

4.1 Ecosystem Service indicators for grasslands in relation to ecoclimatic regions and land use systems

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Key messages

- Concept of Ecosystem Service (ES) still in debate
- No general consensus on ES indicators
- Objectives and indicators uses and users: a key issue
- Promoting a mixture of common and locally adapted indicators

ES concept constantly evolving

- Costanza et al. (1997): ES = "**benefits** human populations derived, directly or indirectly, from [...] Habitat, biological gold system properties or processes of ecosystems"
- Daily et al. (1997): ES = "**conditions and processes** associated with natural ecosystems that confer some benefits to humanity"

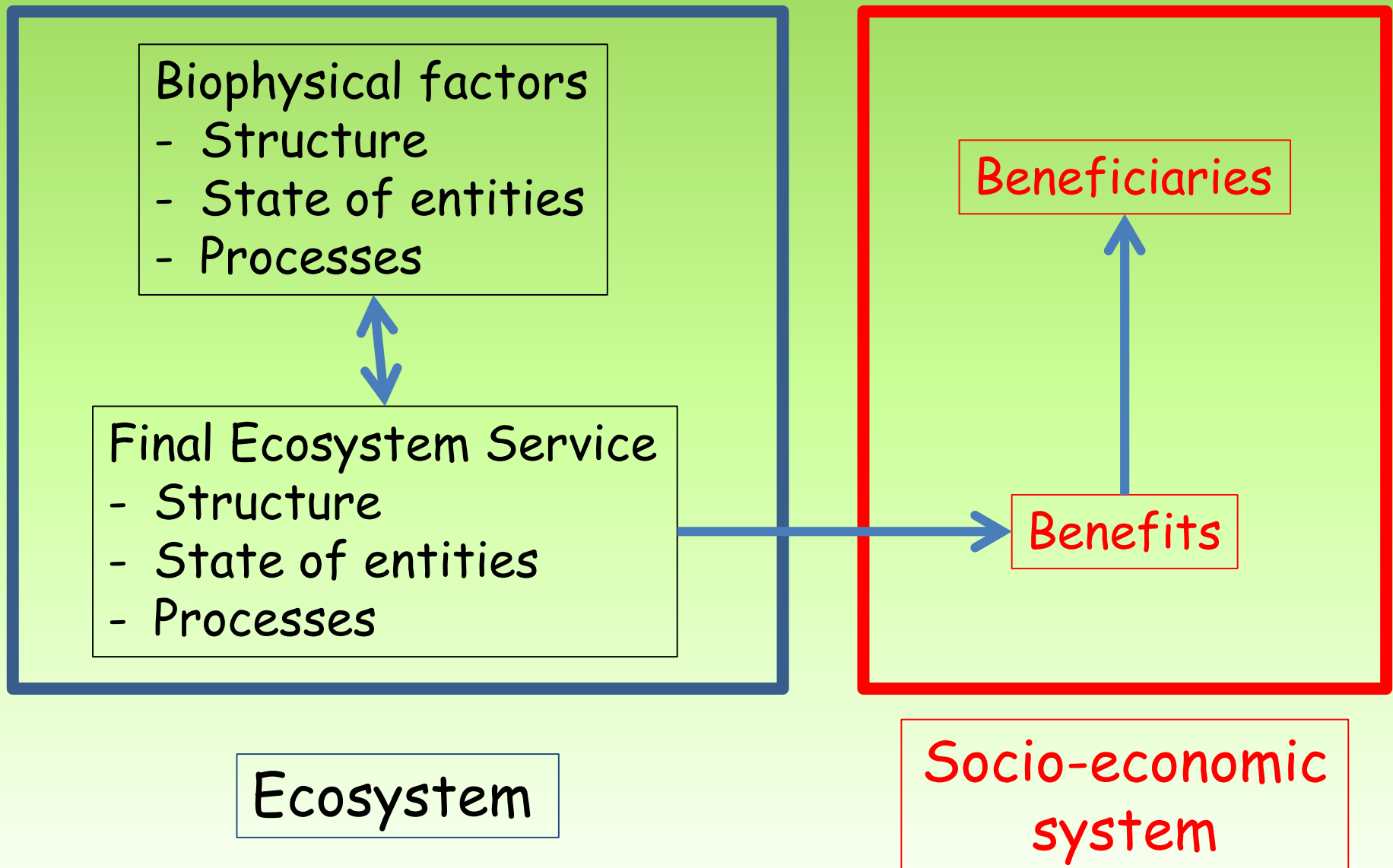


ES concept constantly evolving

- Millenium Ecosystem Assessment (MEA, 2005)
→ provisioning, regulating, supporting, cultural
- CICES-SEEA, MAES (2013)...
- Input services (Zhang, 2007, Le Roux, 2008)



Proposal of ES definition



Example for grassland based dairy production

Biophysical factors:

Type of soil, N mineralization ...

