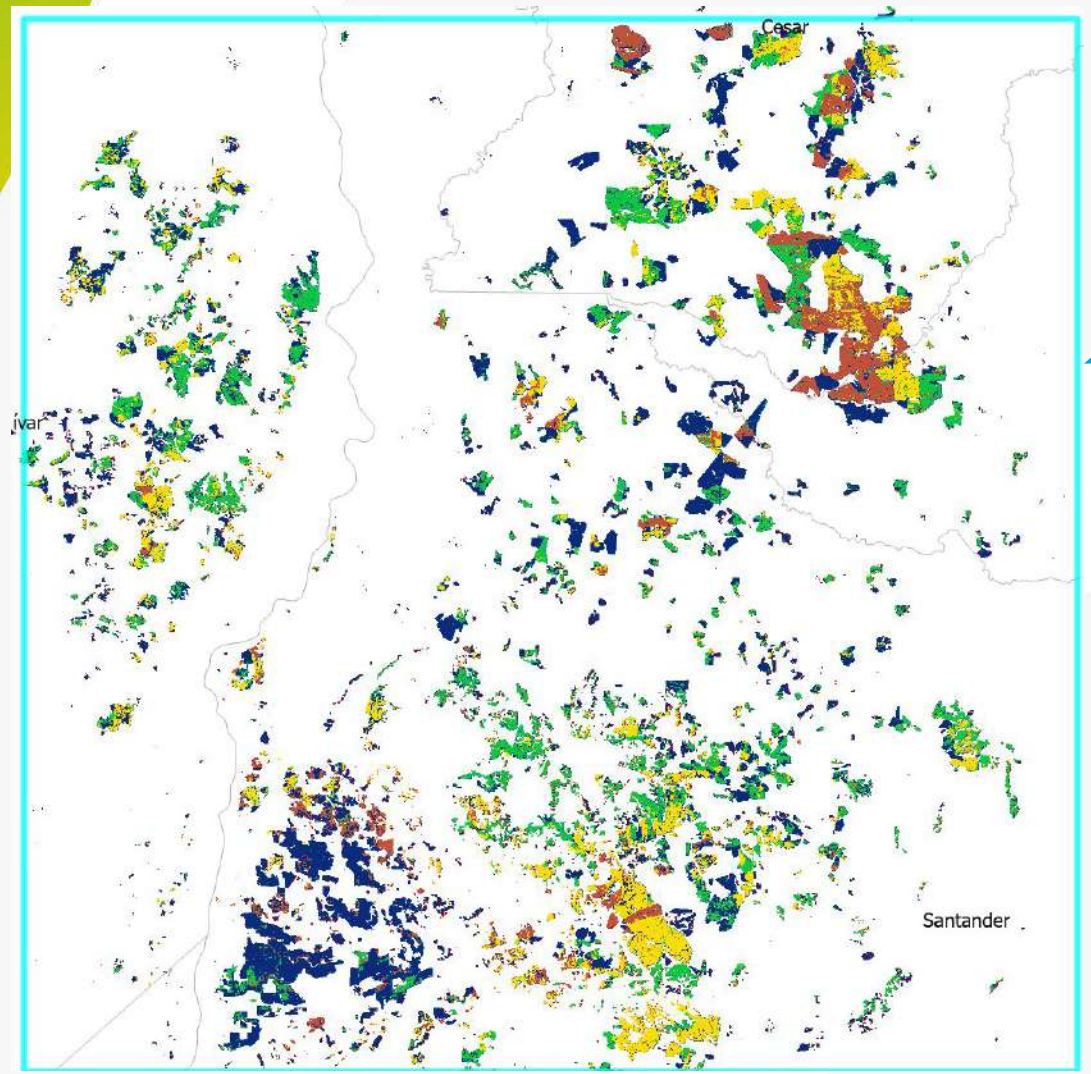
Industrial and smallholder oil palm distribution in Colombia in 2021

