

Wetlands Solutions *for the Future*

Learning from ALFAwetlands and
REWET Projects

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Restoring organic soils under agriculture: cost-effective portfolios in the context of European climate and biodiversity policies

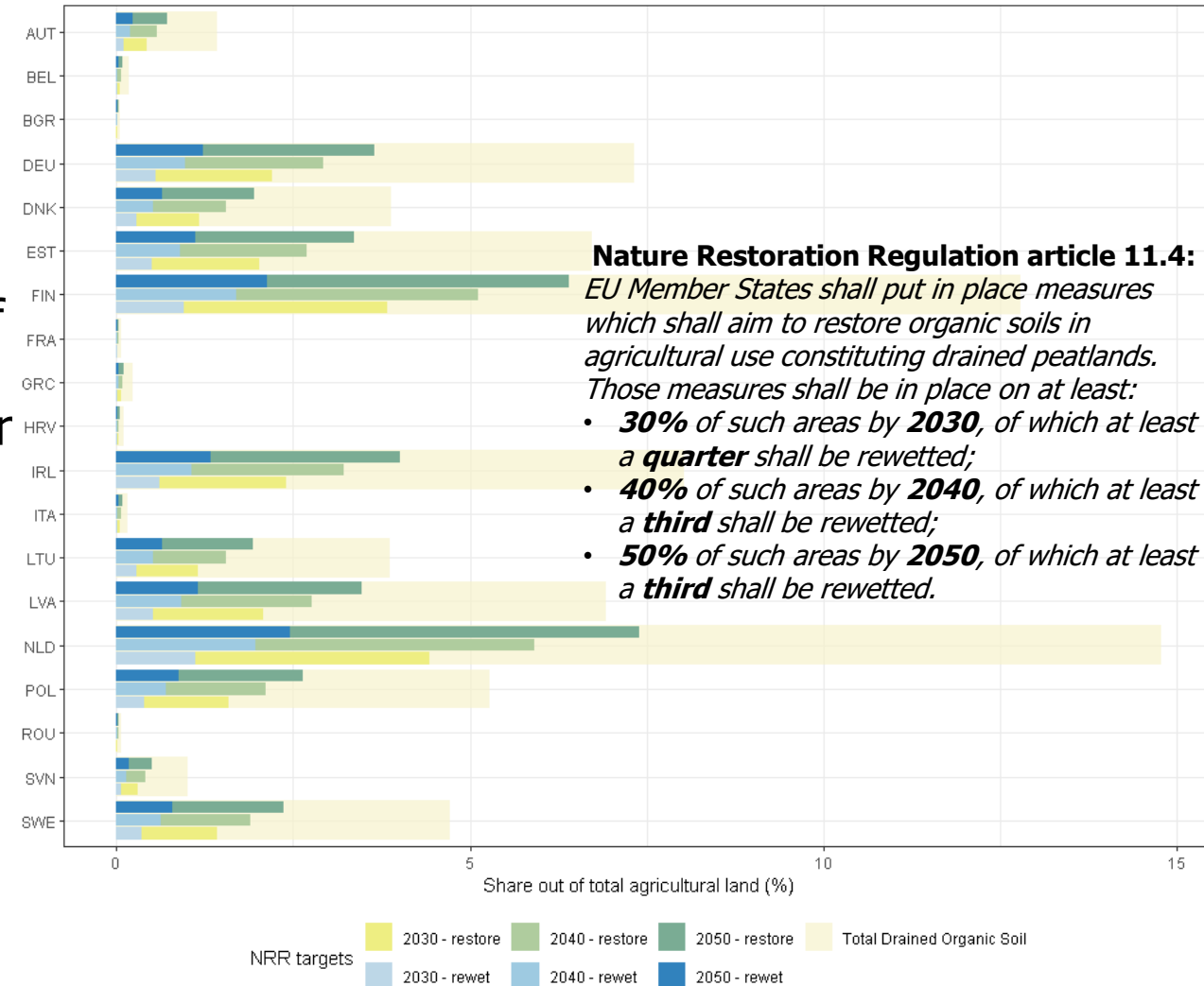
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Introduction