Ecosystem

Final ecosystem services

Grass production, Soil N fertility, ...

Benefits

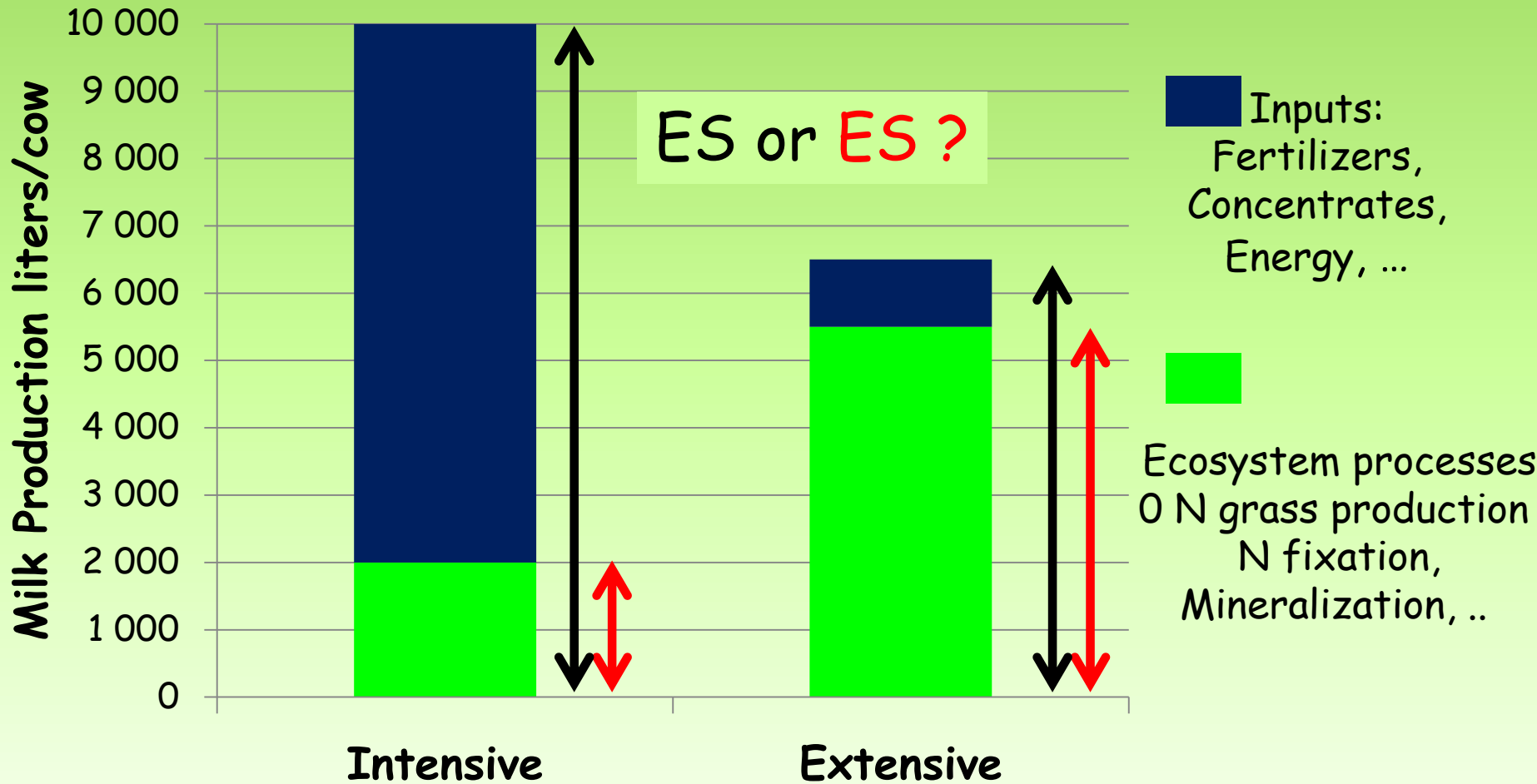
Milk production, N saving, GHG mitigation

Beneficiaries

farmers, consumers, society,

Socio-economic system

Ecosystem Service or not ?



