Outline

1. Intro: multifunctional agriculture
2. Sustainability and carbon footprint of sheep in the Mediterranean
3. Valuing ecosystem services
   a) Socio-cultural value
   b) Economic value
4. Final remarks

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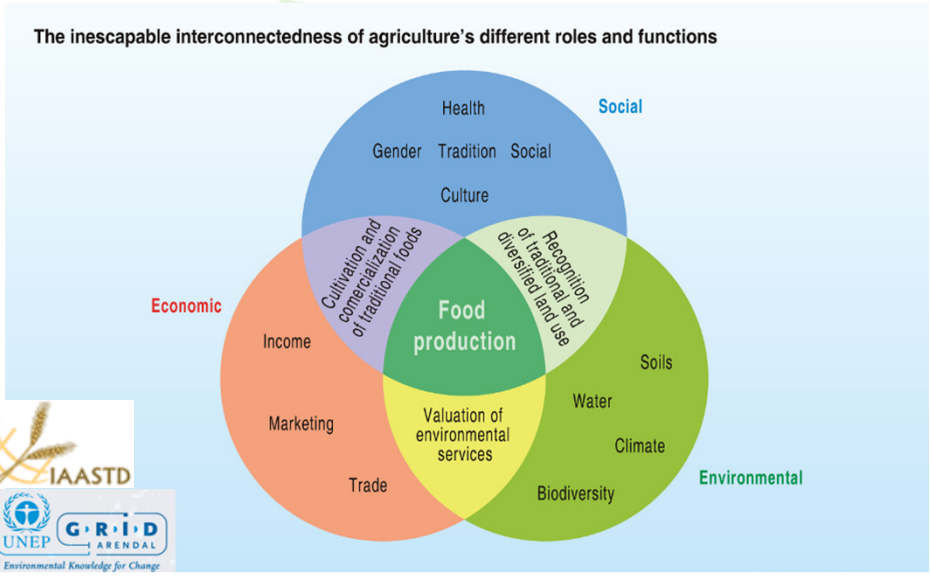
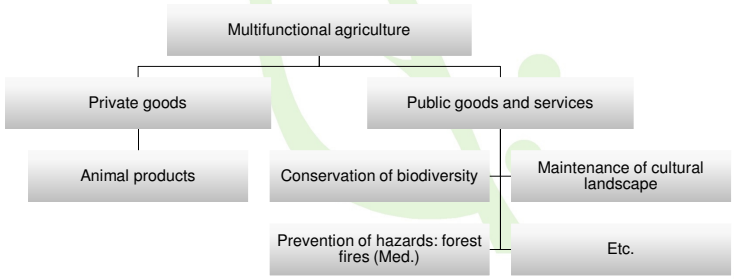
1. Multifunctionality agriculture



Definition

Multifunctionality is a systems oriented concept. It addresses the fact that in addition to the provision of private goods like food and fibre, agriculture also provides a set of public goods.



