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# **Simulated Exchange Values and Ecosystem Accounting: Total Social Income in RECAMAN**

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- First steps done by researchers
- The Agroforestry Accounting System, an accounting framework that allows to estimate total income, had been applied at farm scale:
  - Campos et al. (2001 and 2008); Caparrós, Campos and Montero (2003); Campos and Caparrós (2006)
- The Simulated Exchange Method, a methodology designed to integrate market and non-market goods and services in a consistent manner, had been applied at farm scale:
  - Caparrós (2001); Caparrós, Campos and Montero (2003); Caparrós et al. (2014)

- In 2007, José Guirado, a policy maker in Andalusia, and Pablo Campos, a researcher at CSIC, agreed on the convenience of developing ecosystem accounting
- Policy maker's motivation:
  - Justify large public spending in the forest, mainly fire fighting, biodiversity protection and wardens
  - Explore the possibility to implement Payments for Ecosystem Services
- In 2008, the Andalusian Government commissioned CSIC the task of developing and applying ecosystem accounting at a large scale in Andalusia -> RECAMAN:
  - intended for practical use,
  - financial crisis has prevented continuous application.

- Integrates commercial and environmental outputs and costs
- Spatially explicit results
- Macro (regional) and micro (estates) scales
- Covers 4.7 million hectares
- Main methodological features:
  - Simulated Exchange Values (SEV)
  - Agroforestry Accounting System (AAS)

# Andalusian *montes*

*Andalusian montes* cover 4.6 million ha, 54% of total surface

*Montes* include: forests (61%), shrublands (21%), natural grassland (10%) and other forestlands (8%).

Ownership: 28% public and 72% private (typically >300ha).

*Andalusian montes* have high environmental values (biodiversity hotspot).



## Accounting for

- Flows: price x quantity
- Capital: market prices or future discounted capital income flows

## Commercial values:

- Timber growth and felling (age structure)
- Cork growth and stripping
- Natural grass and acorn fodder
- Game
- Mushrooms
- Livestock and crops (at micro scale)
- Others

## Environmental values:

- Public recreation
- Private owner's amenities
- Forest landscape
- Threatened biodiversity
- Carbon sequestration
- Others

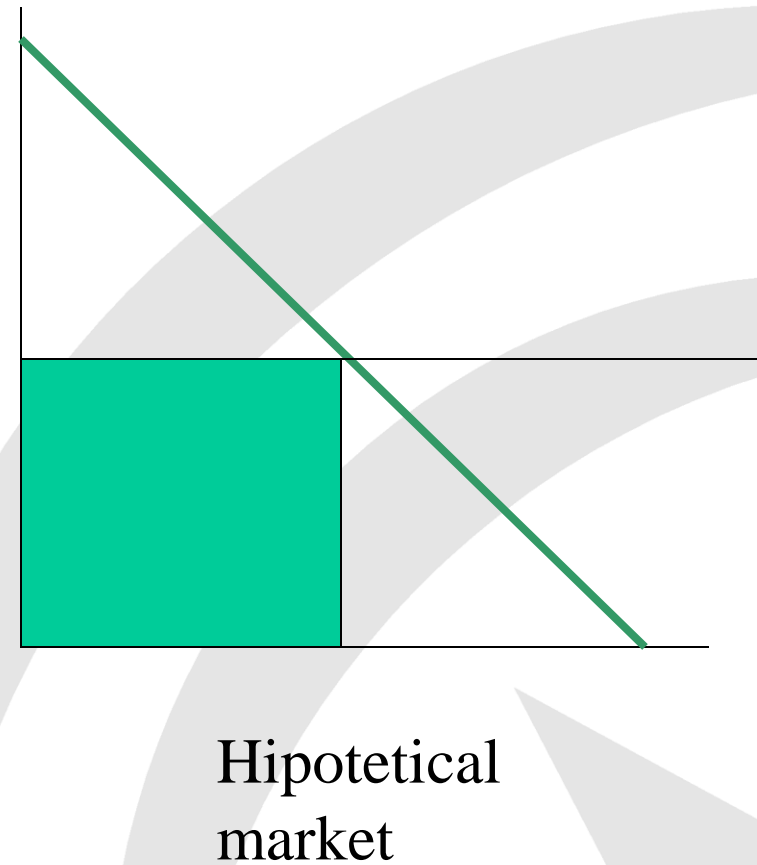
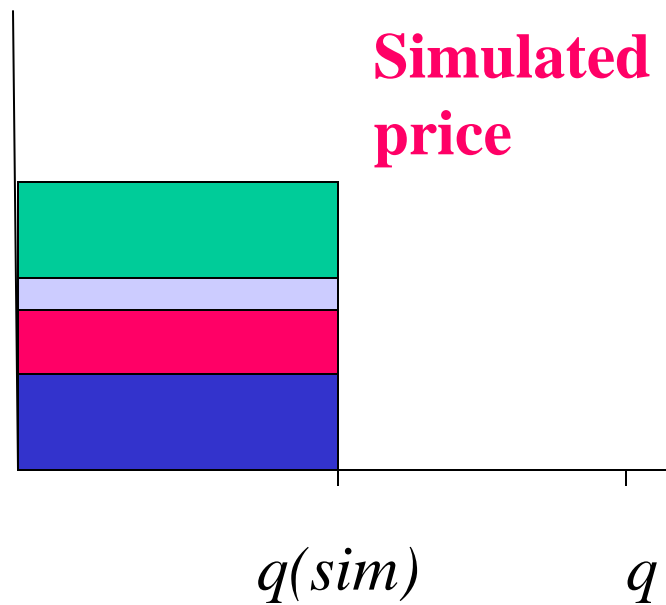
- **Production account**
  - Total output
    - *SNA outputs*
    - *Non-SNA forest outputs*
  - Total cost
    - *SNA costs*
    - *Non-SNA costs*
- **Capital balance**
  - Work in progress (inventories)
  - Fixed capital
    - *Land*
    - *Biological resources*



