



**Expert Meeting on Ecosystem Accounting, 11-13 May 2011
European Environmental Agency, Copenhagen, Denmark**

RECAMAN PROJECT

Mediterranean *Monte* Ecosystems

Total Income Green Accounting

Pablo Campos

Alejandro Caparrós

Institute for Public Goods and Policies (IPP)

Spanish National Council for Scientific Research (CSIC)

**Funding: Department of Environment,
Autonomous Government of *Andalucía*, Spain**

PROJECT COORDINATOR: Pablo Campos.

RESEARCHERS (40) AND INSTITUTIONS PARTICIPATING (11):

- Instituto de Políticas y Bienes Públicos (IPP-CCHS-CSIC): Begoña Álvarez-Farizo, Pablo Campos, Alejandro Álvarez, Alejandro Caparrós, Bruno Mesa, Paola Ovando, José Luis Oviedo y Nuria Ruiz (8).
- Museo Nacional de Ciencias Naturales (MNCN-CSIC): Cesar Luis Alonso, Mario Díaz y Elena Daniela Concepción (3).
- Estación Experimental de Aula Dei (EEAD-CSIC): Santiago Beguería y Roberto Serrano (2)
- Instituto de Estudios Sociales Avanzados de Andalucía (IESA-CSIC): Eduardo Moyano, Sara Pasadas y Carlos Priego (3).
- Centro de Investigación Forestal (CIFOR-INIA): Andrés Bravo, María Martínez, Gregorio Montero, María Pasalodos, Ricardo Ruíz-Peinado y Mario Soliño (6).
- Escuela Técnica Superior de Ingenieros de Monte de Madrid (ETSIM-UPM): Luis Díaz-Balteiro, Casimiro Herruzo, Carlos Romero, Ana Torres y Roberto Voces (5).
- Facultad de veterinaria de la Universidad de Extremadura (FV-UEX): Juan Carranza, Pedro Fernández, José Manuel Seoane y Jerónimo Torres (5).
- Centro de Servicios Forestales de Castilla y León (CESEFOR): Jorge Aldea y Fernando Martínez (2).
- Escuela Universitaria de Estudios Empresariales de Soria de la Universidad de Valladolid (EA-Emp-Soria-UVA): Pablo de Frutos (1).
- Université Montesquieu-Bordeaux IV: Marc Leandri (1).
- Agencia Andaluza de Medio Ambiente y Agua (former Empresa de Gestión Medio Ambiental S. A.) of Autonomous Government of *Andalucía* (*Junta de Andalucía*): María García, Luis Guzmán, Samuel Gómez e Isabel Martín (4).

TOTAL BUDGET FROM ANDALUCÍA GOVERNMENT: 6,906,449 €

RECAMAN: Objective and Methods



- **Objective:**
 - **Developing and implementing** by the Government of *Andalucía* a **forestland and natural grassland ecosystems green accounting system (AAS)** for measuring **Hicksian Green Total Social Sustainable Income (TSI) and capital (C)**.
- **Methods:**
 - Land cover unit: tree, shrub and natural grass.
 - Commercial good and services: SNA 2008 *criteria*.
 - Consumer surplus is not taken into account.
 - Environmental valuation criterion: simulated market exchange price.
 - Contingent valuation and choice experiment.
 - Production function
 - Agroforestry Accounting System (AAS).

Andalusian *montes* study case



- Andalusian *montes* (forest and woodland: 52%, shrubland: 25% and natural grassland: 23%) extend about 4.6 million hectares, which is 53% of Andalusian total surface.
- Ownership: private: 72% and public: 28%.
- Large estates over 500 hectares dominate.
- Andalusian *montes* are recognized as high natural value ecosystems.