Grasslands and ES

	Ecosystem services	SNG	AIG
Provisioning	forage, milk, meat, fiber	0/+	++
	biomass for bioenergy	0/+	++
	biomass for biorefinery	+	+
	Medicinal and ornamental resources	++	0
	wild flower germplasm for restoration and/or breeding	++	0
	clean water supply	++	+
Supporting	buffering/accelerating/slowing down of nutrient cycling	++	++
	water infiltration and retention in soil	++	++
Regulating	erosion control	++	++
	flooding control	++	+
	C-storage in soil	++	+
	greenhouse gas mitigation	++	+/0
	wildfire control	+	++
	water purification	++	+
	preserving biodiversity	++	+/0
Cultural	grassland as herited cultural landscape	++	+
	leisure activities/recreation	0/+	0/+
	Ecotourism	++	+

Grasslands: most studied ES

(Rodriguez-Ortega et al, 2014)

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Evaluation of ES



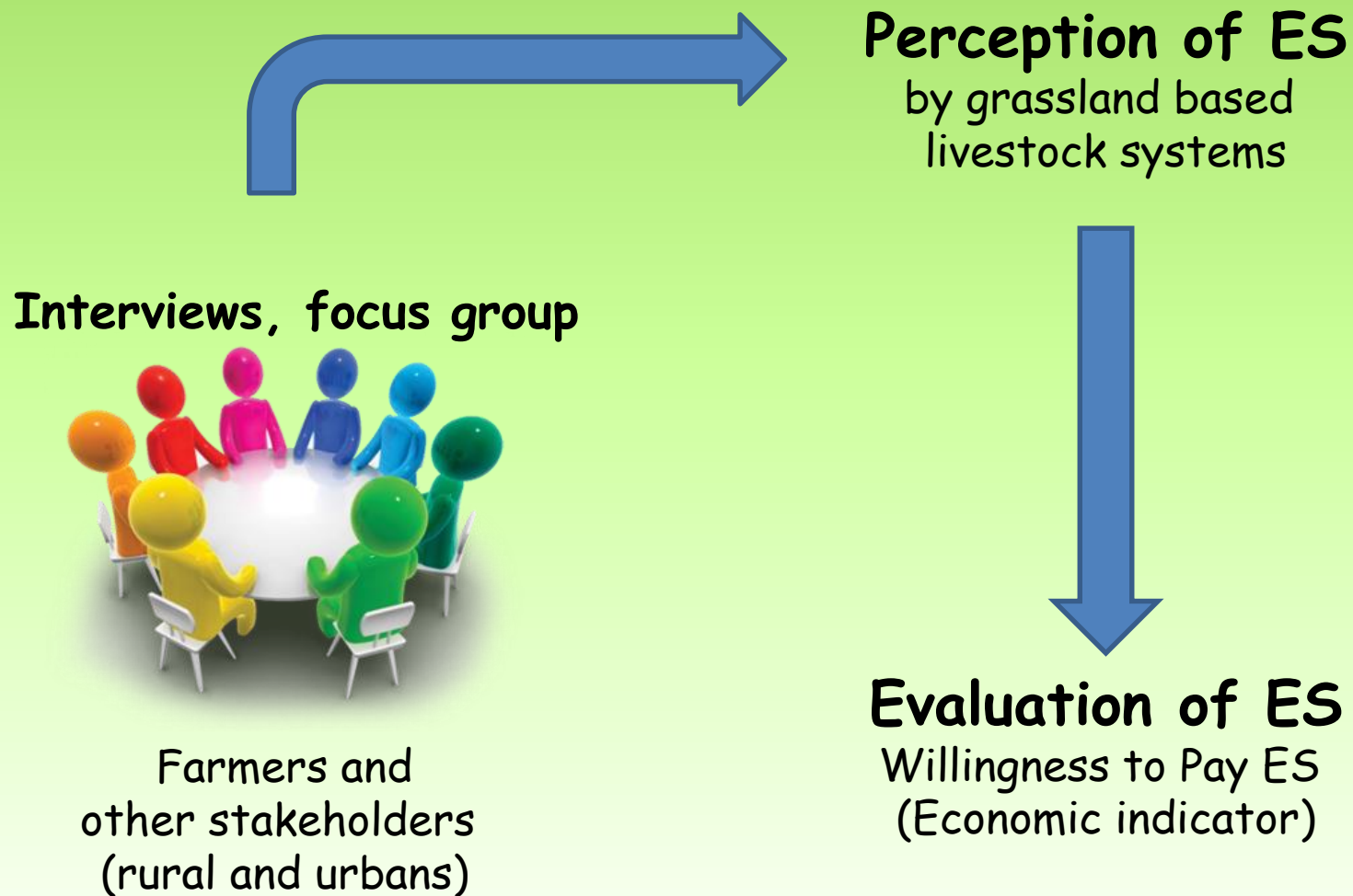
Study 1



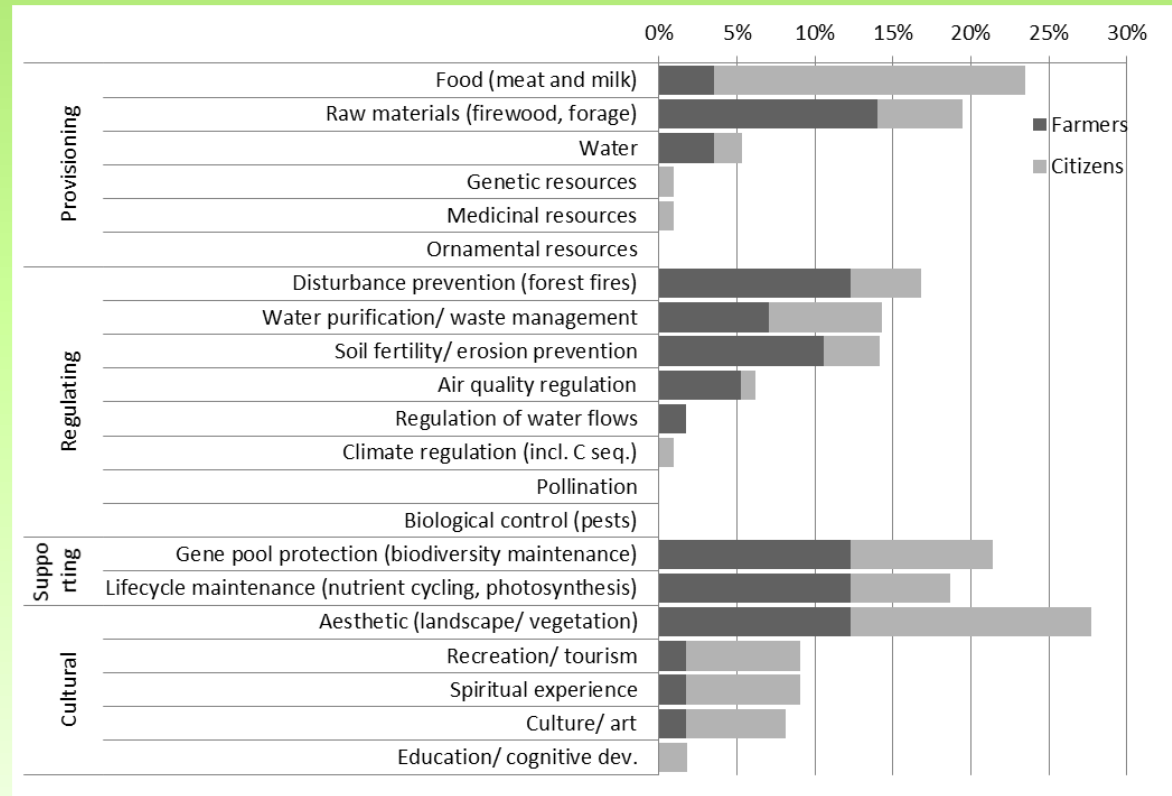
Study 2



Study 1 (Bernues et al., 2015)