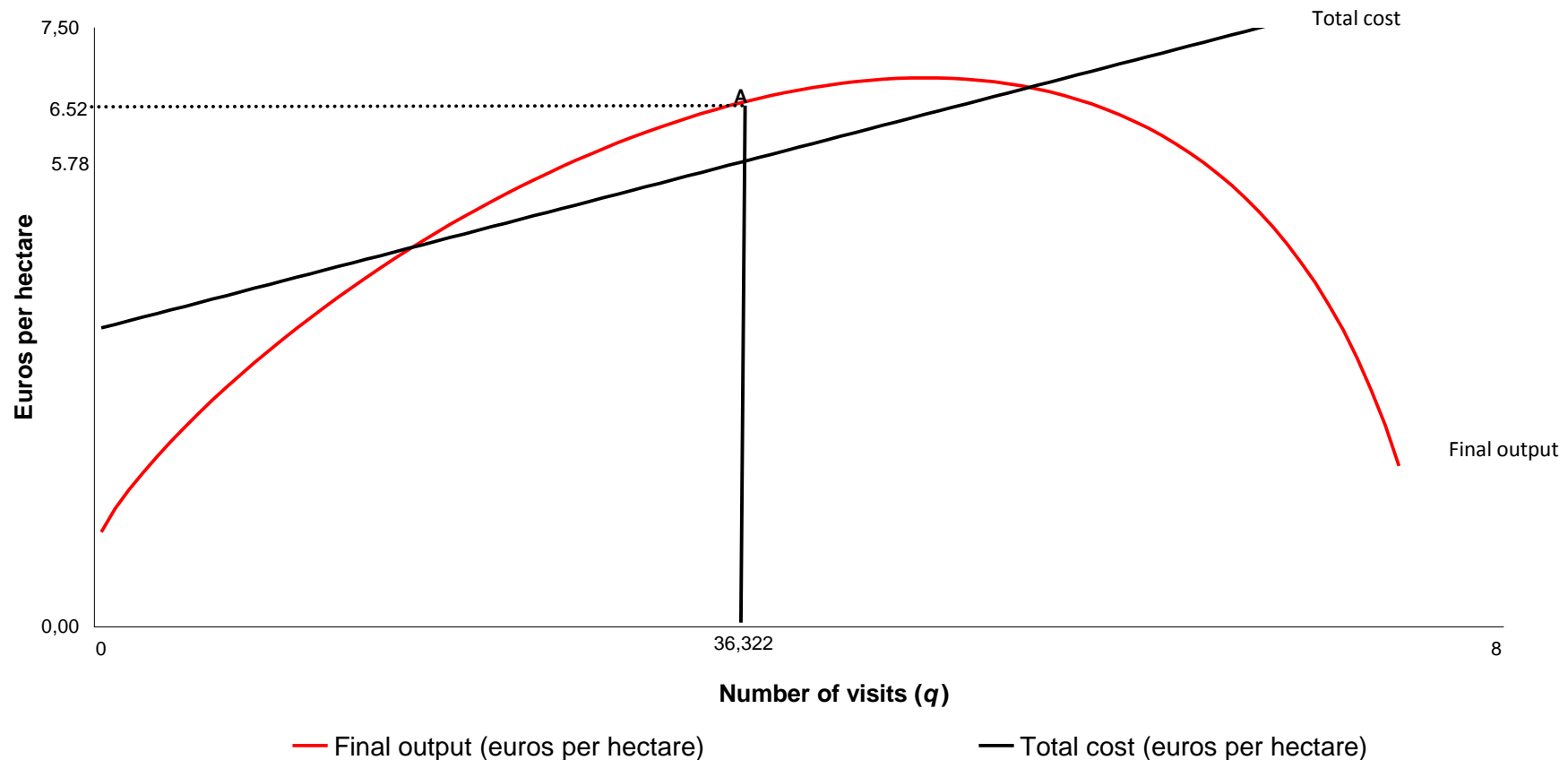
# Values are obtained ...

