



**MAIA**  
Mapping and Assessment for  
Integrated ecosystem Accounting

# Monetary Ecosystem Accounts in Spain

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IPP-CSIC

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817527*

# Index

- **Agroforestry Accounting System (AAS)**
  - Caparrós, Campos and Montero (2003).
  - Campos et al. (2019, 2020)
  - Comparison AAS and SEEA-EA: Campos et al. (2020)
- **RECAMAN Project.**
  - Large scale application to Andalusia (region in Spain)
  - Coordinator: P. Campos
  - Funding: Junta de Andalucía
  - Campos, P., Caparrós, A., Oviedo, et al. (2019).
- **Current efforts in MAIA:**
  - National Scale
  - Simulated Exchange Values
    - Contingent valuation: Caparrós et al, (2017)
    - Choice experiments: Oviedo et al. (2016)
  - Monetary Accounts for Biodiversity/Landscape/Condition



# Agroforestry Accounting System

- Focuses on the economic activities and products generated on the territory
- Private and public outputs and costs are considered
- Net value added and income for each activity
  - Info for Payment for Ecosystem Services
- Intermediate services
- (Environmental/total) income includes capital gains



# Manufactured and environmental values

## Accounting for

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

### Commercial products:

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

### Non-commercial products:

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



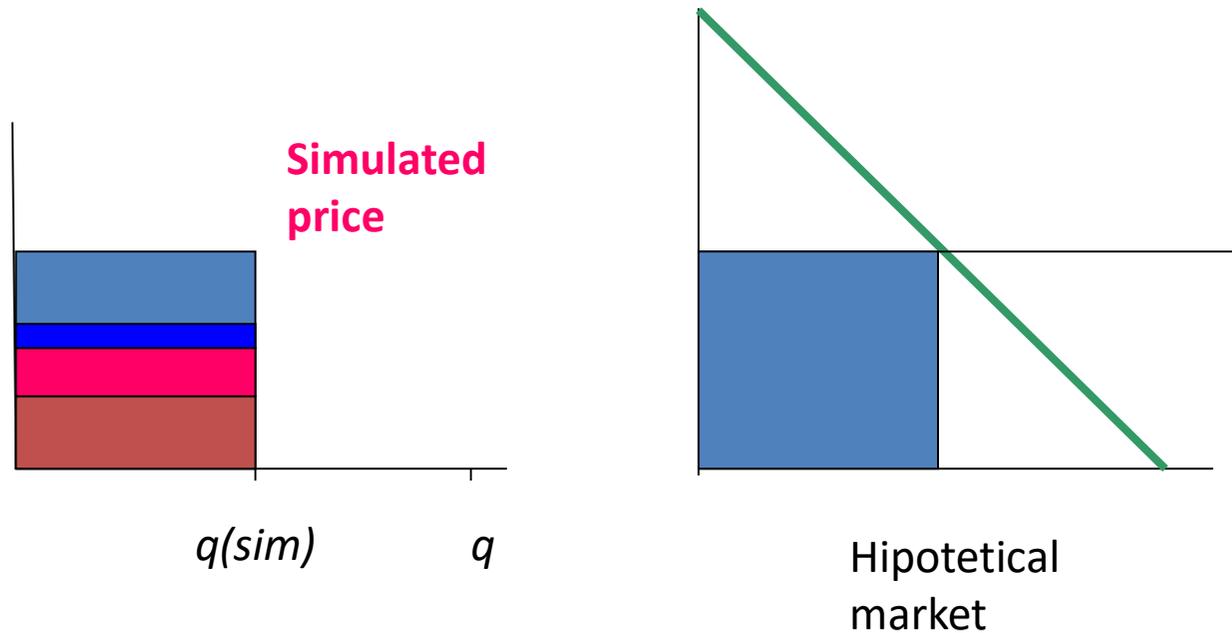
# Agroforestry Accounting System

- **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*

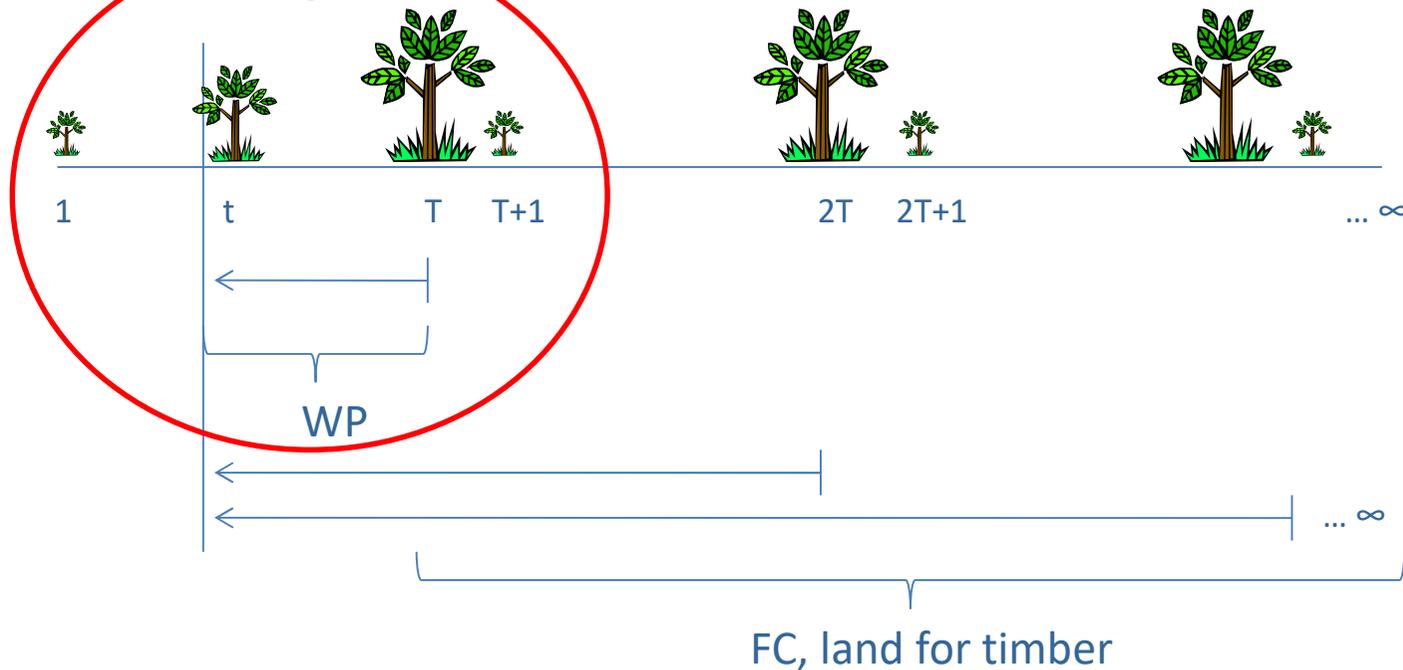


# Simulated Exchange Value (SEV)

- For non marketed goods and services: the income *if* all ecosystem services were internalized