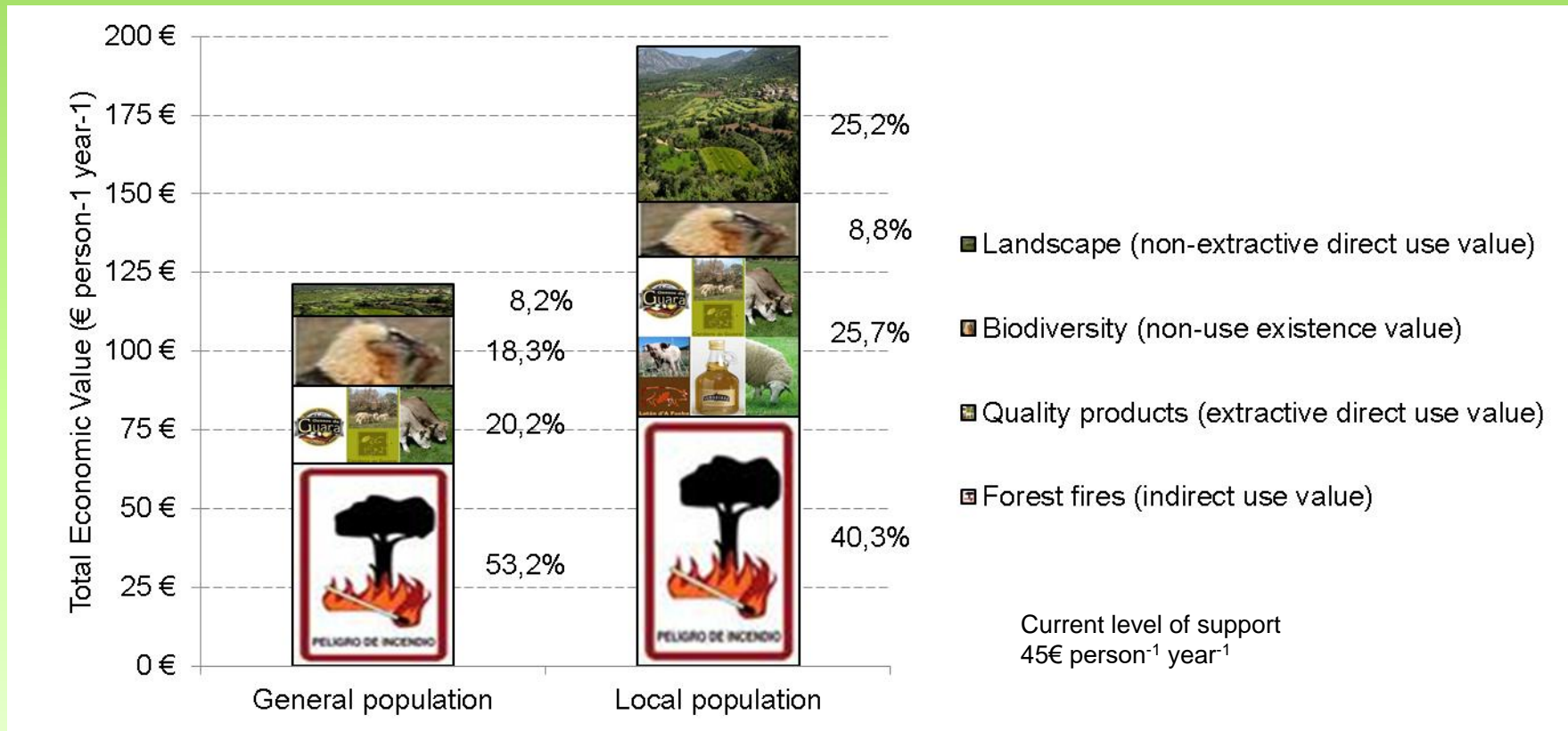


Ecosystem Services socio-cultural valuation: Spain



(Bernues et al., 2014)

ES quantification by economic indicators: Spain



Willingness to Pay (WTP) (€ person⁻¹ year⁻¹)
and composition of the Total Economic Value (TEV)

(Bernues et al., 2014)

Study 2 (MULTISWARD, 2014)

- Indicators of ES at field level (grassland), farm level (grassland based livestock systems) and regional level (EU NUTS)
- ES: Biodiversity preservation, soil, water and air quality, energy use
- Set of indicators: 23 (field), 21 (farm), 45 (region)