- Directly from markets:
  - Timber, cork, ...
- From other existing markets:
  - Carbon sequestration
  - Private amenities
  - Forest water
  - Mushrooms gathering
- By simulating markets (SEV):
  - Public recreation
  - Threatened biodiversity
  - Landscape conservation

# Simulated Exchange Value (SEV)

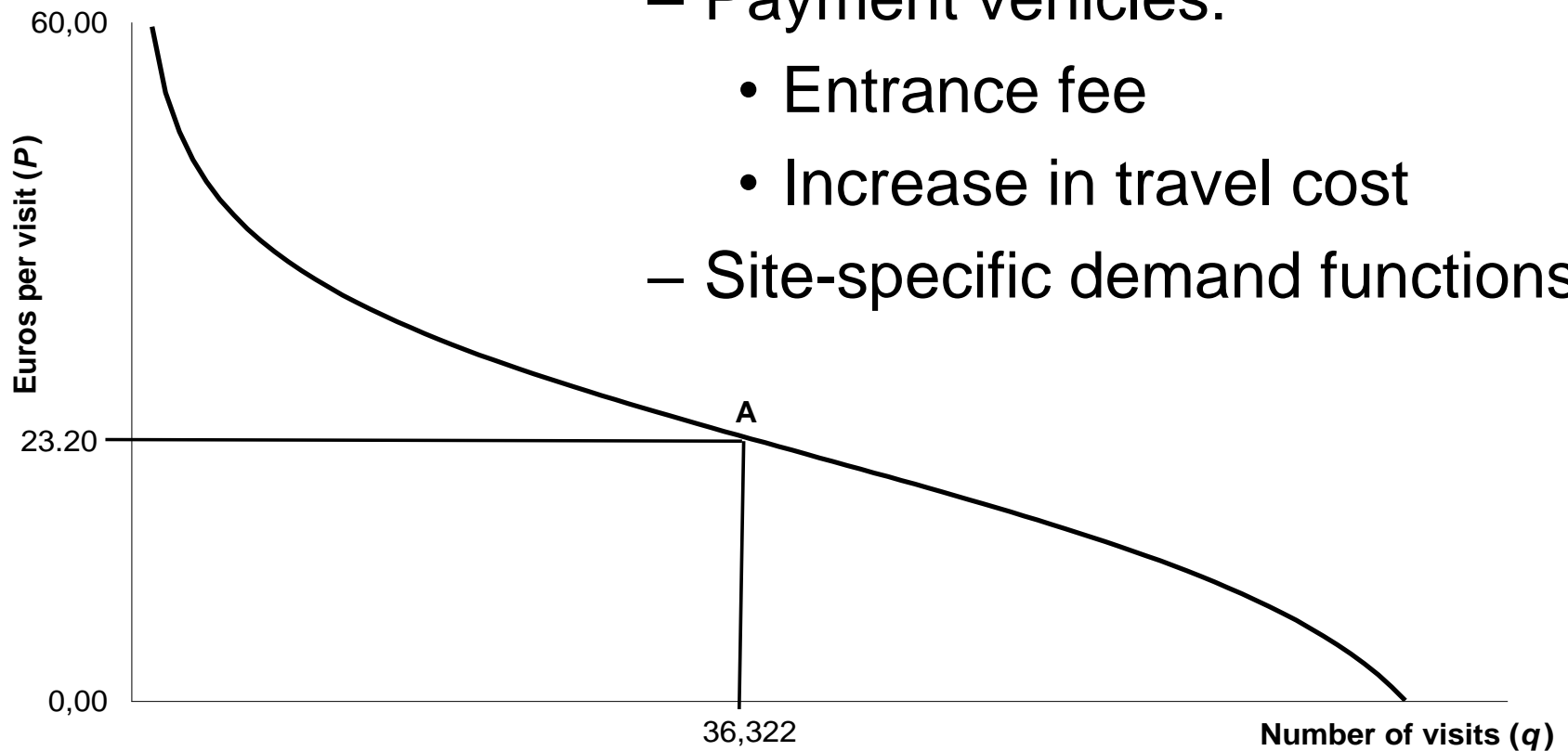