- Agricultural organic soils (peatlands) in EU27 cover only about **2%** of the total cropland and grassland area
 - They contribute approximately **80%** of the **Cropland and Grassland** GHG emissions released to the atmosphere in 2023
- Many EU regulations promote organic soil protection and restoration
 - Good Agricultural and Environmental Conditions (CAP- GAEC)
 - National Energy and Climate Plans (NECPs)
 - Natural Restoration Regulation (NRR)**

NRR Targets for Agricultural Drained Organic Soils

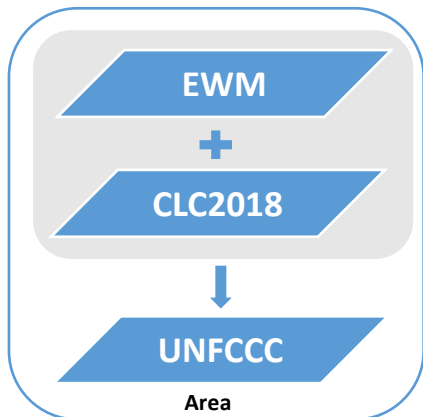
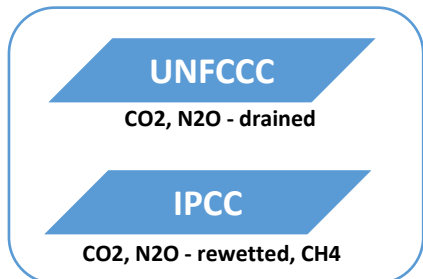


Research Motivations

- How cost-effective are different restoration measures in reducing GHG emissions from drained agricultural organic soils?
- What are the influences of paludiculture on the optimal restoration portfolios?
- What is the optimal restoration portfolio to achieve NRR rewetting and restoration targets in the EU?