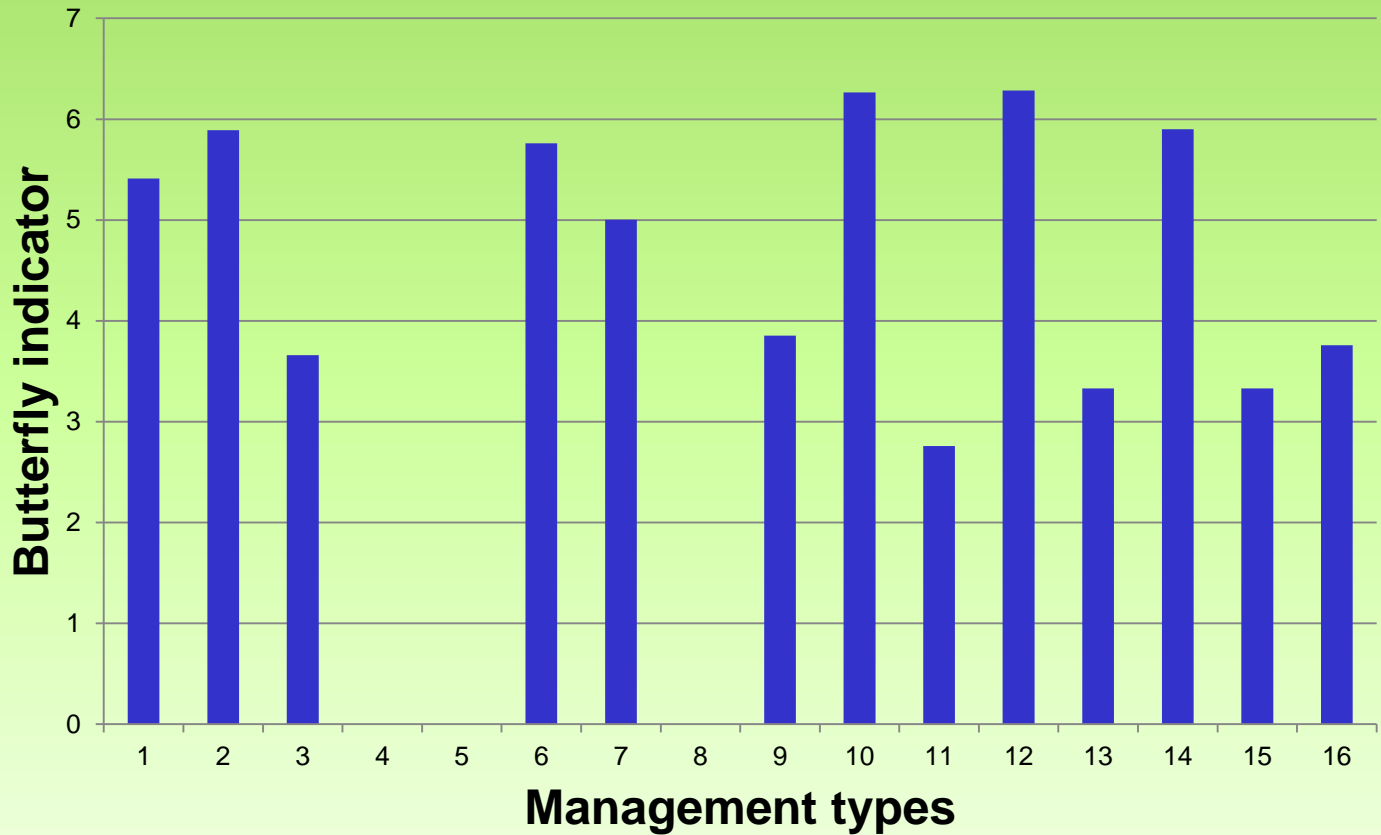
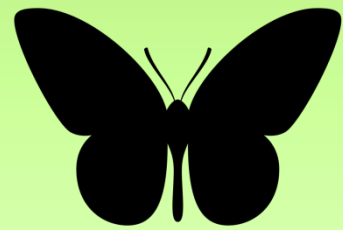
Study 2 (MULTISWARD, 2014)

Biodiversity indicators

	Field level	Regional level
Biodiversity indicators	15 indicators of diversity and abundance of 7 taxa (fauna and flora)	5 indicators <ul style="list-style-type: none">➤ % High Nature Value grasslands➤ Number of Natura 2000 grasslands habitats➤ Land use type diversity➤ Population trend of farmland birds➤ Domestic livestock diversity
Input data	Management, grassland type and ecoclimatic region	Only data available in EU statistics

Study 2 (MULTISWARD, 2014)

Biodiversity indicators



(Plantureux et al., 2014)

Conclusions from study 1 and 2

- ES chosen by end users (1) or experts (2)
- Socio-economical (1) versus biophysical (2)
- ES assessed from field to regional level
- No distinction between services coming from ecosystem only or from ecosystem+inputs
- Variable reference to international assessment systems

Perspectives for ES indicators

What indicators of ecosystem services to assess grasslands in various ecoclimatic regions and land use systems ?

- ES definition, users and uses ...
- Dynamic and long term vision ...
- Adaptation to local conditions ...



Thank you for your attention