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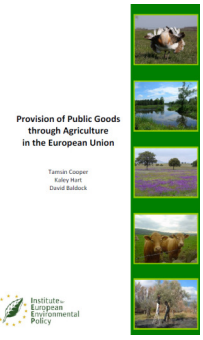
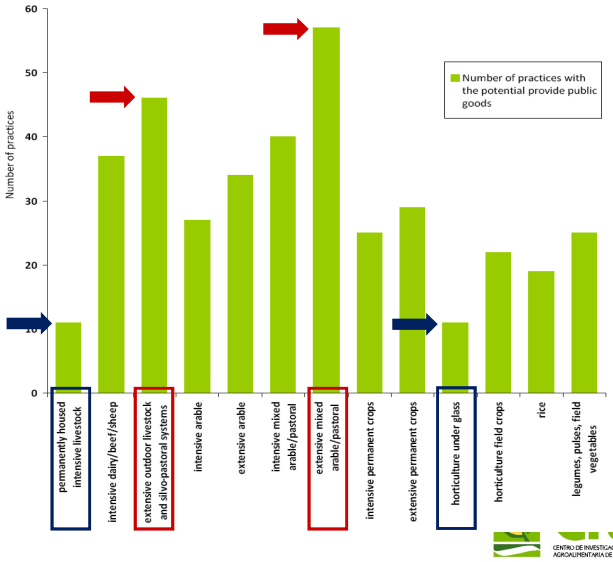
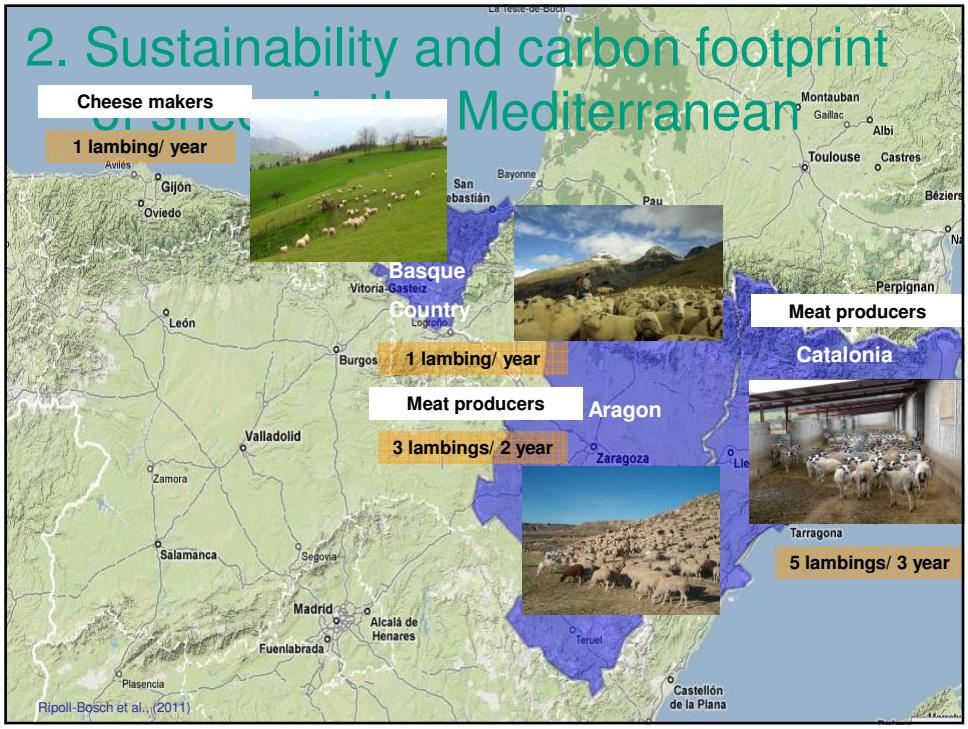
CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA DE ARAGÓN

