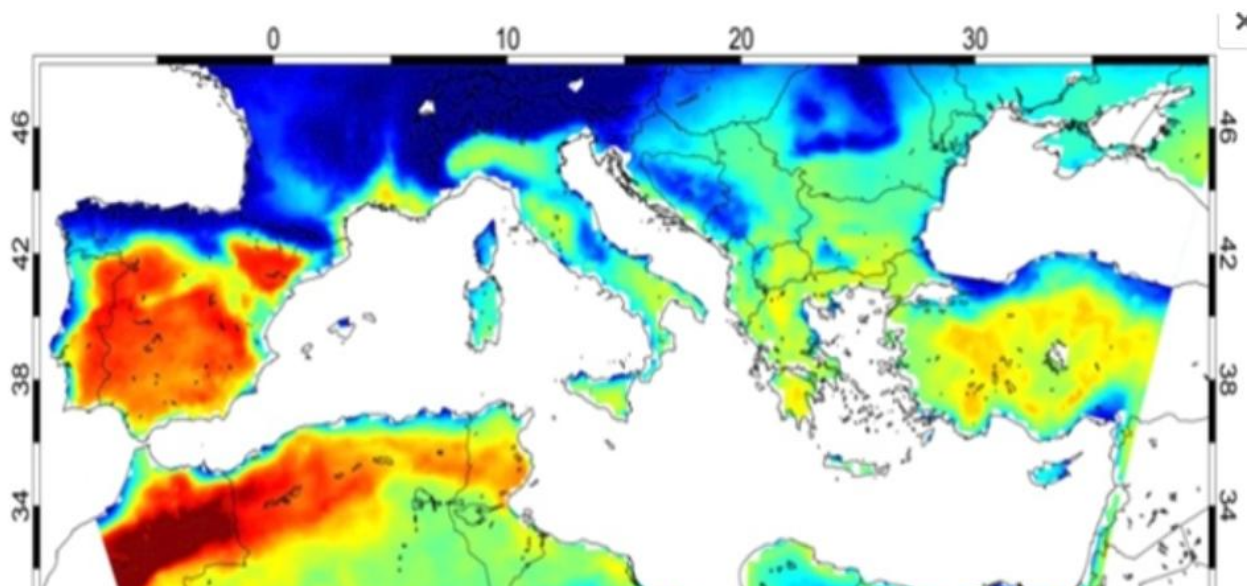


Some thoughts on agriculture and climate change

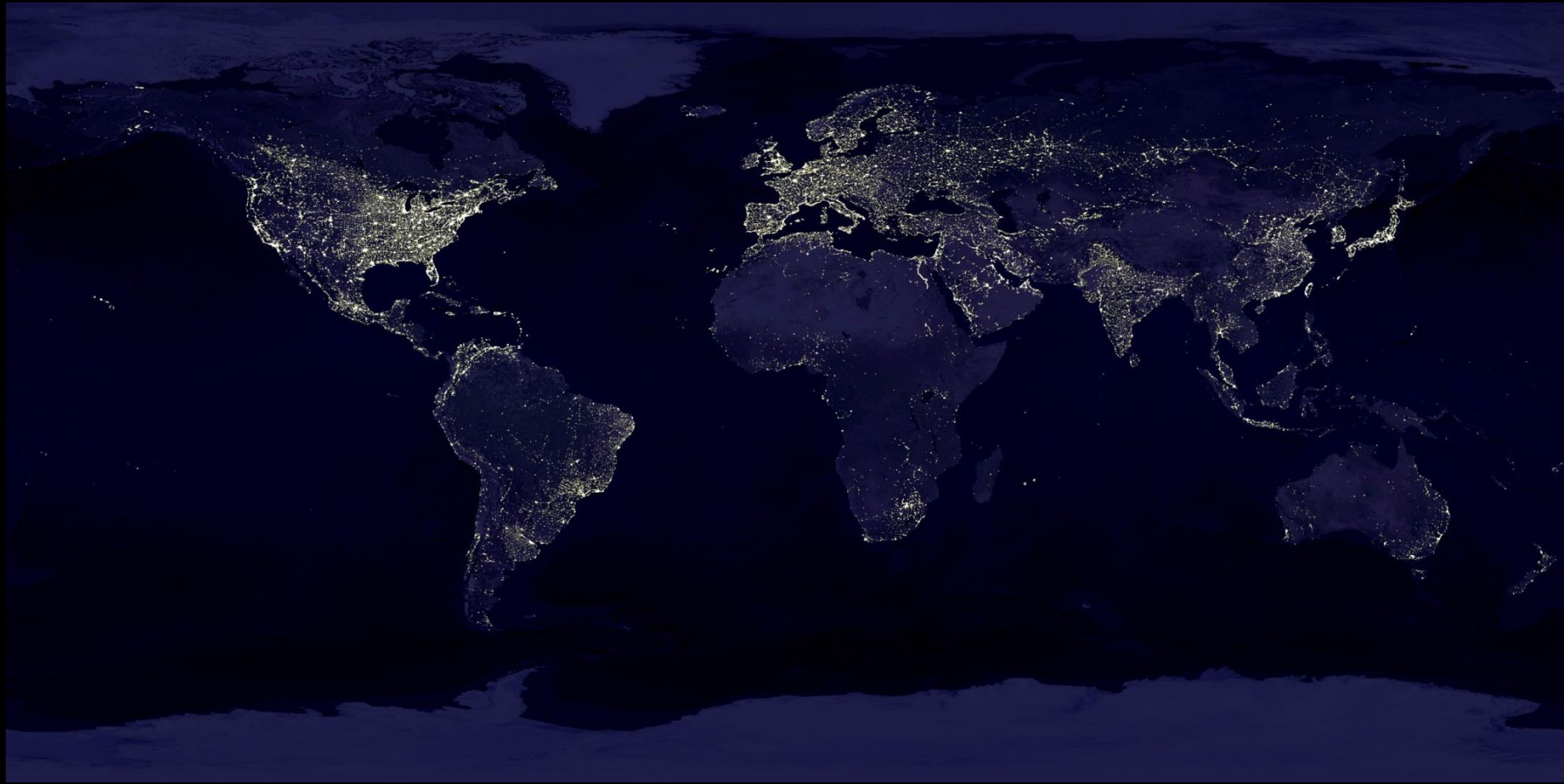