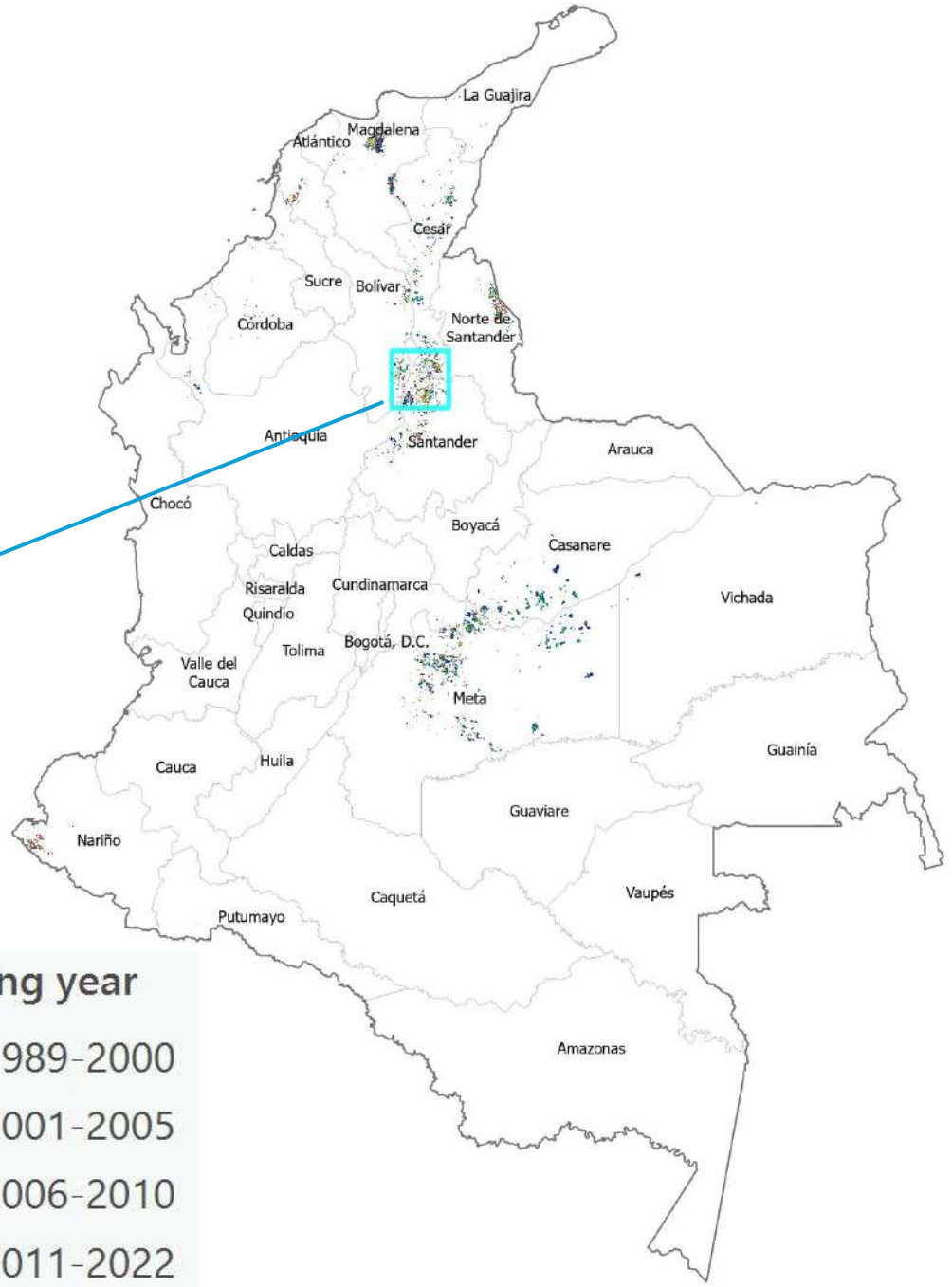
Industrial oil palm:
390, 900 ha (79%)
Smallholder oil palm:
103,200 ha(21%)



In Colombia, oil palm plantations is highly fragmented and heterogeneous, particularly among smallholder plantations.