# Simulated Exchange Value (SEV)

















- **Simulated MARKET: demand and cost functions**
  - Monopolistic competition (short term)

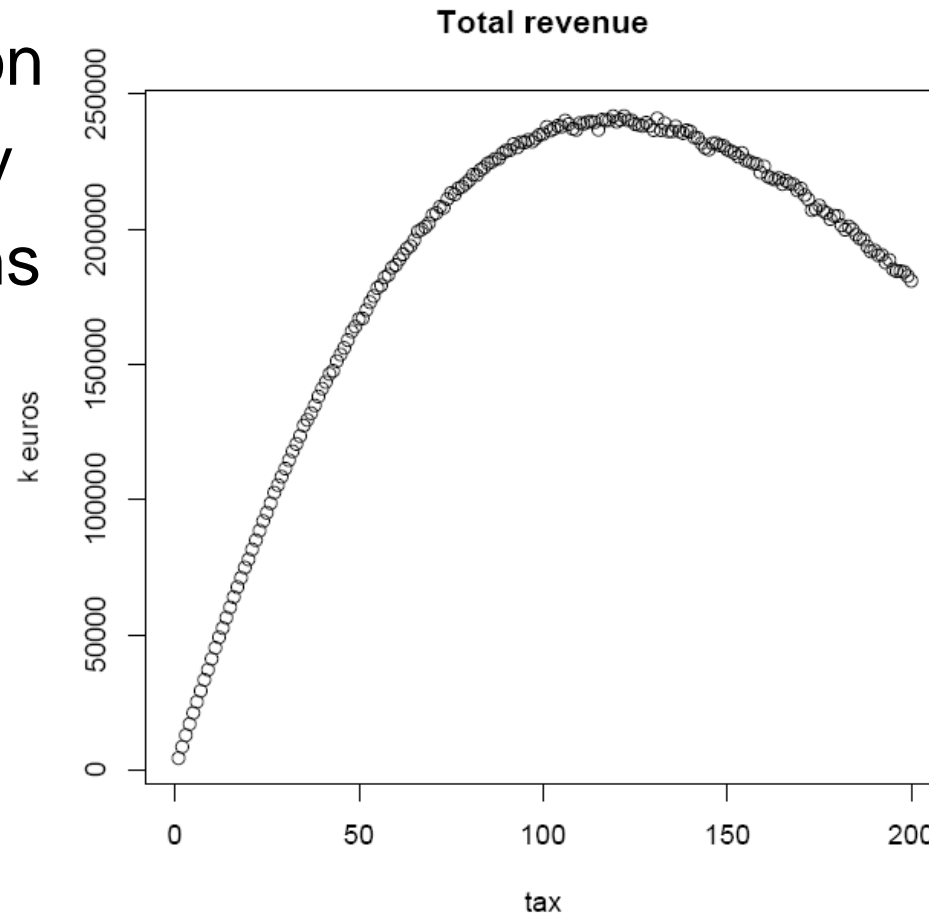
- Contingent valuation
  - Visitors to 10 areas
  - Payment vehicles:
    - Entrance fee
    - Increase in travel cost
  - Site-specific demand functions