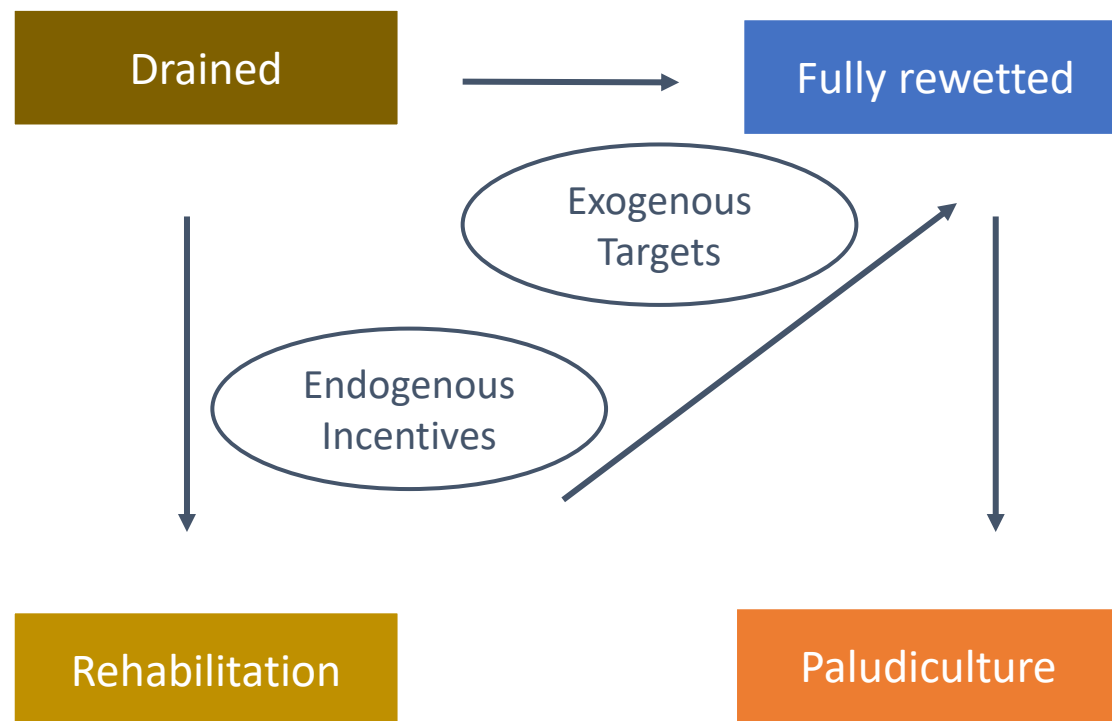
Research Framework

Input Data



GLOBIOM-EU Model Dynamics

Restoration Measures



Maximize CSPS

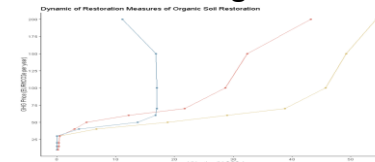


Optimal Restoration Portfolio

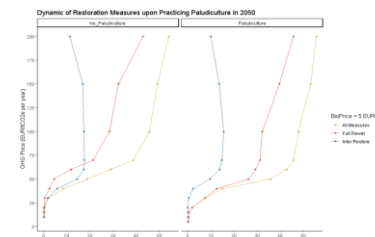
