Applying the Integrated Economic-Environmental Model (IEEM) to Decarbonization in Costa Rica

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THE IEEM PLATFORM VALUE-ADDED

- IEEM is an economy-wide computable general equilibrium model; widely used for public policy and investment analysis. Four decades of literature - a ‘black box’ no more.
- Future-looking scenario analysis of public policy/investment. “What if …?” policy questions.
- Integrates SEEA (System of Environmental-Economic Accounting Central Framework).
- Natural resource modules with policy relevant features.
- Standard economic indicators (Min Fin), plus: natural capital and wealth metrics.
- IEEM and Ecosystem Services Modeling (IEEM+ESM): spatial land use/ecosystem service impacts.

NATURAL CAPITAL

MANUFACTURED CAPITAL

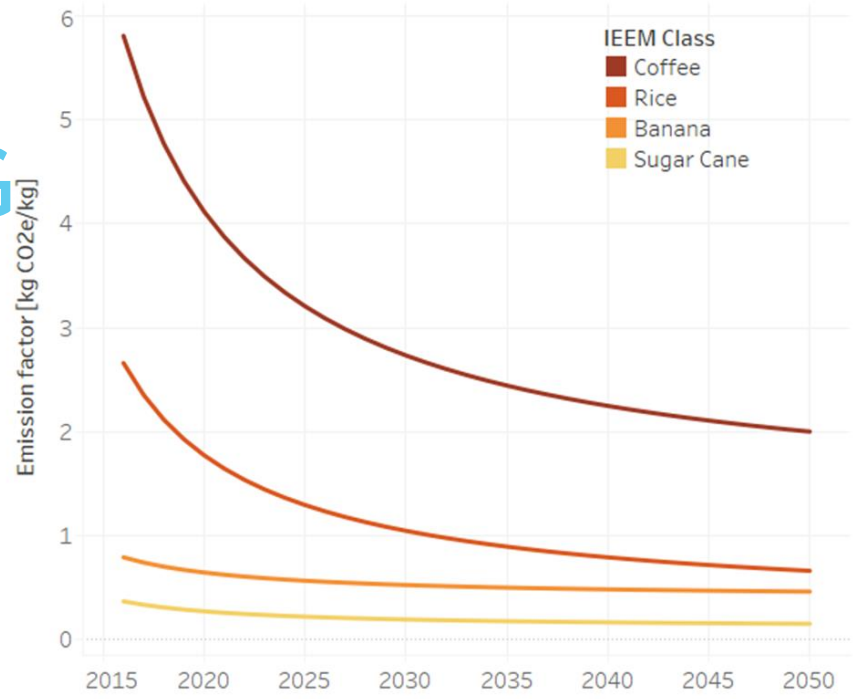
HUMAN CAPITAL

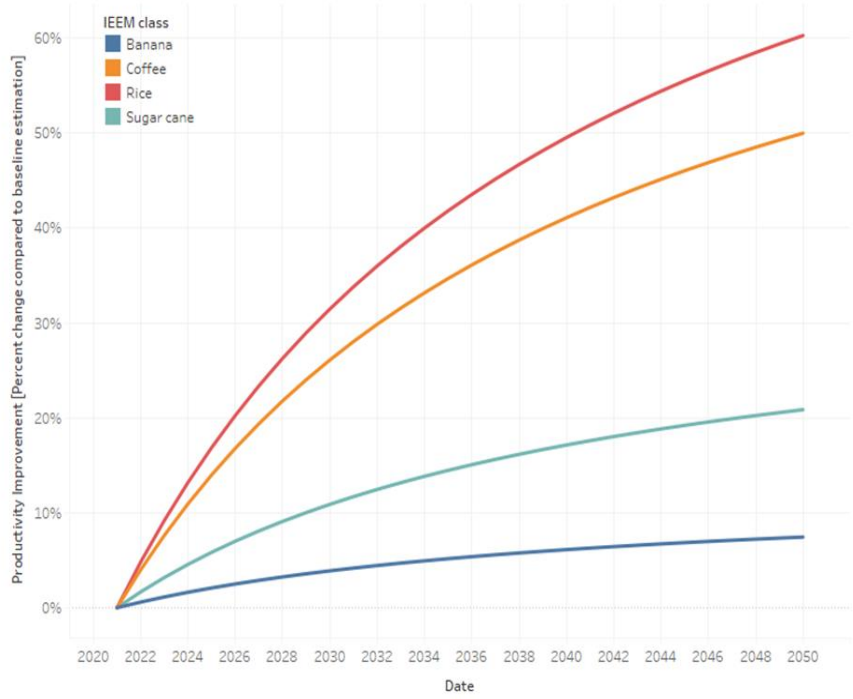
AN APPLICATION TO DECARBONIZING AFOLU IN COSTA RICA

- Decarbonization of Costa Rica's Economy; focus on Agriculture, Forestry and Other Land Uses (AFOLU; 38% of national CO2 emissions).