# Landscape and threatened biodiversity

- Choice experiment
  - Andalusian households
  - Joint payment for:
    - Landscape conservation
    - Threatened biodiversity
  - Mixed logit and simulations

BLOQUE 1	Sierra de Grazalema	Pinares de Doñana	Los Alcomocales	Ninguna
1				
Especie	 Encina	 Pino	 Alcornoque	
Superficie arbolada	 Mantener la misma	 Aumento de un 20%	 Aumento de un 10%	 Disminuye un 10%
Biodiversidad	 12 especies amenazadas MAS	 IGUAL número de especies amenazadas, 235	 12 especies amenazadas MENOS	 12 especies amenaza MAS
Tasa anual	 20€	 40€	 30€	0€



- The SEV has been used in RECAMAN together with the Agroforestry Accounting System (AAS).
  - AAS: production account and capital balance
  - AAS focuses on the economic activities and products generated on the territory
  - It allows the estimation of net value added and total social income for each activity
  - Private and public outputs and costs are considered
- The SEV method could also be applied with the System of Economic and Environmental Accounts - Experimental Ecosystem Accounting (SEEA-EEA)

- We use the AAS, which does not follow institutional sectors.
  - This allows income estimations for each activity in the forests.
  - Facilitates the design of efficient Payment for Ecosystem Services
- We use the SEV method for non marketed goods and services
  - It allows estimation of what would be the income *if* all the ecosystems services were internalized
  - If one country charges visitors to the forest and another not, with the SEV the value in the accounts would be similar (not in SNA-SEEA)

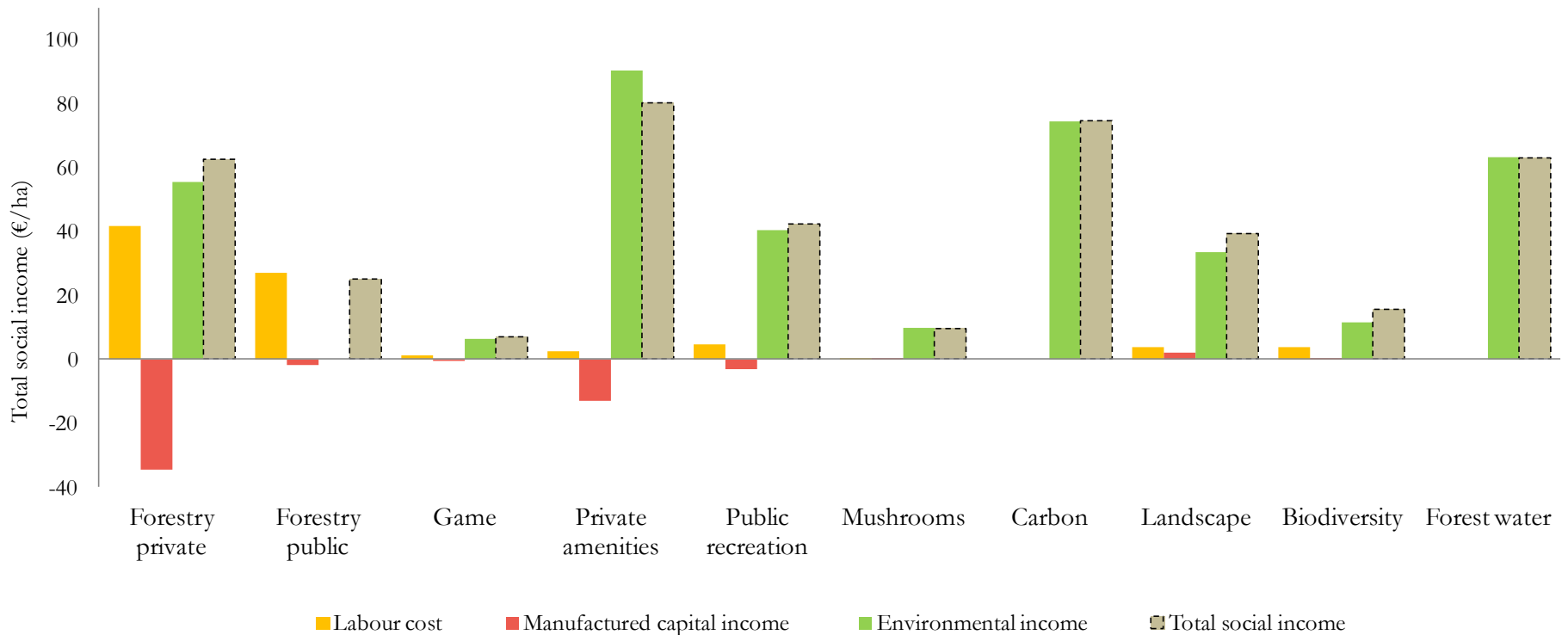
- Forest National Inventory for forests and woodlands (age structure)
- Land cover and land use data GIS
- Prices of over 4,000 transactions per year on forest products
- 58 revenues and costs in depth analysis of *montes* estates (including crops and livestock)
- 800 interviews to *montes* non-industrial landowners
- 4,000 interviews to free access visitors (CV and choice exp)
- 5,600 interviews to households (CV and choice exp)
- 800 interviews to hunters
- 800 interviews to *montes* hunting estates
- 4,000 interviews to mushroom gatherers
- Public expenditures on *montes* disaggregated by *montes* activities
- Threatened biodiversity index by vegetation type
- Green water consumption by vegetation type