Planting Year for Oil Palm Plantations in Colombia

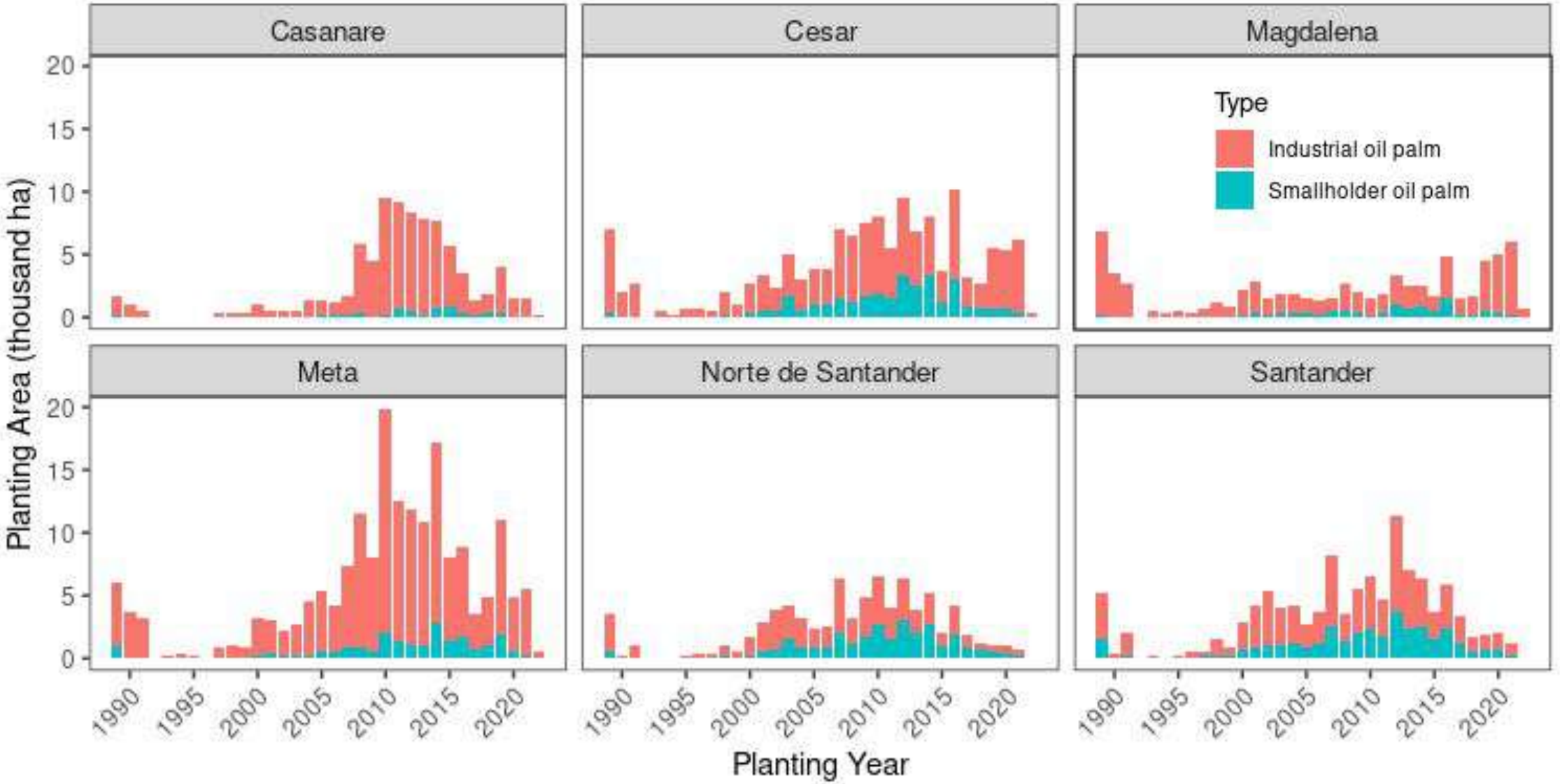




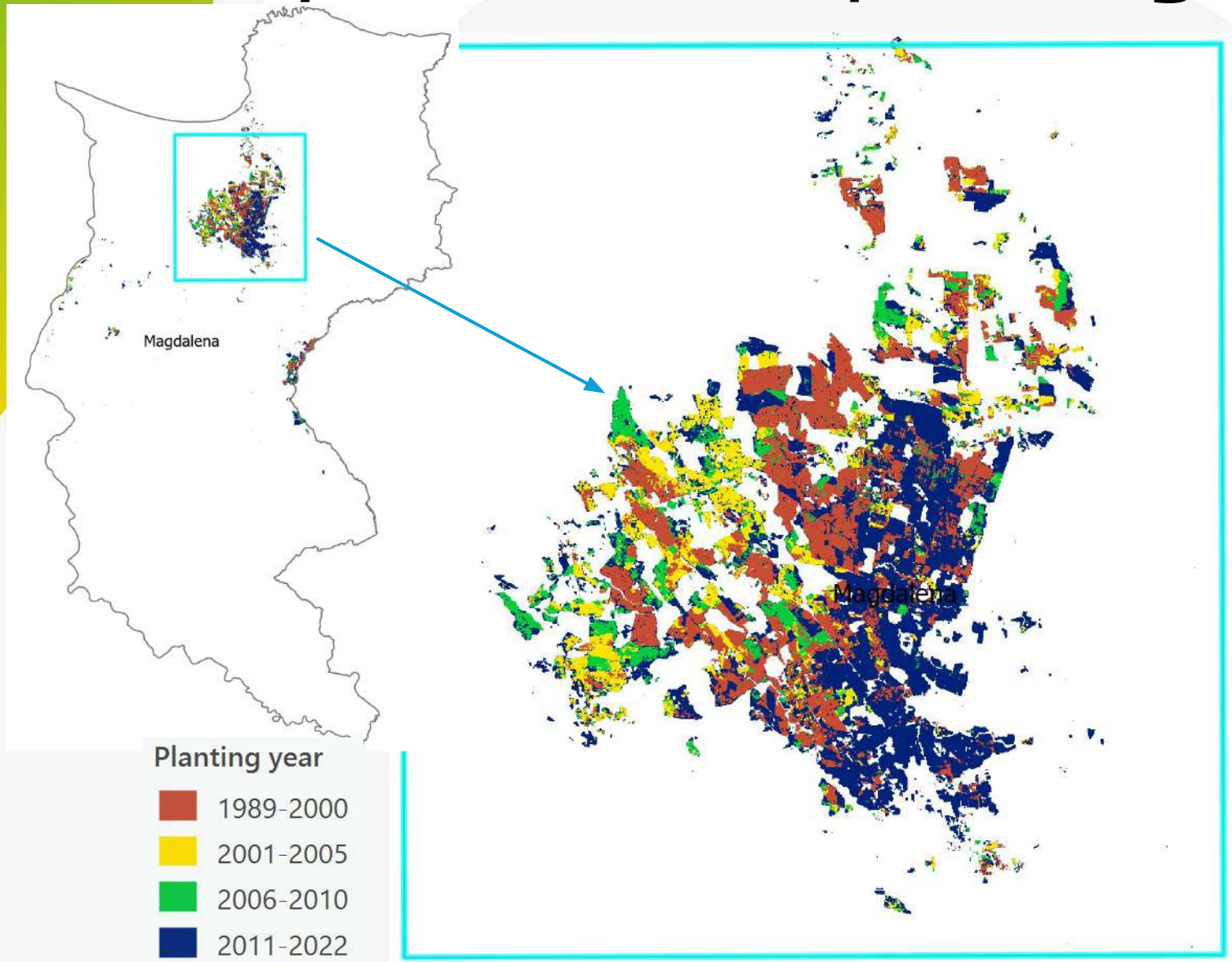
Planting year

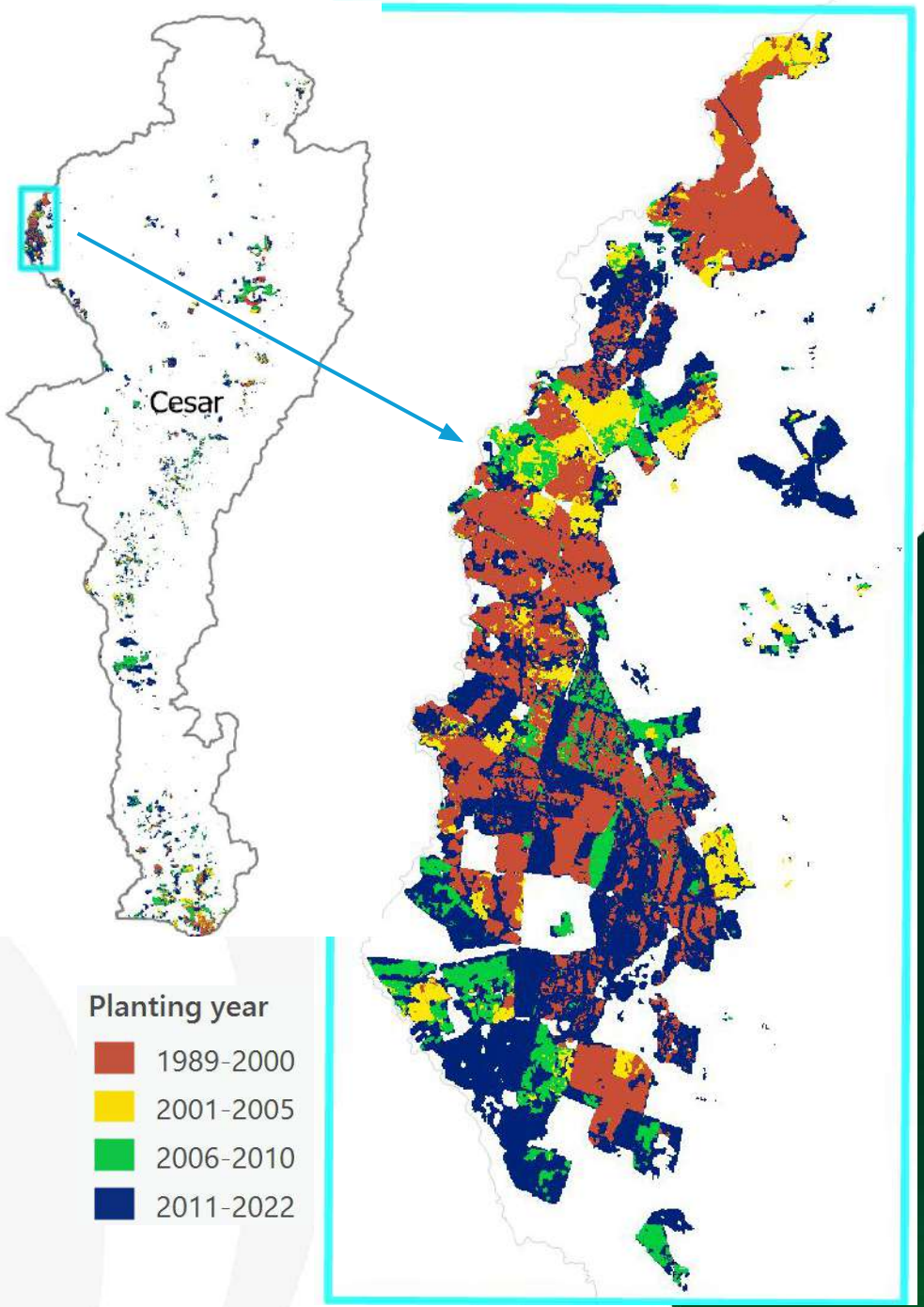
- 1989-2000
- 2001-2005
- 2006-2010
- 2011-2022

Oil palm planting year and area by department and type



Priority areas for replanting





Summary

- Implementing replanting strategies is crucial for maintaining productivity at the landscape level.
- Smallholder farmers tend to postpone replanting if subsidies or financial assistance are not available.
- The distribution of aging oil palms in Colombia is highly fragmented and heterogenous.
- Spatiotemporal analysis can help identify priority areas to focus on during different years.

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