- 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
- 57 Revenues and costs in depth analysis of *montes* estates (including crops and livestock)
- 800 interviews to *montes* 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 activity

- **Accounting for**
 - Flows: price x quantity
 - Capital: future discounted capital income flows

Main commercial values:

- Timber growth and felling (age structure)
- Cork growth and stripping
- Natural grass and acorn fodder
- Hunting (age structure)
- Mushrooms
- Others

Main environmental values :

- Public recreation
- Owner amenity self-consumption
- Forest landscape production
- Threatened biodiversity
- Carbon sequestration
- Others

Hicksian Total Sustainable Income



- “From a theoretical point of view, income is often defined as the maximum amount that a household, or other unit, can consume without reducing its real net worth” (SNA 2008, 2009, para. 8.25, p. 160).
 - SNA Objective: measuring market values and government non-market services yielding a partial **net value added** (NVA_{SNA}).

$$\mathbf{TSI = NVA + CG = NVA_{SNA} + NVA_{NSNA} + CG}$$

$$\mathbf{Production\ account: NVA = TO - IC - CFC}$$

$$\mathbf{Capital\ balance\ account: CG = Cr - Cd - NGoc + CFC}$$

- Total output
 - SNA outputs
 - Non-SNA outputs (acorn, natural fodder, natural growth, hunting and scarce environmental values)
- Total cost
 - SNA costs
 - Non-SNA costs (intermediate output, works in progress used, carbon, government expenditures)

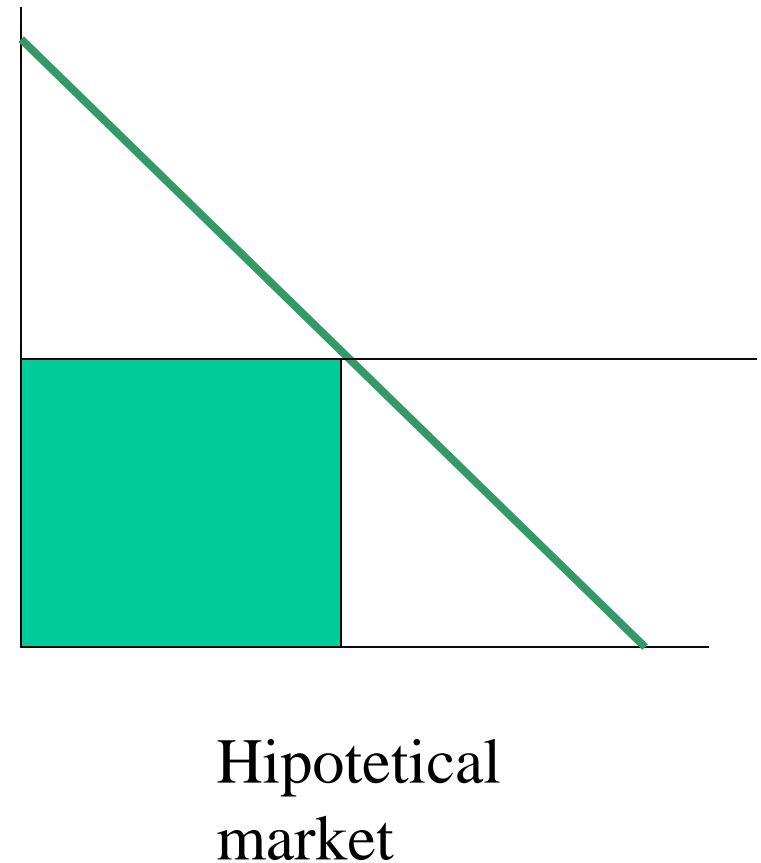
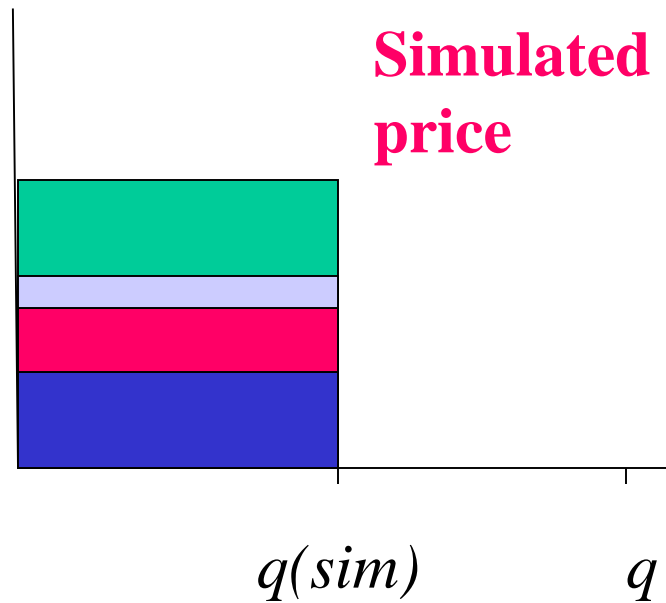
Capital (present discount values)