# Capital balance: timber



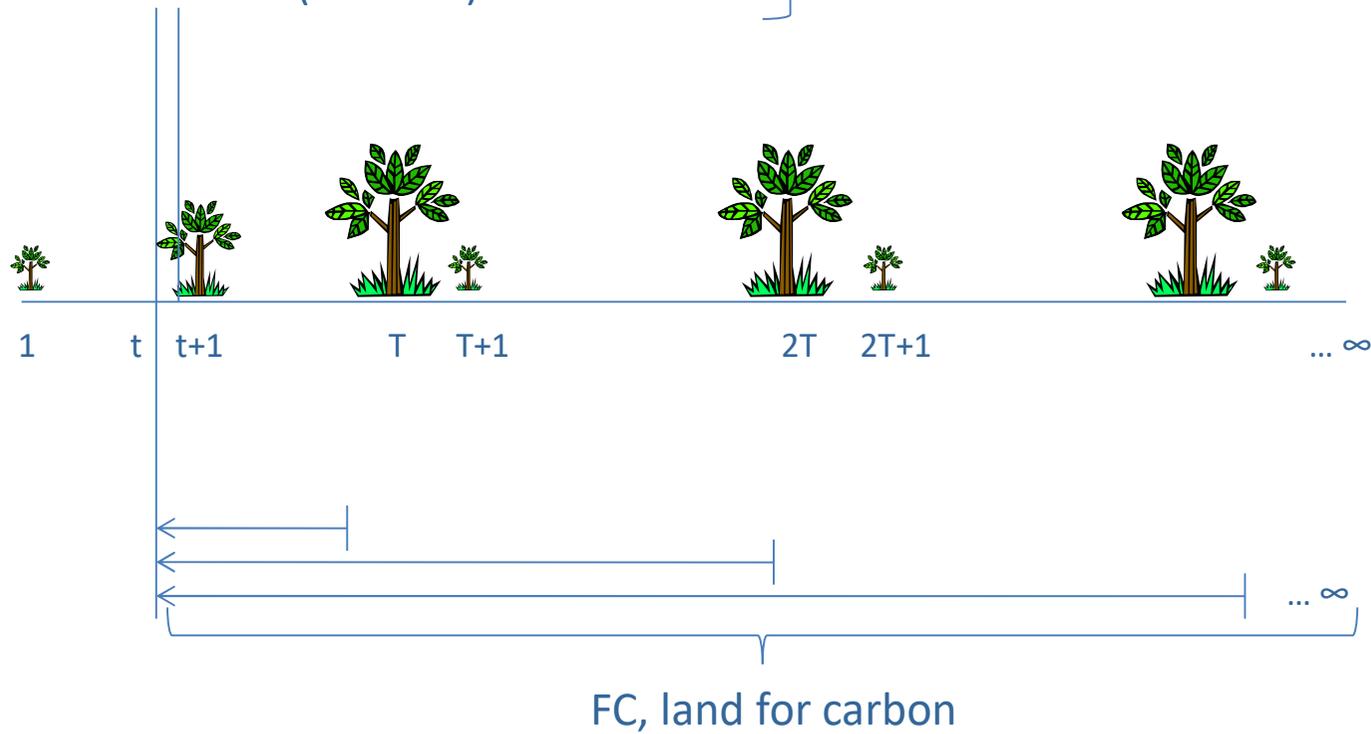
$$V(t) = \sum_{z=t}^T RC_z (1+r)^{-(z-t)} + (1+r)^{-(T-t)} \sum_{z=1}^{\infty} RC_z (1+r)^{-z}$$

# Carbon sequestration

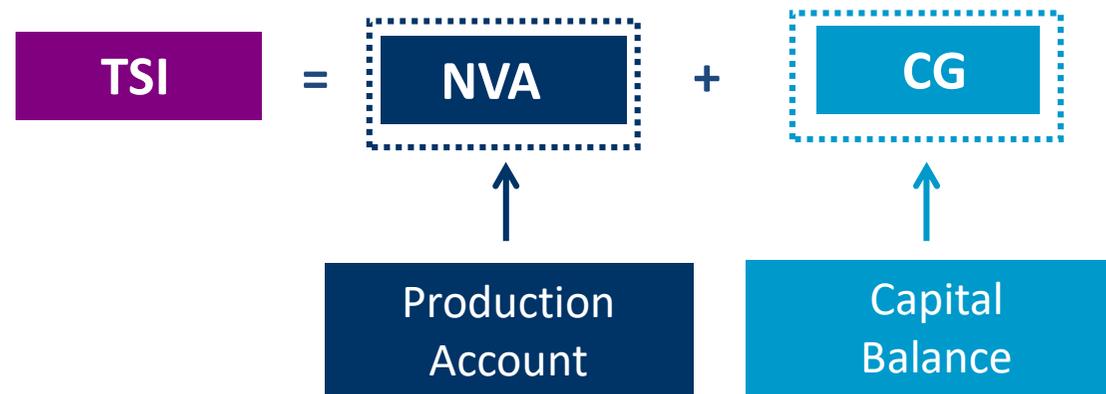
Production account:

- Entrance (imputed sales)
- Exit (services)

Net: *Carbon Flow Method*



# Main difference AAS vs SEEA-EA



TSI: Total social income (private + public/trustee )