Restored area by management options



GHG mitigation

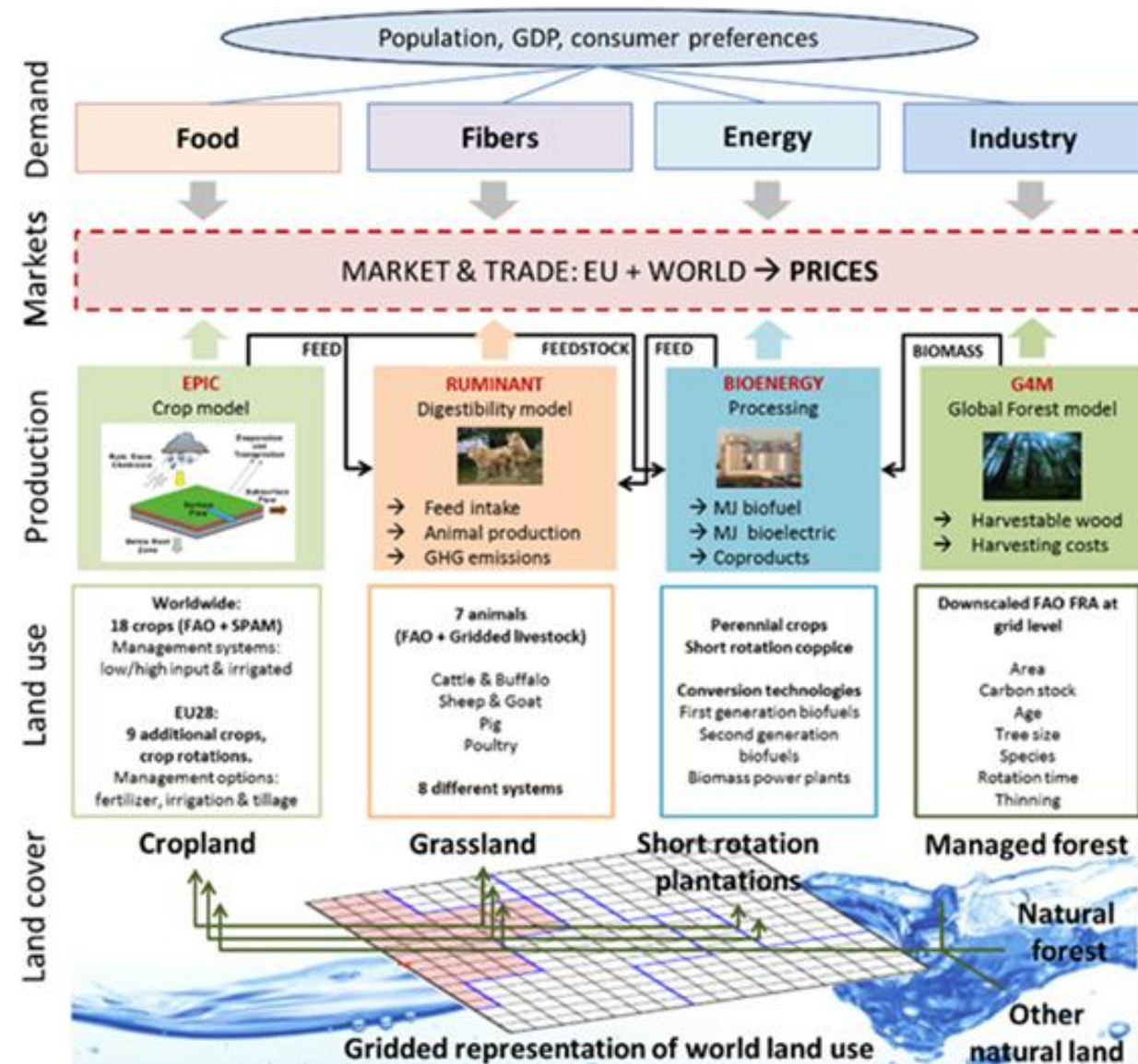


Marginal Abatement Cost Curves

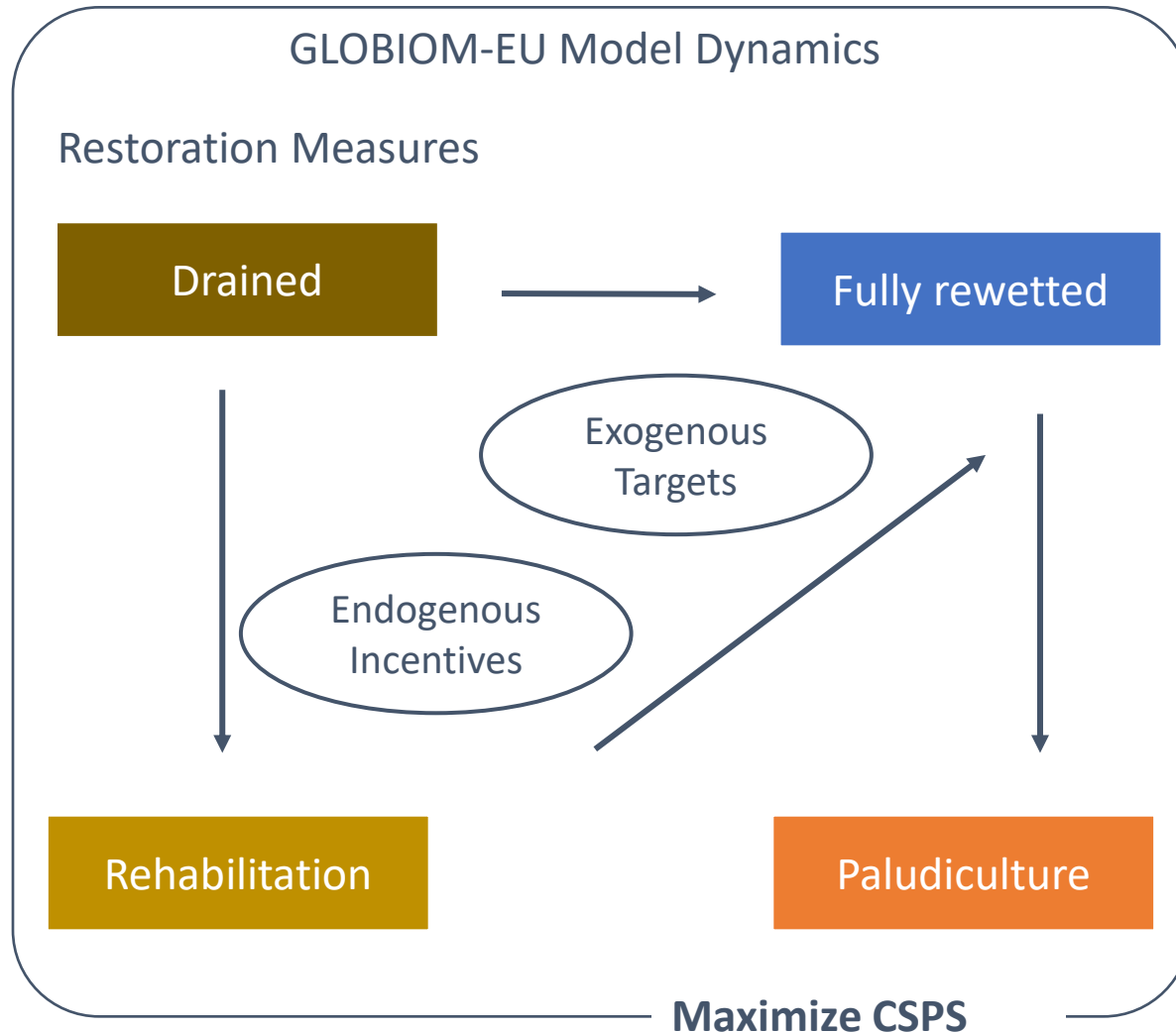


GLOBIOM-EU (Global Biosphere Management Model)

- Global, economic land use model with **detailed representation of EU27**
- Main **land use** categories: cropland, grassland, forests, energy crops, other natural land
- Linear programming approach maximizing social welfare (Consumer **S**urplus and Producer **S**urplus)