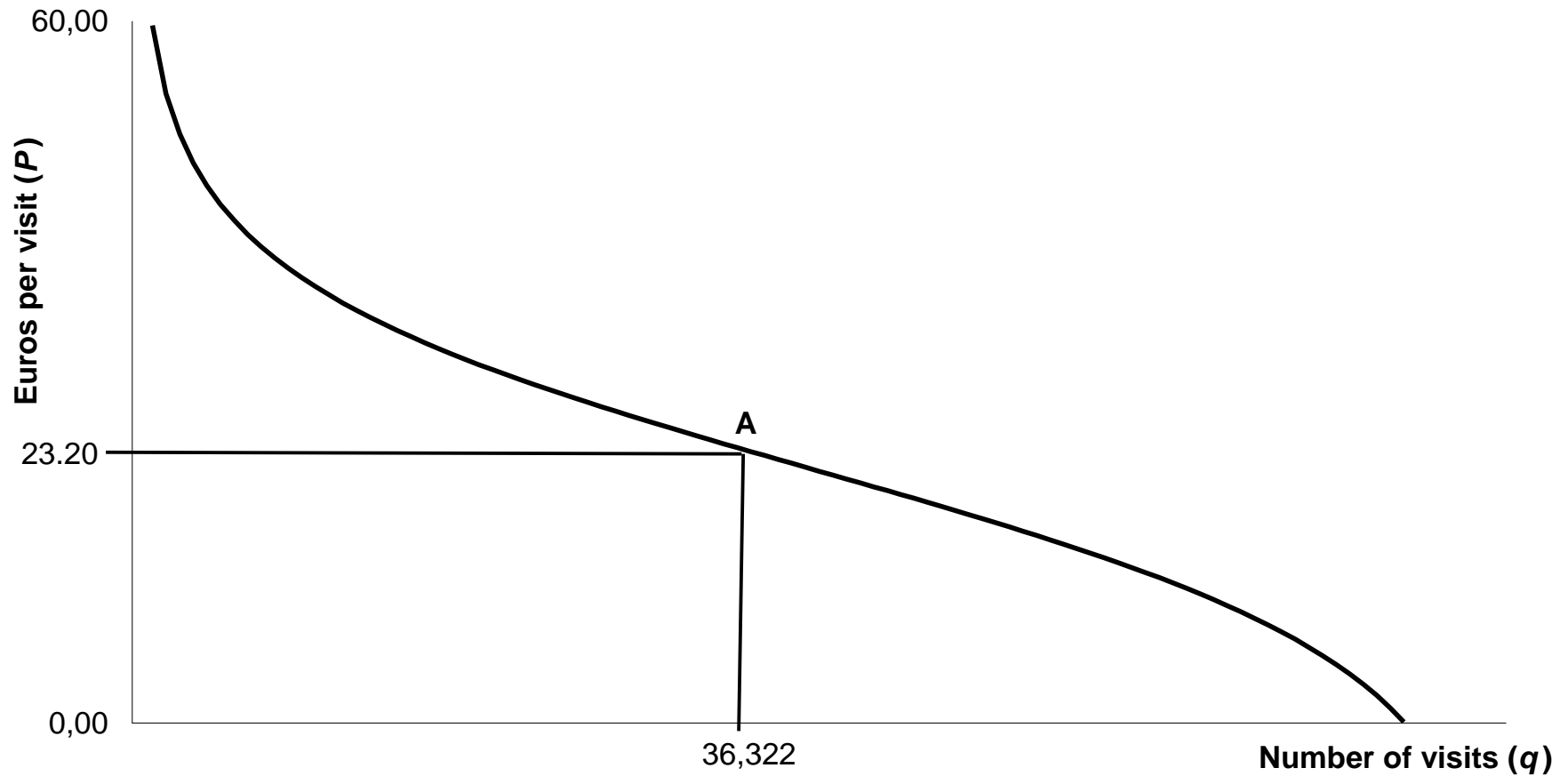
- Work in progress balance sheet (inventories)
 - Standing timber, cork and fuelwood
 - Game inventories.
- Fixed capital assets balance sheet
 - Land (timber, cork, acorn, commercial recreation, owner amenity self-consumption, carbon sequestration, landscape, threatened biodiversity, free public environmental recreation)
 - Biological resources (standing trees yielding repeat outputs and big game reproductive female, others).
 - Others