Elements of the AFOLU decarbonization strategy:

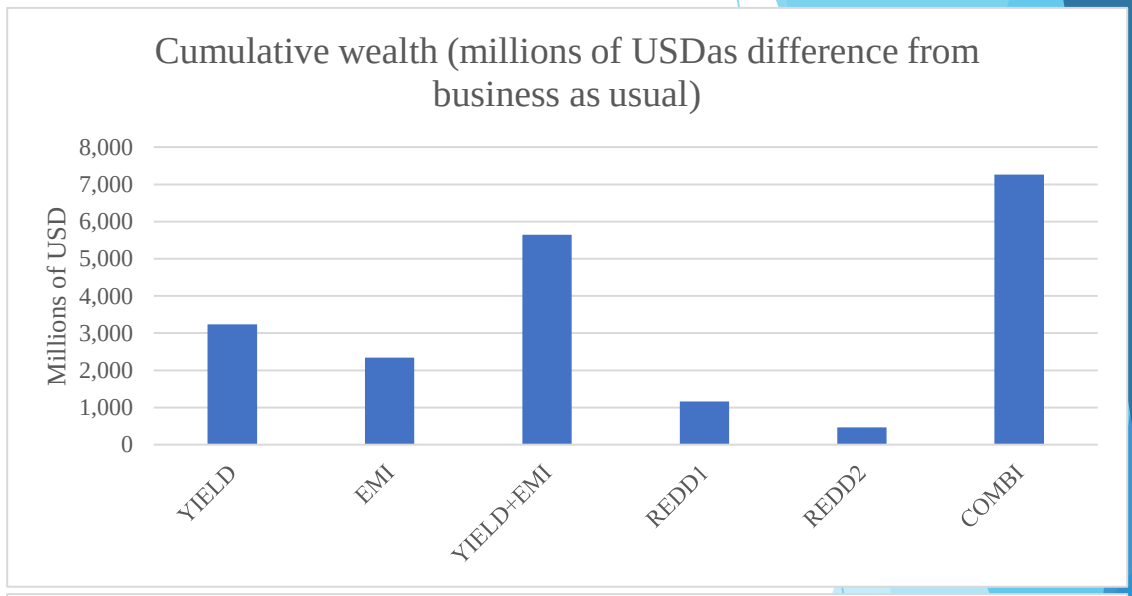
- Reduced emissions from crop and livestock systems, and; improved agricultural yields. Estimates based on comparison with countries at the frontier.
- Reduced emissions from deforestation/ degradation: implementation of agroforestry and silvopastoral systems + forest plantations.