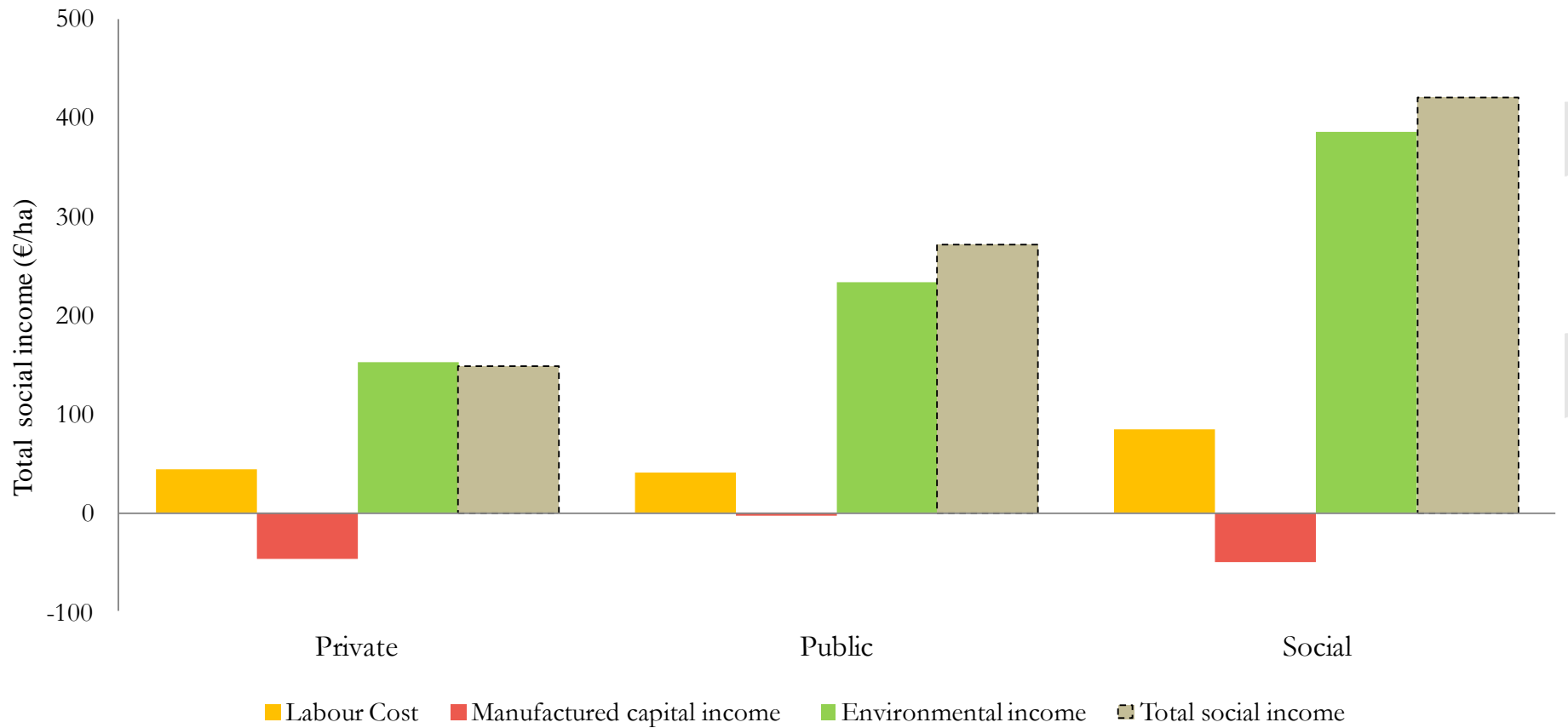
# Results

(for 2010)

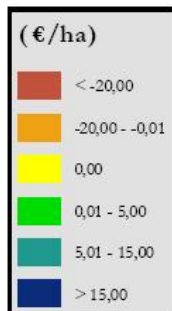