different farming systems render different ecosystem services/ public goods

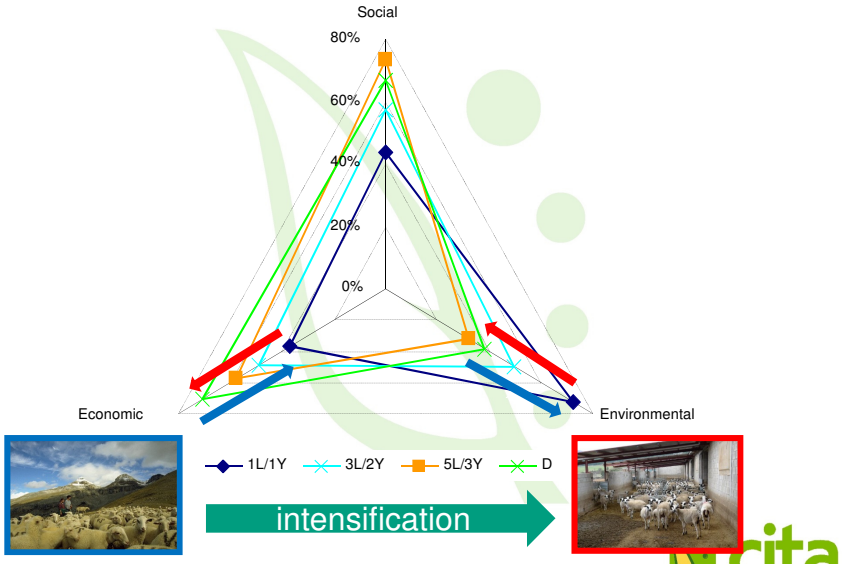




2. Sustainability and carbon footprint of sheep systems in the Mediterranean



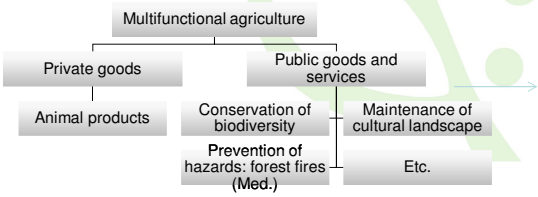
trade-offs among sustainability pillars



Ripoll-Bosch et al., Agric. Syst. (2012)

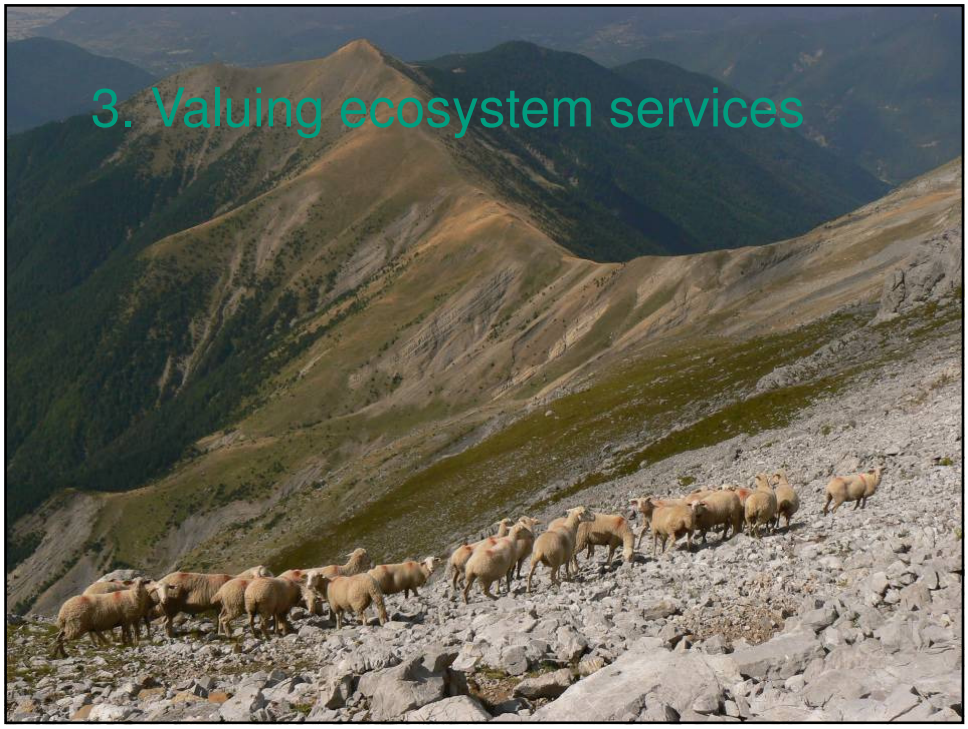
carbon footprint and other functions: trade-offs within environmental pillar

	No allocation kg CO_2-eq / kg LW	Allocation	Corrected kg CO_2-eq / kg LW
Grazing (1L/1Y)	25.9	53.6 %	13.9
Mixed (3L/2Y)	24.0	73.9 %	17.7
Zero grazing (5L/3Y)	19.5	100 %	19.5

