

Rubber-Based Agroforestry System in South China: Gaining Ground with Farmers

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Objective
Design and promote scalable, diversified rubber-based agroforestry systems that increase ecosystem services of rubber monoculture.

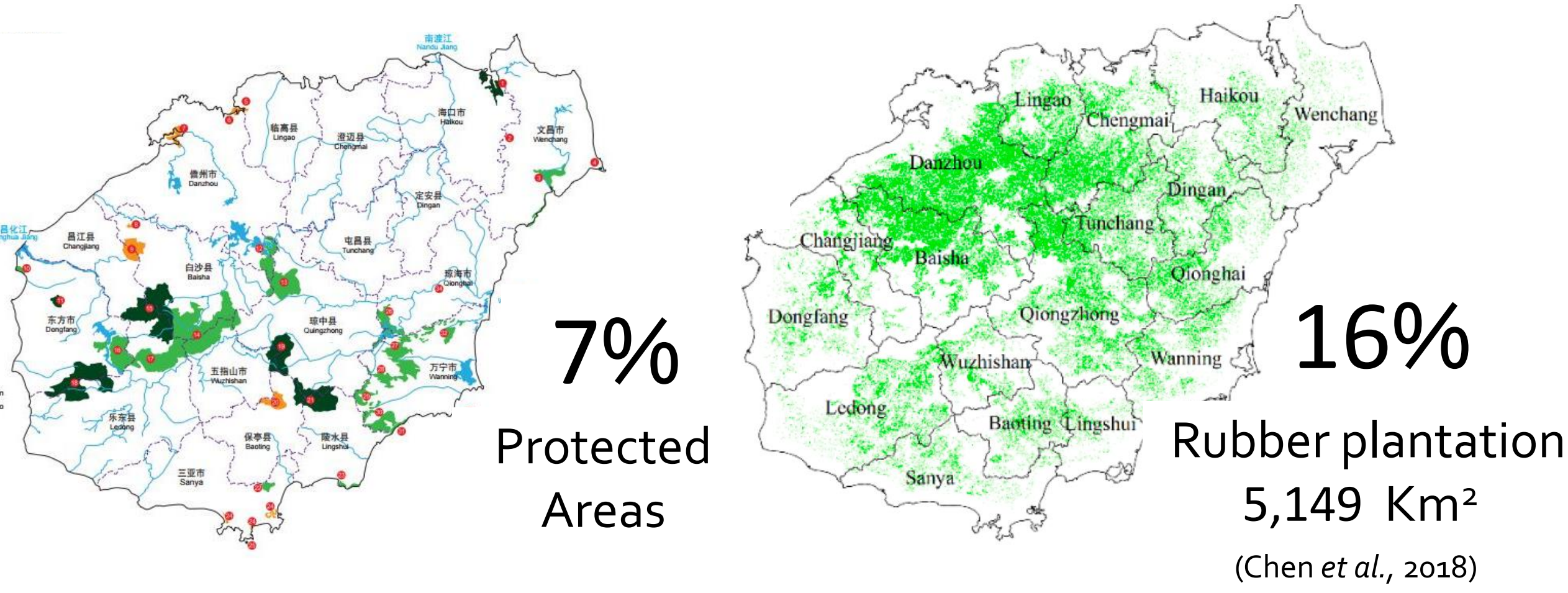
Situation – Rubber in China



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 - Biodiversity
 - Ecosystem services
 - Water quality
- ↑

 - Soil erosion: Plantation without ground cover > Open grassland (Labrière *et al.*, 2015)



Situation – Rubber in Tropical Hainan

- Contributing to half of China's rubber production :
- Rubber: Most successful government poverty alleviation program; almost all rural households depend on rubber in Hainan
 - No existing model of rubber agroforestry system widely accepted by farmers in Asia



Rubber Analogue Agroforestry System * Native

- Rubber (*Hevea brasiliensis*) - existing monoculture crop
- *Cardamom (*Alpinia oxyphylla*) - Chinese medicinal understory herb
- *Dumpling leaf (*Phrynium capitatum*) - understory herb
- *Agarwood (*Aquilaria sinensis*) - high value timber tree
- *Rosewood (*Dalbergia odorifera*) - high value timber tree
- *Tea oil camellia (*Camellia oleifera*) - source of priced oil
- *Hainan honeybee (*Apis cerana hainanensis*) - pollinates cardamom
- *Stingless bees (*Trigona ventralis* & *Trigona pagdeni*) - pollinates cardamom



- Looked into farmers' backyard seedling nurseries
- Set up demonstration farms
- Collaborated with local government – subsidized seedlings
- Conducted arthropod diversity study



Combinations accepted (increasing complexity →)



Ecosystem services

- Trimming of old cardamom stems increased soil organic matter and enhanced ecological services
- Agroforestry increased arthropod diversity in rubber

Social economic impact

- Diversified crops increased farmers resilience to fluctuating market prices

Lesson learnt

- Low-lying scrubs (~ 1m high) are critical in soil erosion control
- Critical to select combinations acceptable to market-oriented farmers

References

1. Labrière, N., Locatelli, B., Laumonier, Y., Freycon, V., & Bernoux, M. (2015). Soil erosion in the humid tropics: A systematic quantitative review. *Agriculture, Ecosystems & Environment*, 203, 127-139.

2. Chen, B., Xiao, X., Wu, Z., Yun, T., Kou, W., Ye, H., ... & Luo, W. (2018). Identifying establishment year and pre-conversion land cover of rubber plantations on Hainan Island, China using landsat data during 1987–2015. *Remote Sensing*, 10(8), 1240.

Rubber-Cardamom adoption - 8,600 ha

Species	Acceptability	Market Price	Shade tolerance	Payback period - year
Cardamom	☺☺☺☺☺☺☺	\$\$\$	XXXXXX	S - 2
Agarwood	☺☺☺☺	\$\$\$\$\$\$\$	XXXXX	L - 15
Dumpling Leaf	☺☺☺	\$	XXXXXX	S - 1
Hainan honeybee	☺☺☺	\$\$\$	XXXXX	S - 1
Rosewood	☺☺	\$\$\$\$\$\$\$	XX	L - 20
Tea Oil Camellia	☺	\$\$\$	X	M - 7
Stingless bee	☺	\$\$\$\$	XXXXX	S - 1



Introduction

What we did

Findings