Environmental marginal values

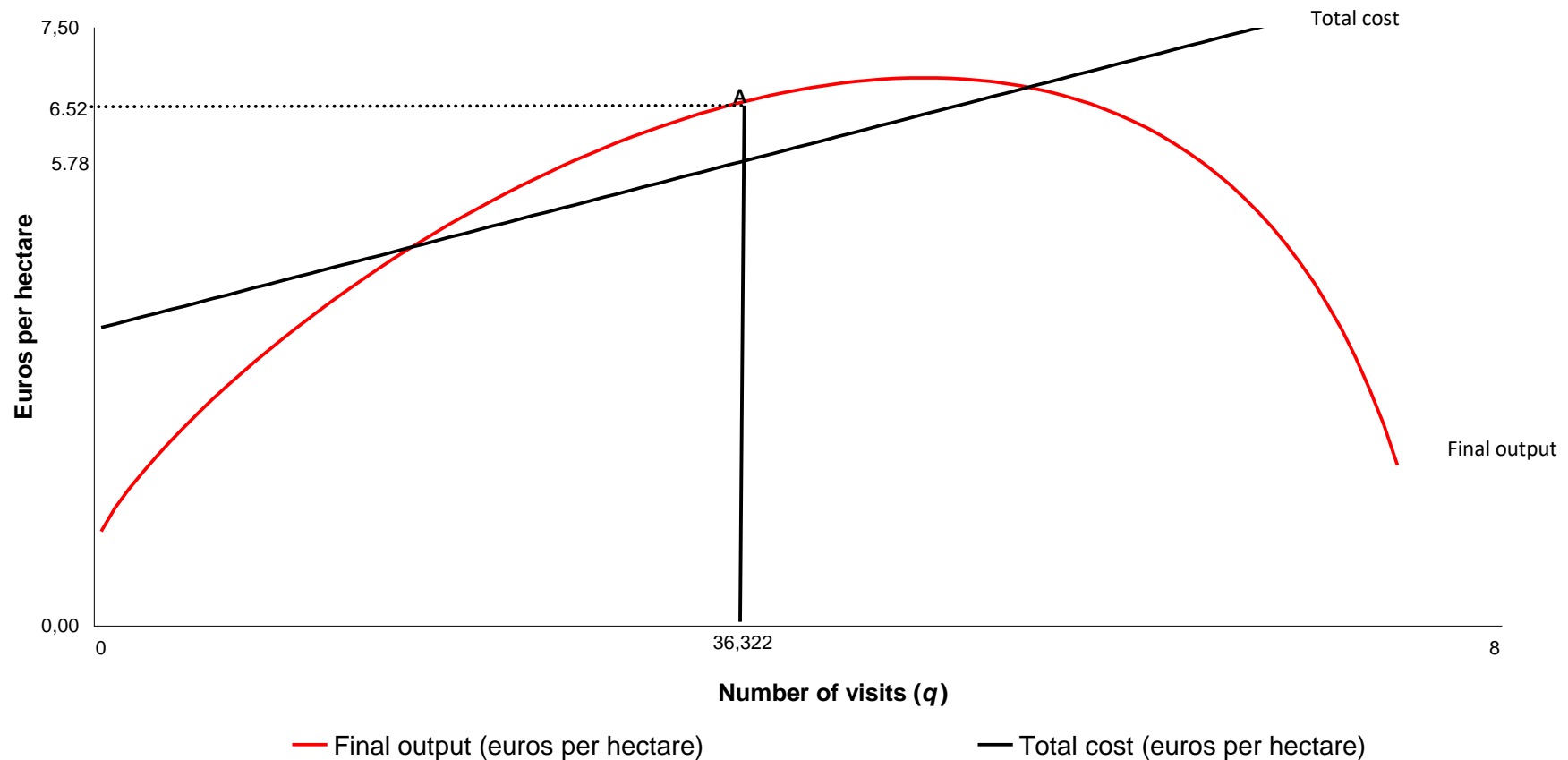
- *Free public recreation*
- *Produced landscape*
- *Threatened biodiversity*
- *Owner amenity self-consumption*