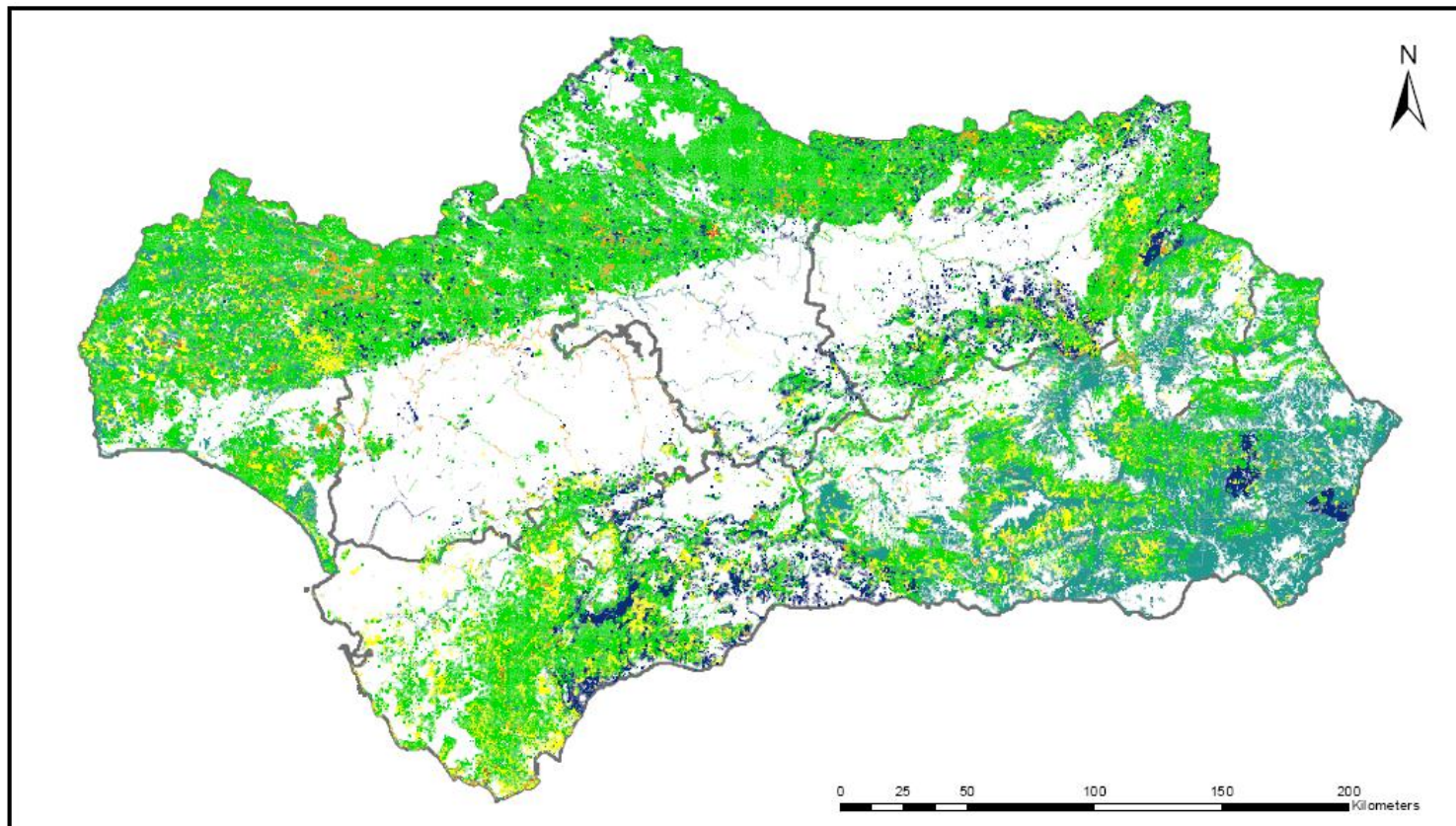
# Total social income distribution