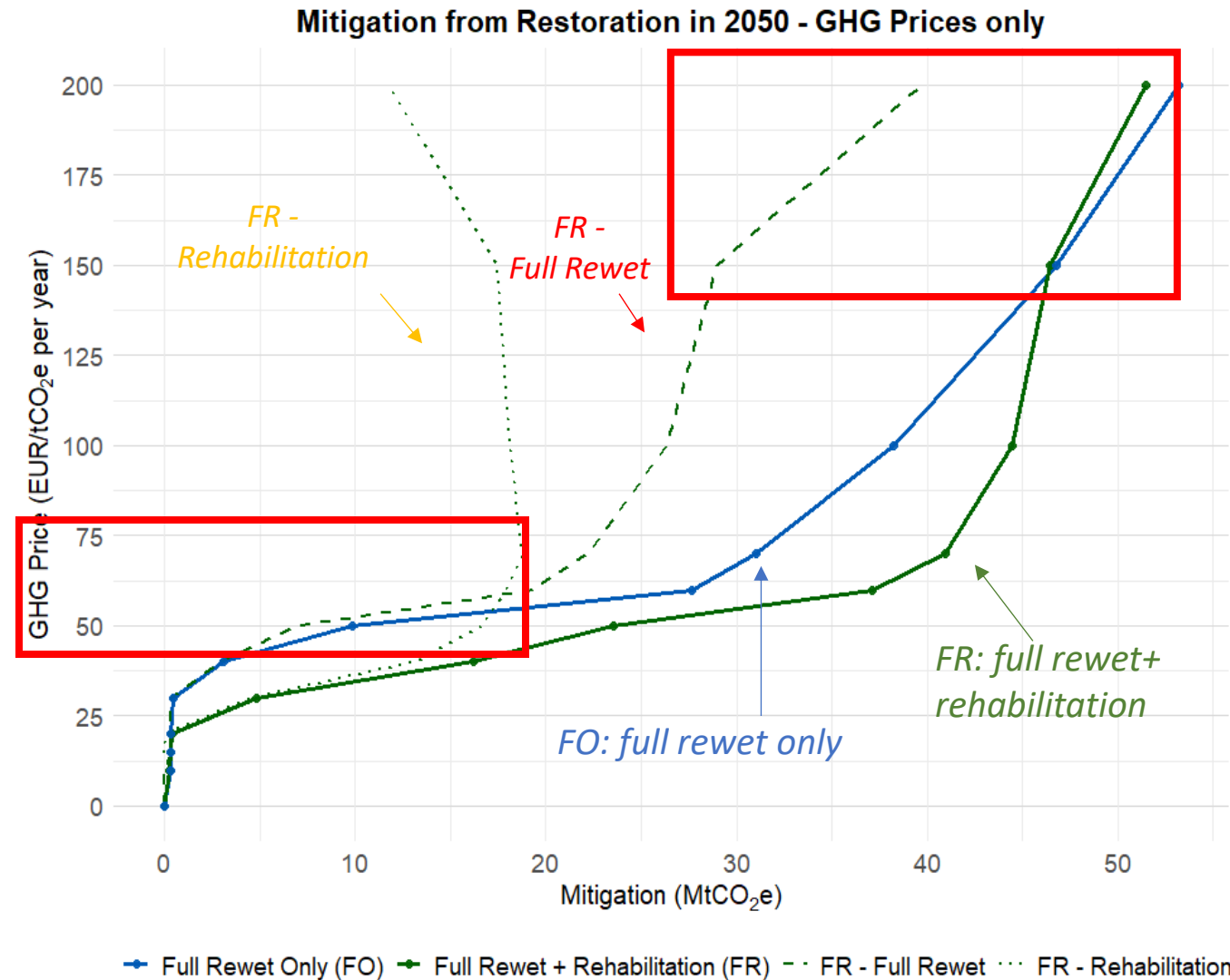
Restoration Measures



- No additional drainage for agricultural land expansion
- Rehabilitation: intermediate restoration measures – convert to new **cultivated** land use types with **lower emission factors**
 - Converting cropland to permanent grassland
 - Shallow-drained grassland
- Restoration incentivized by two ways
 - Exogenous targets, e.g., **NRR targets**
 - Endogenous incentives, e.g., **GHG prices, biomass prices**