Free access recreational services (demand)



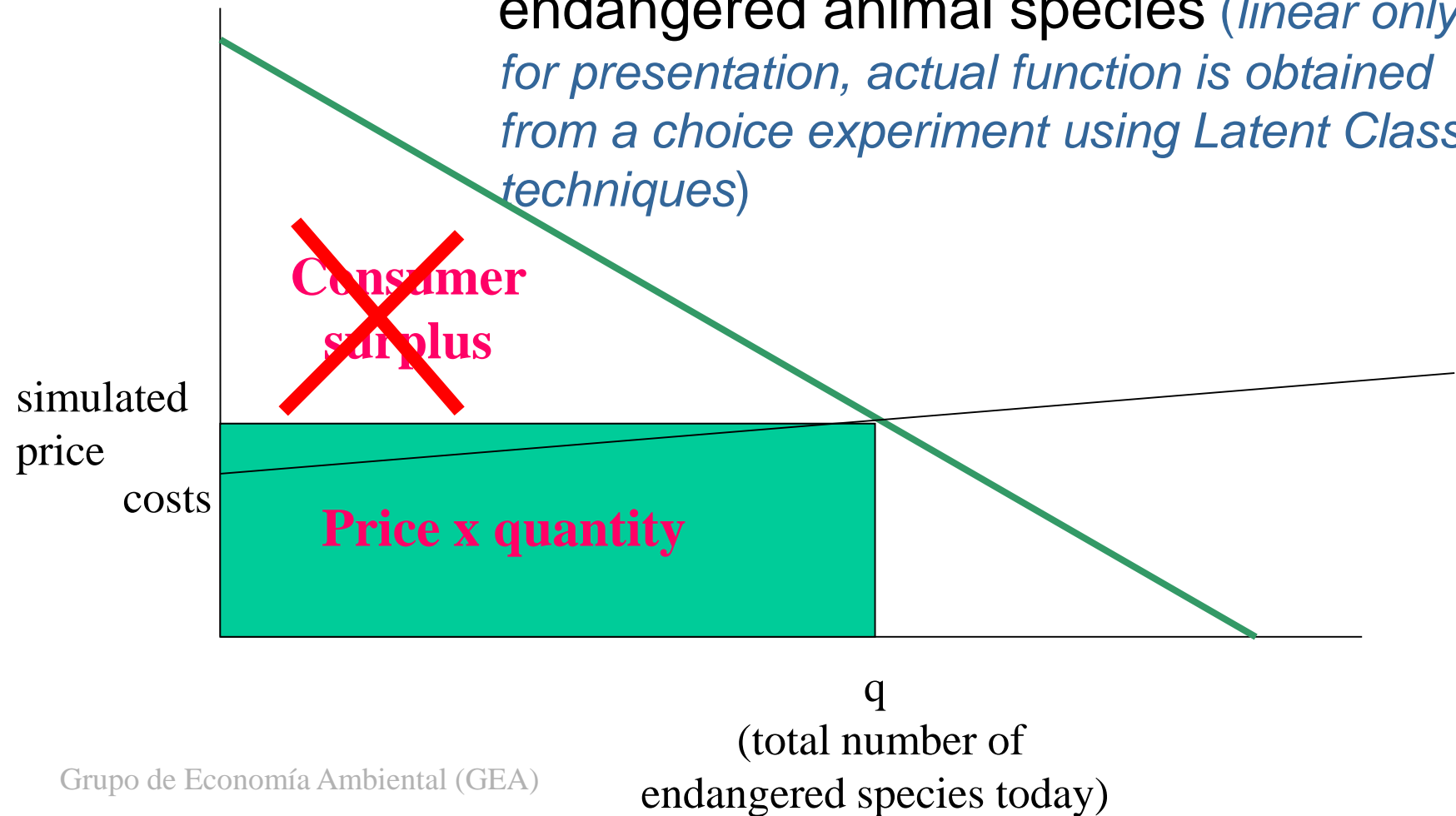
Simulated Exchange Value Method



- **Simulated MARKET: demand and cost functions**
 - Monopoly
 - Perfect competition