- > Total environmental income

NVA: Net value added



# RECAMAN



- Integrates commercial and environmental outputs and costs
- Macro (regional) and micro (estates) scales
- Covers 4.7 million hectares of *montes*: forests (61%), shrublands (21%), natural grassland (10%) and other forestlands (8%).
- Andalusia (Spain)
- Data for 2010
- Spatially explicit results



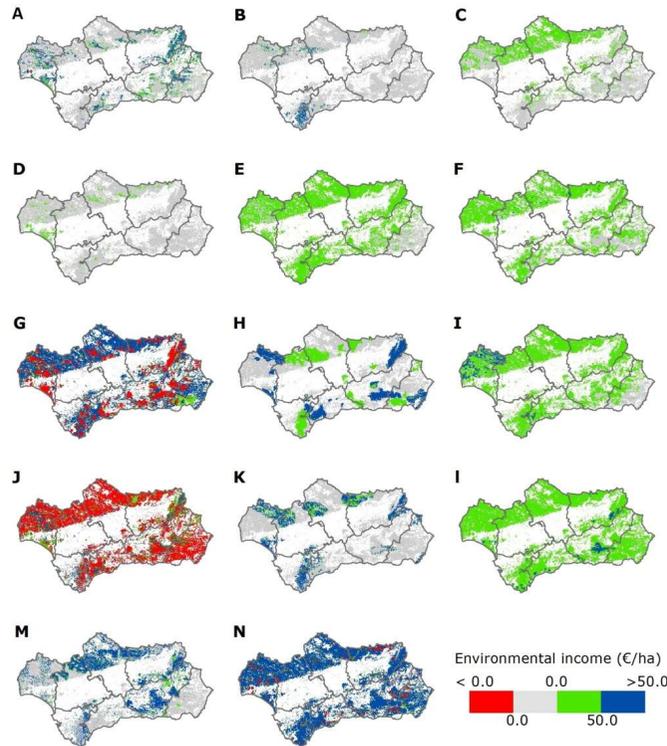
# Values are obtained ...



- 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
- Primary Data:
  - 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

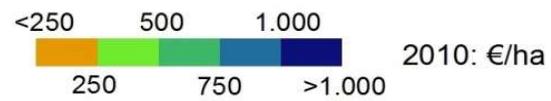
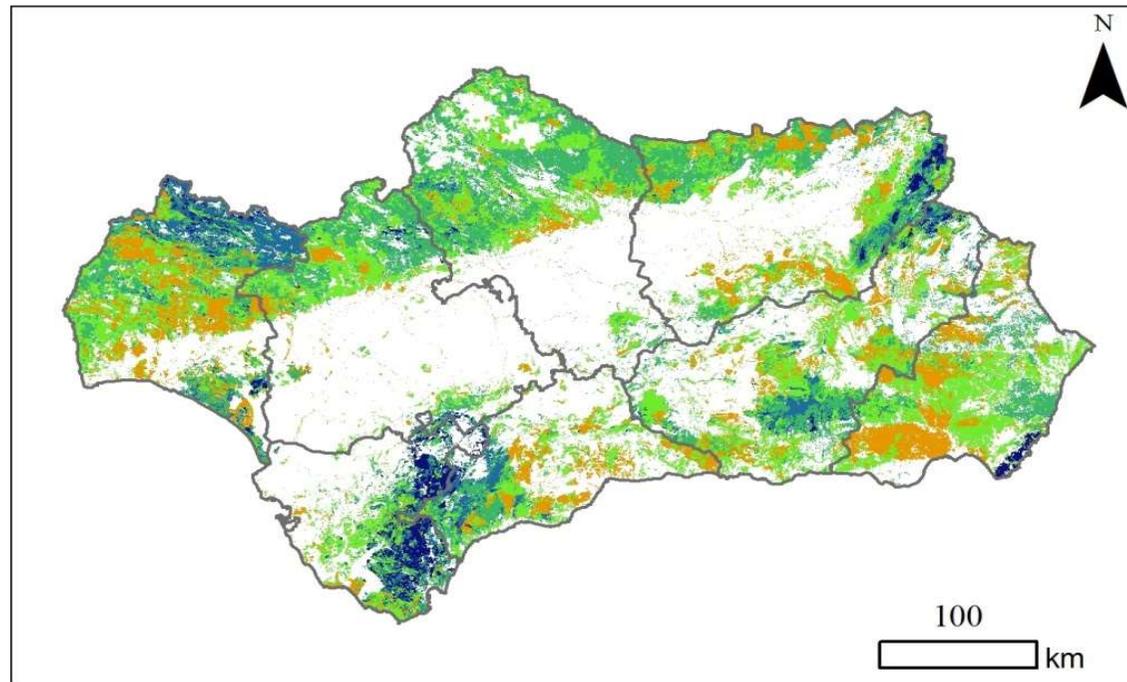