# Private and public incomes



# Maps: "Kyoto" carbon in 2010



Analyzed surface:  
4.229.772 ha

 <p>JUNTA DE ANDALUCÍA</p>  <p>CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS</p>   <p>Centro de Investigación Biomédica y Ambiental del Medio Natural</p>	<p>Map code: 01-01-13-000</p>	<p>Date: 02/04/2014</p>	<p>Region: Andalusia</p>
	<p>Map title: Environmental income from net carbon sequestration under the Kioto protocol in Andalusian forests (2010: €/ha).</p>		

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PERIOD: 2008-2014.

- Campos, P., Rodríguez, Y. and Caparrós, A. (2001). Towards the Dehesa total income accounting: theory and operative Monfragüe study cases. *Investigación Agraria: Sistemas y Recursos Forestales*. Monográfico fuera de serie New Forestlands Economic Accounting: Theories and Applications 1: 45-69.
- Campos, P., Daly, H., Oviedo, J.L., Ovando, P. and Chebil, A. (2008). Accounting for single and aggregated forest incomes: Application to public cork oak forests of Jerez in Spain and Iteimia in Tunisia. *Ecological Economics* 65: 76-86.
- Campos, P. and Caparrós, A. (2006). Social and private total Hicksian incomes of multiple use forests in Spain. *Ecological Economics* 57, pp. 545-557.
- Campos, P., Caparrós, A., Beguería, S., Carranza, J. Díaz-Balteiro, L., Díaz, M., Farizo, B., Herruzo, C., Martínez, F., Montero, G., Ovando, P., Oviedo, J.L., Soliño, M., Aldea, J., Almazán, E., Álvarez, A., Concepción, E.D., Fernández, C., Frutos, P., Martínez-Jauregui, M., Mesa, B., Pasalodos, M., Romero, C., Serrano, R. and Torres, J. (2014). *RECAMAN: Manufactured and environmental total incomes of Andalusian forest*. Mimeo. Available at [www.recaman.es](http://www.recaman.es)
- Caparrós, A (2001). *Valoración económica del uso múltiple de un espacio natural: análisis aplicado en los pinares de la sierra de Guadarrama*. PhD Thesis, Univeristy Complutense of Madrid.
- Caparrós, A., Campos, P. and Montero, G. (2003). An operative framework for total Hicksian income measurement: application to a multiple use forest. *Environmental & Resource Economics* 26, pp. 173-198.
- Caparrós, A., Oviedo, J.L., Ovando, P., Álvarez, A., and Campos, P. (2014). *Simulated Exchange Values and Ecosystem Accounting*. Mimeo



**Thank you for your  
attention**



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