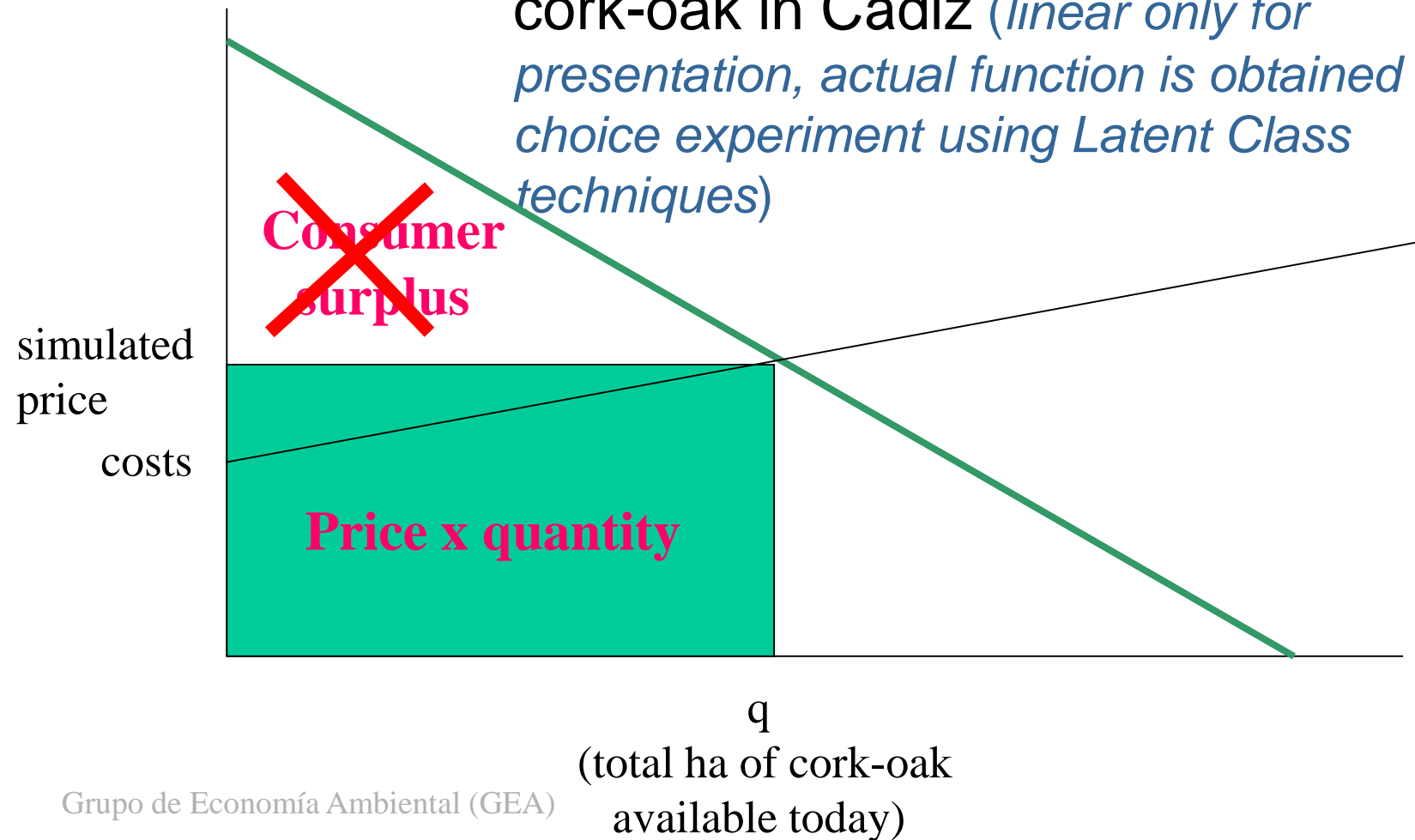
Endangered species: marginal valuation

- WTP to avoid the increase in endangered animal species (*linear only for presentation, actual function is obtained from a choice experiment using Latent Class techniques*)



Landscape values: marginal valuation

- WTP to increase one hectare of (e.g.) cork-oak in Cádiz (*linear only for presentation, actual function is obtained from a choice experiment using Latent Class techniques*)



Owner's amenity self-consumption



- Recreational and other types of amenities consumed by the land-owner
- This value is capitalized in the market for land
- If enough data are available one can decompose the price (hedonic method) and then convert the capital value into an equivalent flow
- Since land transactions are not transparent enough we use contingent valuation
- This method allows to estimate directly flows