# Environmental incomes by individual products



(A) timber, (B) cork, (C) firewood, (D) nuts, (E) grazing, (F) hunting, (G) private amenity, (H) public recreation, (I) mushrooms, (J) carbon, (K) landscape, (L) biodiversity, (M) water, (N) all products.

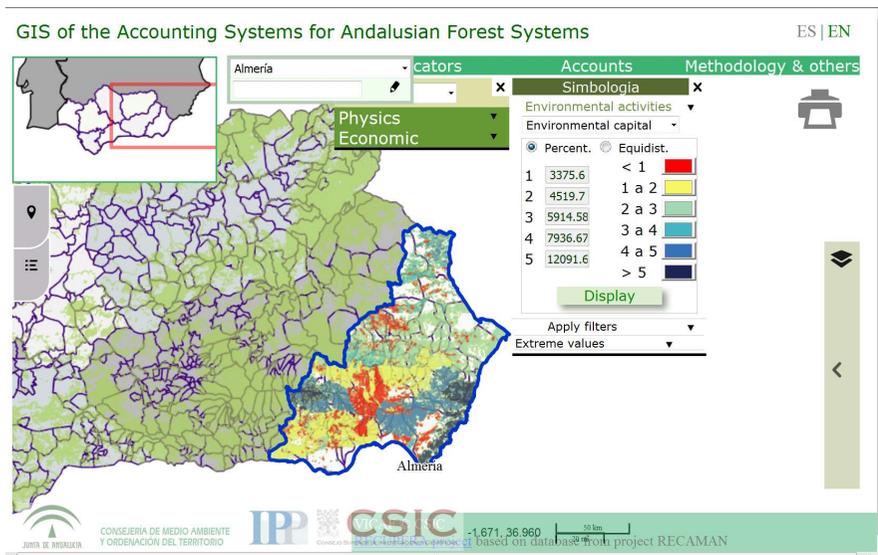
# Ecosystem services



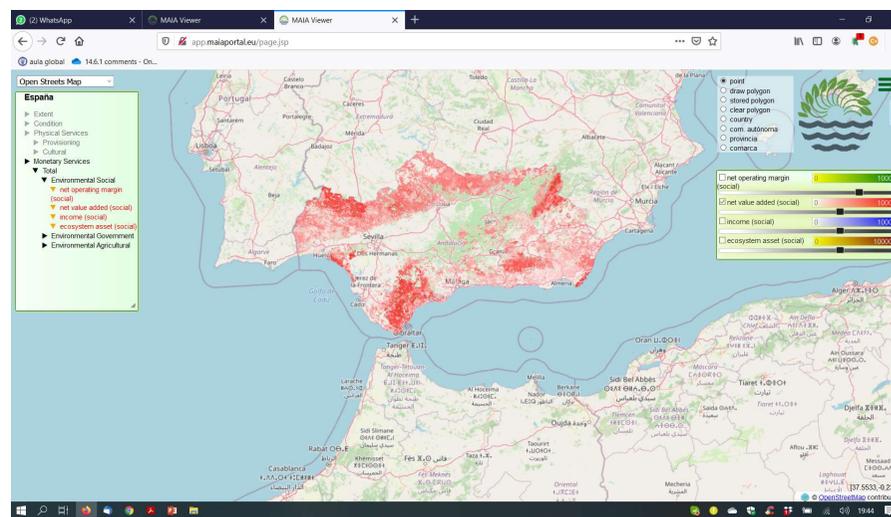


# VICAF

CSIC/ Junta de Andalucía  
Open access and hosted  
at a (regional) governmental web