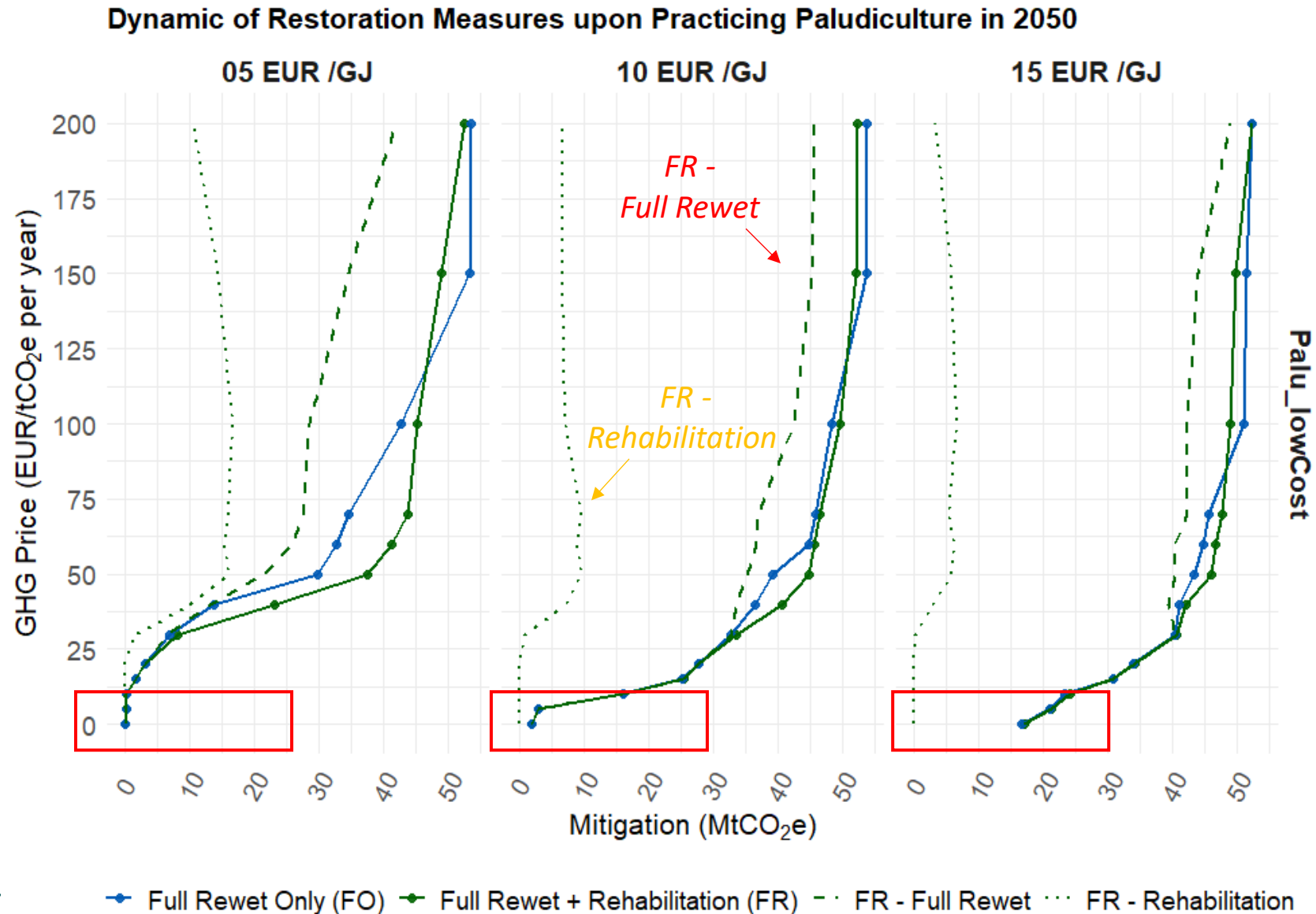
Cost-effectiveness of restoration measures

- At 100 EUR/tCO₂e: ~ 70-81% of GHG emissions mitigated
- Multi-measure portfolio (FR): **economic tipping point** at 60 EUR/tCO₂e
 - Competition between *climate benefits* and *restoration costs*
- In FO and FR: dominant mitigation process **converges toward full rewetting** at higher GHG prices