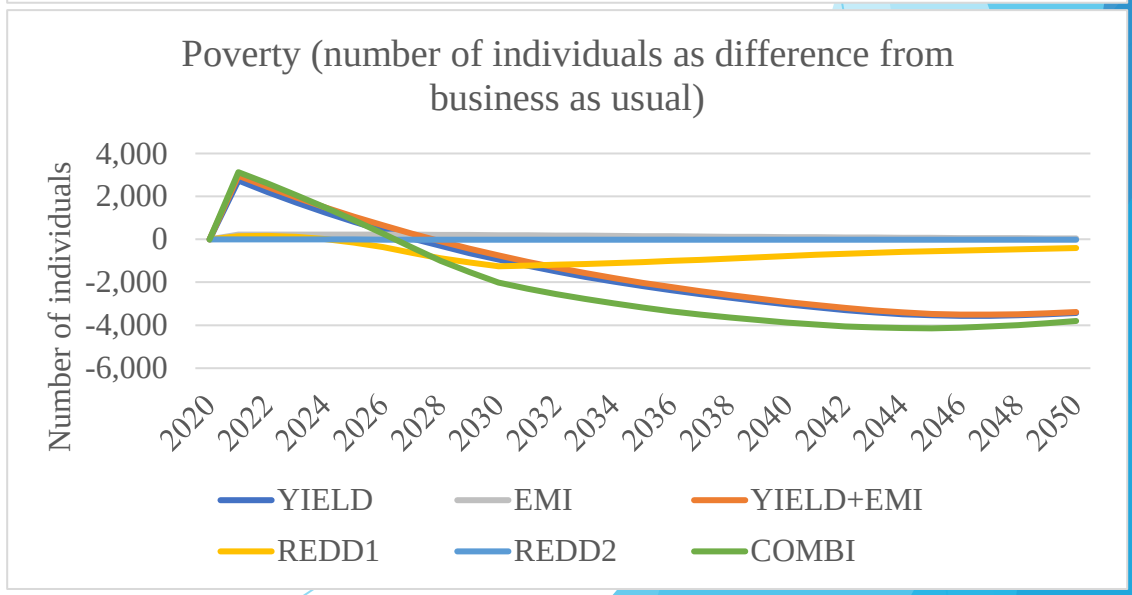




DECARBONIZATION OF AFOLU SCENARIOS

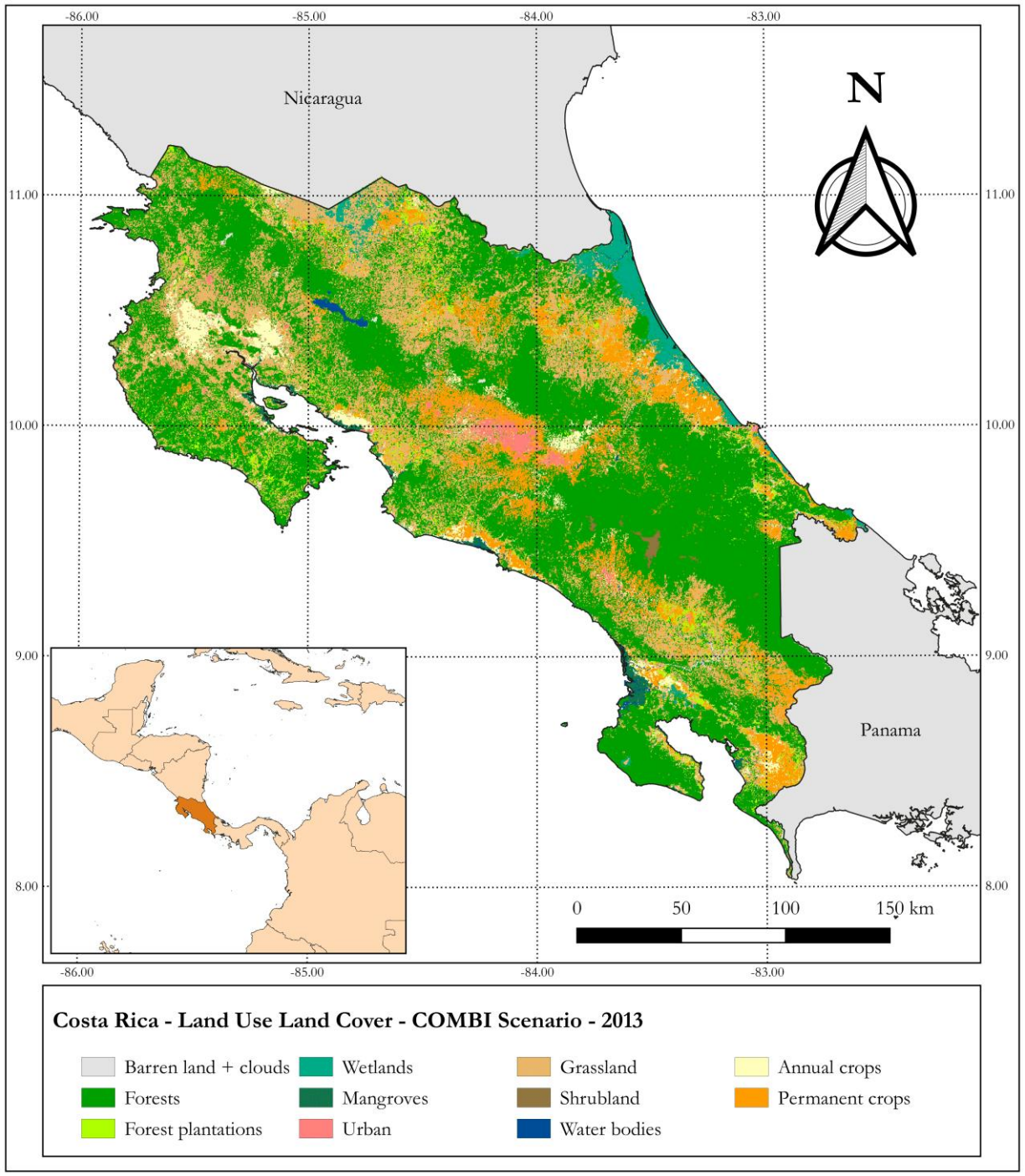
- **EMI:** Reduce emissions for key crops, 80% of frontier; improved soil management; cost: US$57/ton of CO2e; implemented gradually until 2050.
- **YIELD:** Yield improvements, 50% of frontier for key crops; variable investment cost based on crop; implemented gradually until 2050.
- **REDD1:** Implement 122,241 ha of silvopastoral systems and 121,093 ha of agroforestry systems; total cost of US$39.4 million; 2021 to 2027.
- **REDD2:** Implement 19,900 ha of forest plantations; total cost of US$4.0 million; 2021 to 2027.





RESULTS: LAND USE LAND COVER

- Analysis undertaken at 300-meter spatial resolution; results for LULC and ES at level of pixel.
- Dyna-CLUE LULC model; suitability analysis based on econometric estimations.
- Besides, standard macro/meso economic indicators and genuine savings.



RESULTS: ECOSYSTEM SERVICES

- We model carbon, erosion mitigation, water quality and water yield with the InVEST suite of ES tools.
- Carbon storage with full decarbonization strategy (left) and changes in carbon storage with respect to business as usual (right) in 2050.