# Web viewers



**MAIA analytical tool**  
MAIA / SarVision / WU/ CSIC

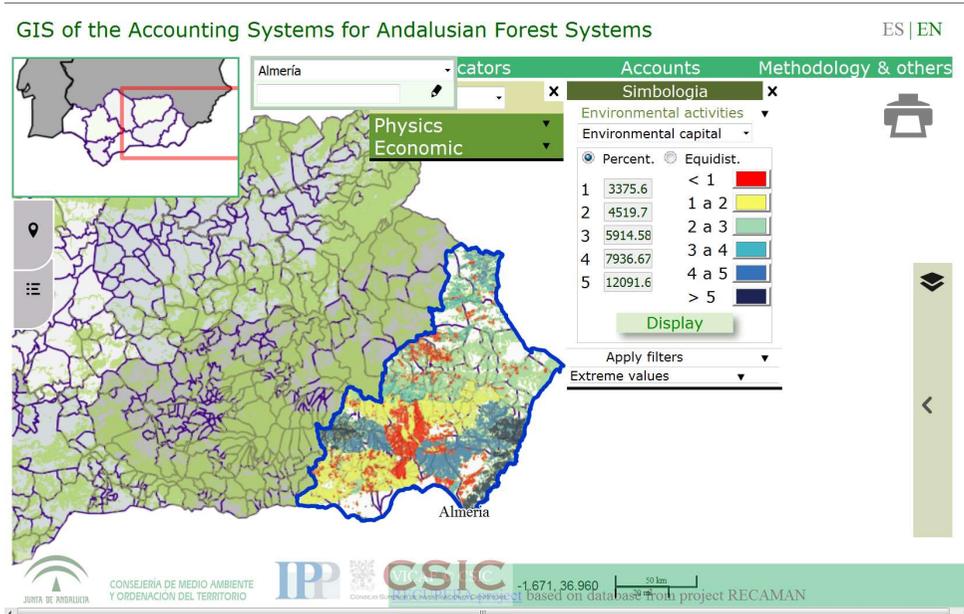


# VICAF

CSIC/ Junta de Andalucía

<https://recaman.agenciamedioambienteyagua.es/VICAF/visor.html>

Open access and hosted at a (regional) governmental web  
Economic accounts and indicators; biophysical indicators



Home | Web mapping | Indicators | Methodology | Glossary

Andalucía and provinces | Municipalities | Forestry accounting | ES | EN

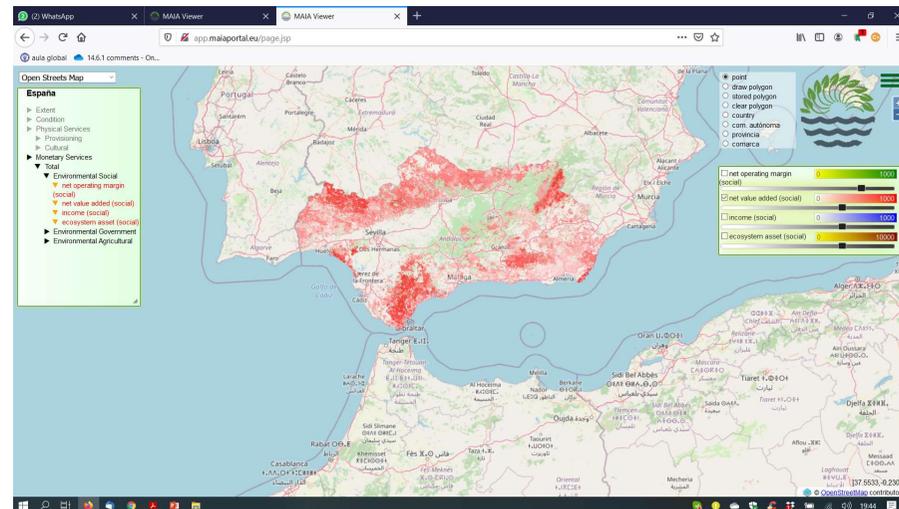
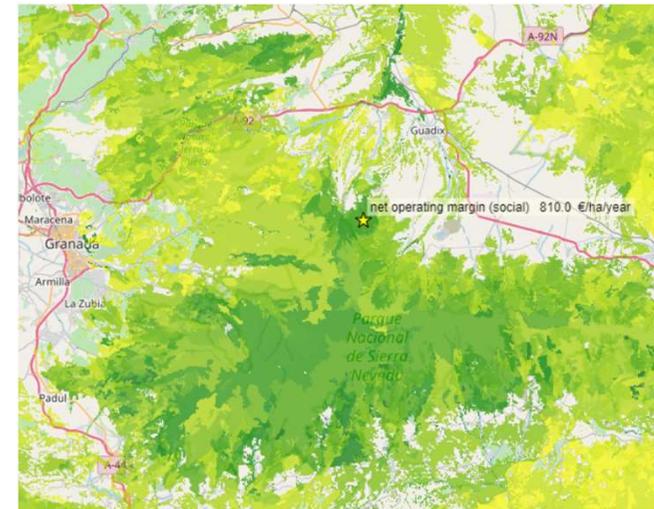
Accounting type: Production | Aggregation: Social | Extent: Almería | Vegetation: All vegetations | Filter: Complete | Export