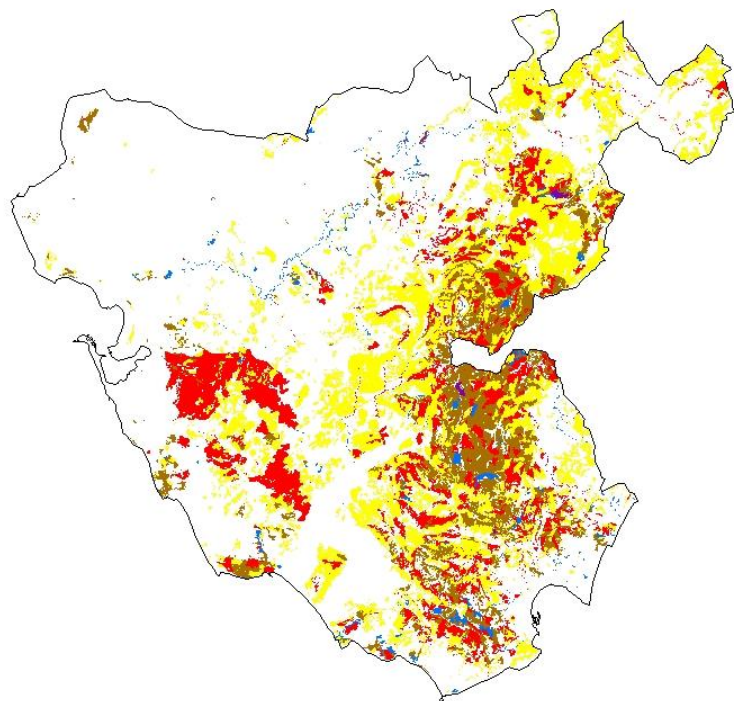
Previous results at micro scale



Class	Guadarrama pines				Monfragüe cork-oaks			
	ESA 95		Public environmental	AAS	ESA 95		Public environmental	AAS
	EAF 97	Omitted			EAF 97	Omitted		
	1	2	3	4=1+2+3	1	2	3	4=1+2+3
Total output (TO)	235	394	235	864	538	138	17	693
Intermediate output (IO)		12		12		16		16
Livestock-grazing (GR)		12		12		16		16
Final output (FO)	235	382	235	852	538	122	17	677
Timber (TH)	235			235				
Cork (CS)					462			462
Firewood (FH)					76			76
Hunting (HR)		3		3		37		37
Mushrooms (MC)			24	24				
Owners' self-consumption (SC)		379		379		85		85
Min		199		199		n.a.		
Max		379		379		85		85
Public access recreation (VR)			178	178			8	8
Min			38	38			3	3
Max			178	178			8	8
Conservation, visitors (VC)			33	33			9	9
Total cost (TC)	100	62		162	192	6		198
Intermediate consumption (IC)	45	48		93	48	6		54
Private (PIC)	45			45	48			48
Governmental ^a (GIC)		48		48		6		6
Labour (L)	47	14		61	142			142
Private (PL)	47			47	142			142
Governmental ^a (GL)		14		14		n.a.		
Fixed capital consumption (FCC)	8			8	2			2
Net operating margin (NOM)	135	332	235	702	346	132	17	495
Gross value added at market prices (GVA)	190	346	235	771	490	132	17	639
Net value added at market prices (NVA)	182	346	235	763	488	132	17	637

- Provisional results available in May 2012
 - Commercial and non-commercial values
 - Flow values and capital values