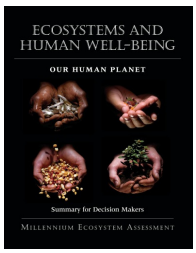


- Non-marketable
- Inherently linked to extensive livestock farming systems IEEP (2009)

Ripoll-Bosch et al., Agric. Syst. (2013)



Ecosystem services



direct and indirect benefits people obtain from (agro)ecosystems

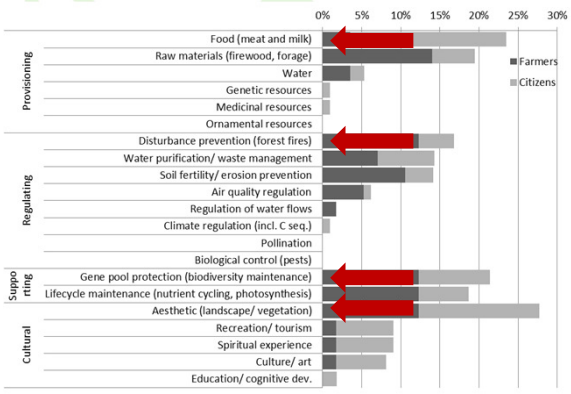
1. Provisioning: products obtained from the ecosystem, i.e. food, timber, fiber, fresh water, etc.
2. Regulating: benefits obtained from the regulation of ecosystem processes, i.e. regulation of climate, erosion prevention, water regulation, etc.
3. Supporting: ecosystem services that are necessary for the maintenance of all other ecosystem services, i.e. primary production (photosynthesis), soil formation, nutrient cycling, water cycling, etc.
4. Cultural: nonmaterial benefits people obtain from ecosystems, i.e. spiritual enrichment, cognitive development, recreation, aesthetic experience, etc.

Ecosystem Services valuation

- Different functional units
- Different temporal and spatial scales
- Different perceptions by society
- No market price

1. BIOPHYSICAL
2. SOCIO-CULTURAL
3. ECONOMIC

a) Socio-cultural value



Bernués et al, PLOS ONE (2014)

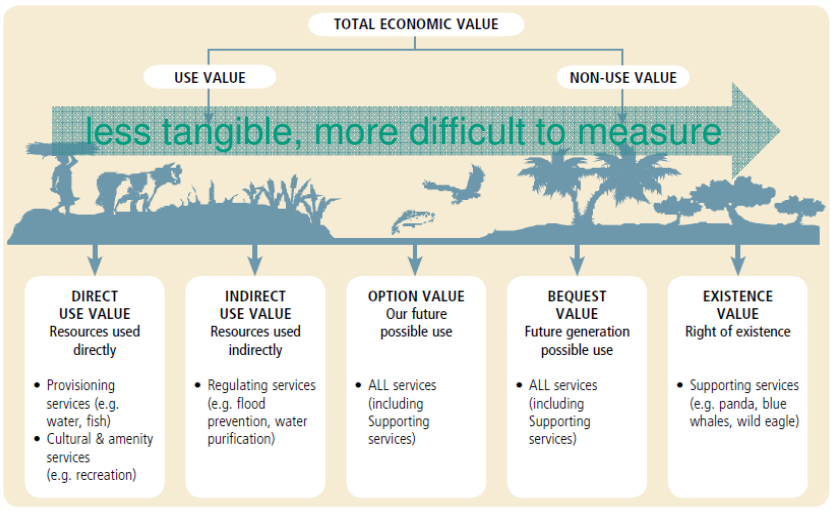
farmers

other citizens

b) Economic value: measuring public goods?

Total economic value (TEV): sum of output values (the values generated in the current state of the ecosystem, e.g., food production, climate regulation and recreational value) as well as insurance values, now and in the future.