Social Production account All vegetations in Almería (2010:€/ha)

Class	Forest	Grass	Shrub	Other	Forest	Grass	Shrub	Other	Comm.	Armed.	Reed.	Mush.	Carr.	Land.	Water	Env.	Social			
	1	2	3	4	1*	2	3	4	10*	11	12	13	14	15	16	17	20*	21*		
1 Total output	2.07	-	0	-	0.60	12.61	39.04	54.63	1.92	9.17	65.72	237.94	61.44	0.97	28.04	77.72	16.56	3.44	426.11	491.03
1.1 Intermediate output	0	-	-	-	0.60	8.18	37.04	49.88	0.21	9.17	55.24	-	-	-	-	-	-	-	-	0
1.1.1 Natural growth	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.1.2 Rough grass grazed	-	-	-	-	-	0.56	-	-	-	-	0.56	-	-	-	-	-	-	-	-	0.56
1.1.3 Rough sown fodder	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	-	-	-	0
1.1.4 Macerated housing catch	-	-	-	-	-	-	-	-	0.21	-	-	-	-	-	-	-	-	-	-	0.21
1.1.5 Fattened livestock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.6 Environmental water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.7 Intermediate service	-	-	-	-	-	8.18	37.04	45.22	-	9.17	54.39	-	-	-	-	-	-	-	-	54.39
1.1.8 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2 Final output	2.31	-	0	-	-	4.43	2.00	8.75	1.71	-	10.46	237.94	61.44	0.97	28.04	77.72	16.56	3.44	426.11	436.37
1.2.1 Sales	0.43	-	-	-	-	-	-	-	-	-	0.43	-	-	-	-	-	-	-	-	0.43
1.2.2 Gross fixed capital formation	-	-	-	-	-	4.43	2.00	8.75	0	-	6.51	-	-	-	0.31	0.59	-	-	-	1.86
1.2.2.1 Timber production for repeated production	-	-	-	-	-	4.43	2.00	8.75	0	-	4.43	-	-	-	-	-	-	-	-	4.43
1.2.2.2 Non equipment	-	-	-	-	-	-	-	-	-	-	1.88	-	-	-	0.61	-	-	-	-	0.18
1.2.2.3 Investment incomes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.03
1.2.2.4 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.2.2.5 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.2.3 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.2.3.1 Gross value added in progress forestry	1.88	-	-	-	-	-	-	0.75	0.75	-	0.77	-	0.12	-	0.28	0.40	-	-	-	0.83
1.2.3.2 Timber net value added	1.88	-	-	-	-	-	-	1.88	1.42	-	1.88	-	-	-	-	-	-	-	-	2.33
1.2.3.3 Non breeding game	-	-	-	-	-	-	-	-	-	-	1.42	-	-	-	-	-	-	-	-	1.42
1.2.3.4 Other in progress	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.2.3.5 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1.2.4 Other final consumption	-	-	-	-	-	-	-	-	-	-	-	-	-	-	237.94	-	-	-	-	237.94
1.2.5 Public environmental goods and services	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60.48	0.97	28.04	77.41	15.97	3.44
1.2.9 Other	-	-	-	-	-	-	-	-	0.21	-	0.21	-	-	-	-	-	-	-	-	0.21
2 Total cost	34.49	-	-	-	-	1.19	12.56	39.00	87.24	0.71	7.18	96.13	9.17	7.84	0.09	2.90	50.90	5.13	-	76.03
2.1 Intermediate consumption	4.59	-	-	-	-	0.18	4.52	12.45	21.74	0.49	0.58	22.81	9.17	3.02	0	2.90	46.15	1.44	-	62.49
2.1.1 Raw materials	0.50	-	-	-	-	0.12	0	0.08	0.74	0.23	0.13	1.10	0	-	0	0	0	0	-	1.13
2.1.1.1 Fuel	0.44	-	-	-	-	0.12	0	0.08	0.48	0	0.13	0.83	0	-	0	0	0	0	-	0.86
2.1.1.2 Intermediate consumption	0	-	-	-	-	-	-	-	0	0	0.27	0.27	-	-	-	-	-	-	-	0.27
2.1.1.3 Other	0	-	-	-	-	-	-	-	0	0	0.27	0.27	-	-	-	-	-	-	-	0.27
2.1.1.4 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.1.5 Fuel	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.1.6 Fuel	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2 Services	3.93	-	-	-	-	0	4.49	12.36	20.84	0.26	0.45	21.53	9.17	2.99	0	2.90	46.14	1.42	-	62.62
2.1.2.1 Intermediate production service	2.93	-	-	-	-	-	4.49	12.36	20.84	0.26	0.45	21.53	9.17	2.99	0	2.90	46.14	1.42	-	62.62
2.1.2.2 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.3 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.4 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.5 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.6 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.7 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.8 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.9 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.10 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.11 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.12 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.13 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.14 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.15 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.16 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.17 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.18 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.19 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.20 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.21 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.22 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.23 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.24 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.25 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.26 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.27 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.28 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.29 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.30 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.31 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.32 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.33 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.34 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.35 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.36 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.37 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.38 Other	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2.1.2.39 Other	0	-	-	-	-	-														