 - Spatially explicit results (2-3 ha poligons) for 4 * 10^6 ha
- Final results available from May 2013 onwards
 - Annual update of results thereafter

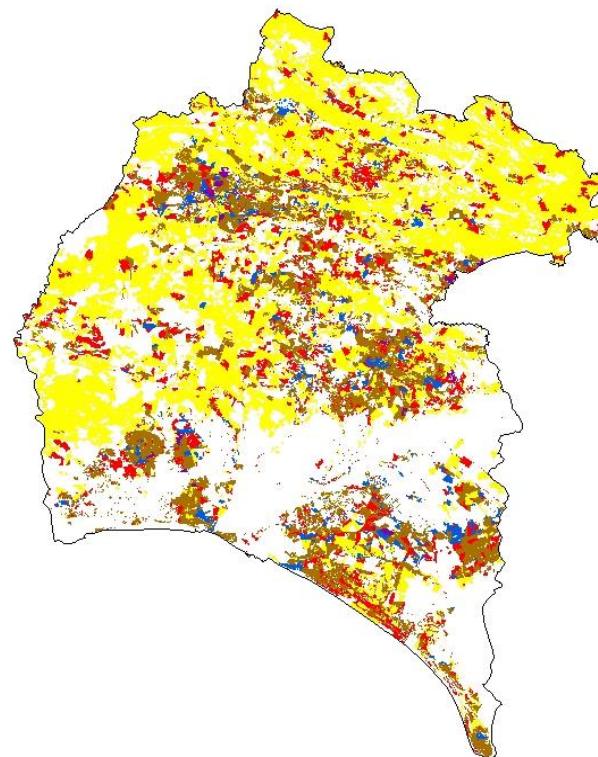
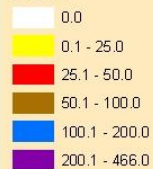
“Preliminary not ready yet first results”



Legenda

Provincia de Cádiz

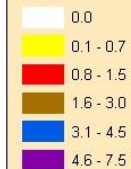
Volumen con corteza total
m3/ha



Legenda

Provincia de Huelva

Flujo total de carbono (IAVC)
t/ha



- **Non-market valuation techniques** (CV, choice...) can be used for green national accounting to estimate demand functions which, together with appropriate costs functions, allow to **simulate markets** for non-commercial values (yielding *prices x quantity* estimates).
- The application to the Mediterranean *monte* in Andalusia (RECAMAN) proves the viability of the ***Simulated Exchange Value Method*** approach on a large scale for *free public recreation, produced landscape, threatened biodiversity and owner amenity self-consumption flow and capital values*.
- **Natural Ecosystems Hicksian Green TSI** and **Total capital** could be measured with **enough theoretical SNA consistency**; thus, avoiding waiting for the **golden measure** that probably will come much too late.
- **RECAMAN** provisional results available in May 2012 and **final results** available from May 2013 onwards (annual update of



**Thank you for
your attention**