Impacts of paludiculture on restoration

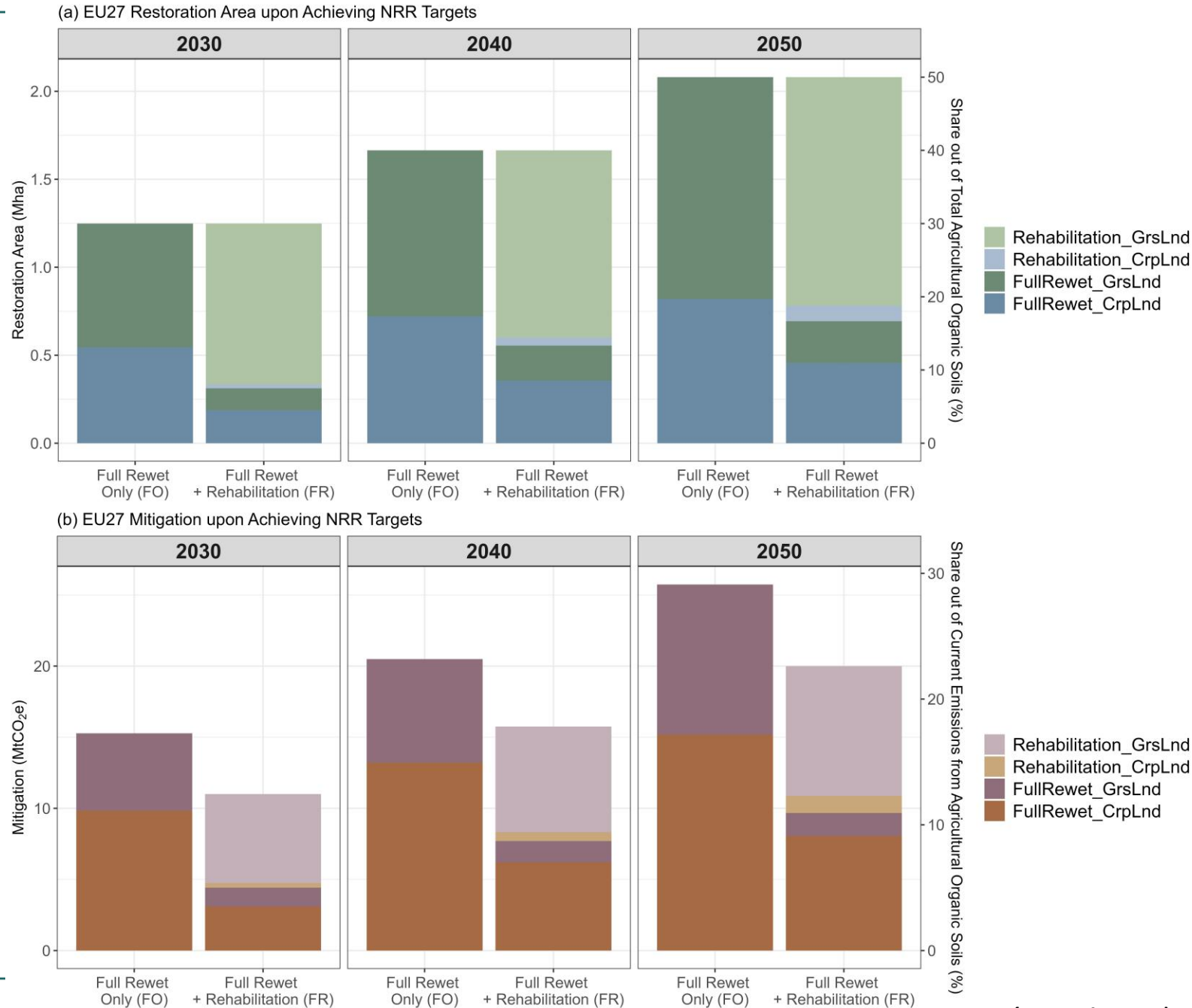
- **Full rewetting** progresses **more rapidly** with paludiculture practices
- Under favorable economic conditions:
 - Substantial GHG mitigation is achieved **without GHG prices**
 - **Full rewetting** is implemented at GHG price = 0 EUR/tCO₂e
 - **Market impacts alone could stimulate restoration**



(Jia et al., 2026)

Achieving NRR targets

- By 2050, about 23%-29% of current emissions from drained agricultural organic soils mitigated
- NRR 2050 area targets can be reached at 60-150 EUR/tCO₂e
- Mitigation potential upon achieving NRR 2050 targets can be reached at 50-60 EUR/tCO₂e
 - Practicing paludiculture further lowers the incentive levels



Conclusion

- As GHG prices increase, restoration portfolios shift toward **full rewetting, increasing overall climate benefits**
 - **Paludiculture** improve the attractiveness of full rewetting
 - Under **high demand for paludiculture products**, restoration occurs even **without GHG price incentives**
 - **2050 NRR restoration targets** can be achieved under different compensation levels depending on the restoration portfolio
 - **Restoring drained organic soils represents a substantial mitigation opportunity for the EU agricultural sector, with synergies for bioeconomy development and nature restoration**
 - **An integrated approach to policy design is needed to ensure efficiency in delivering multiple co-benefits from peatland restoration**
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THANK YOU

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