# MAIA Analytical Tool

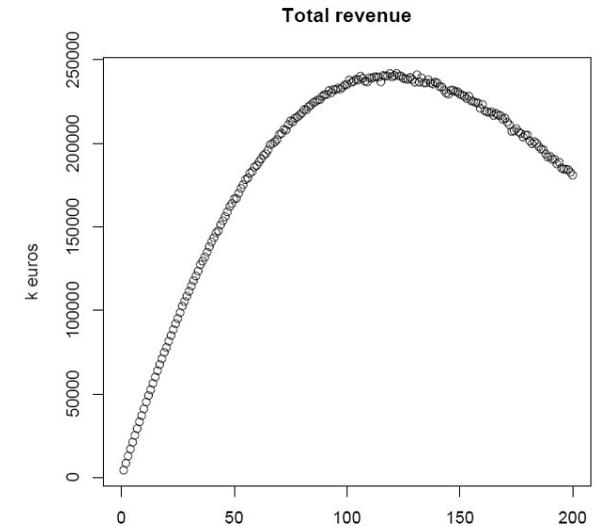
- Andalusia, RECAMAN/CSIC DATA
- By agent:
  - Social
  - Government
  - Private
- By indicator:
  - Net operating margin
  - Net value added
  - Income
  - Ecosystem asset





# What's new in MAIA

- Comparison AAS vs SEEA-EA, see Campos et al. (2020)
- Simulated exchange values at national scale for
  - Threatened biodiversity
  - Landscape/condition
- Distinguishing how threatened biodiversity is and level of degradation
- The income that a PES would obtain if implemented
- Choice experiments and SEV (Oviedo et al, 2016; Campos et al, 2019)



	Sien	tax		
BLOQUE 1 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 amenazadas MAS
Tasa anual	20€	40€	30€	0€
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# References

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**MAIA**  
Mapping and Assessment for  
Integrated ecosystem Accounting

*Mapping & Assessment for Integrated ecosystem Accounting*  
*Road Name, City Name, Post Code, Country*  
*<http://maiaportal.eu/>*

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