Total Economic Value (TEV)



Non-use value

- do not involve direct or indirect use of the ecosystem service, but reflect the satisfaction that individuals derive from the knowledge they exist (e.g. enjoyment of a beautiful landscape)
- related to moral, religious of aesthetic properties of individuals
- **markets do not exist**

Stated preference methods

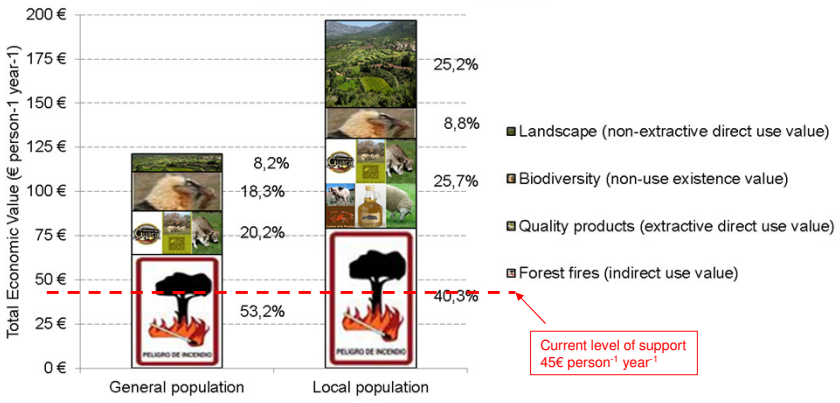
- **Choice modelling** Individuals are asked to choose their preferred alternative among several hypothetical land uses. Each **scenario** of land use is described by a number of attributes (e.g. vegetation cover, landscape fragmentation, biodiversity index, human activities, etc.). Individuals make trade-offs between the levels of the attributes describing the different alternatives in a choice set.
- **Underlying rational decision process**

Choice model for ES

	Policy A	Policy B	CURRENT policy
Landscape	 strong increment of bushes reduction of meadows and crops	 light decrement of bushes light increment of meadows and crops	 light increment of bushes meadows and crops are maintained
Bearded vulture	 7 pairs	 15 pairs	 11 pairs
Forest fires	 **6** forest fires per year	 **2** forest fires per year	 **4** forest fires per year
Product quality linked to territory	 **2** quality products available sheep cheese and lamb meat	 **6** quality products available sheep cheese, lamb meat, pasture pork meat and olive oil, pasture beef and organic lamb	 **4** quality products available sheep cheese, lamb meat, pasture pork meat and olive oil
Annual cost	 15 €	 75 €	 45 €
CHOICE	◯ A	◯ B	◯ C

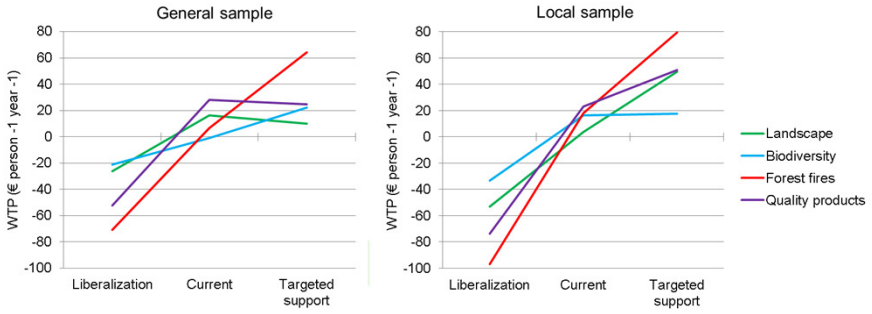
Economic value of agro-ecosystems in Guara

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



Bernués et al, PLOS ONE (2014)

Willingness to Pay (WTP) (€ person-1 year-1) for ecosystem services in different policy scenarios



4. Final remarks

1. animal agriculture can be multifunctional (delivery of public goods or ecosystem services), but not all farming systems are (eg. ecosystem disservices or negative externalities)
2. there is need to objectively value “non-market” functions of animal agriculture and integrate public goods into evaluation frameworks (LCA) and policy design

Grazie!