Daniel Martín-Collado and Ana Iglesias

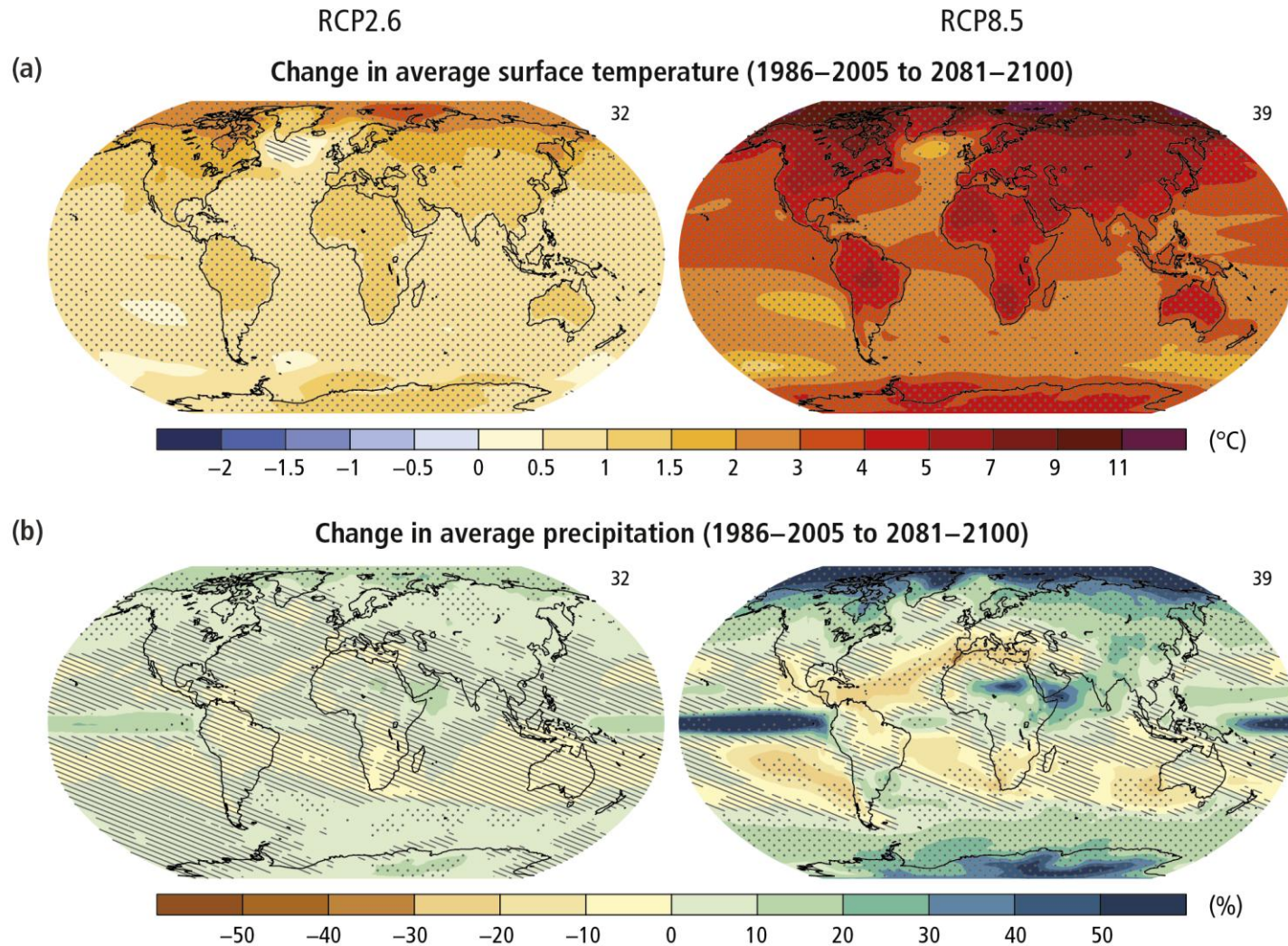
JORNADAS MED – PÓLO DA MITRA

27 e 28 de Junho de 2019, Evora

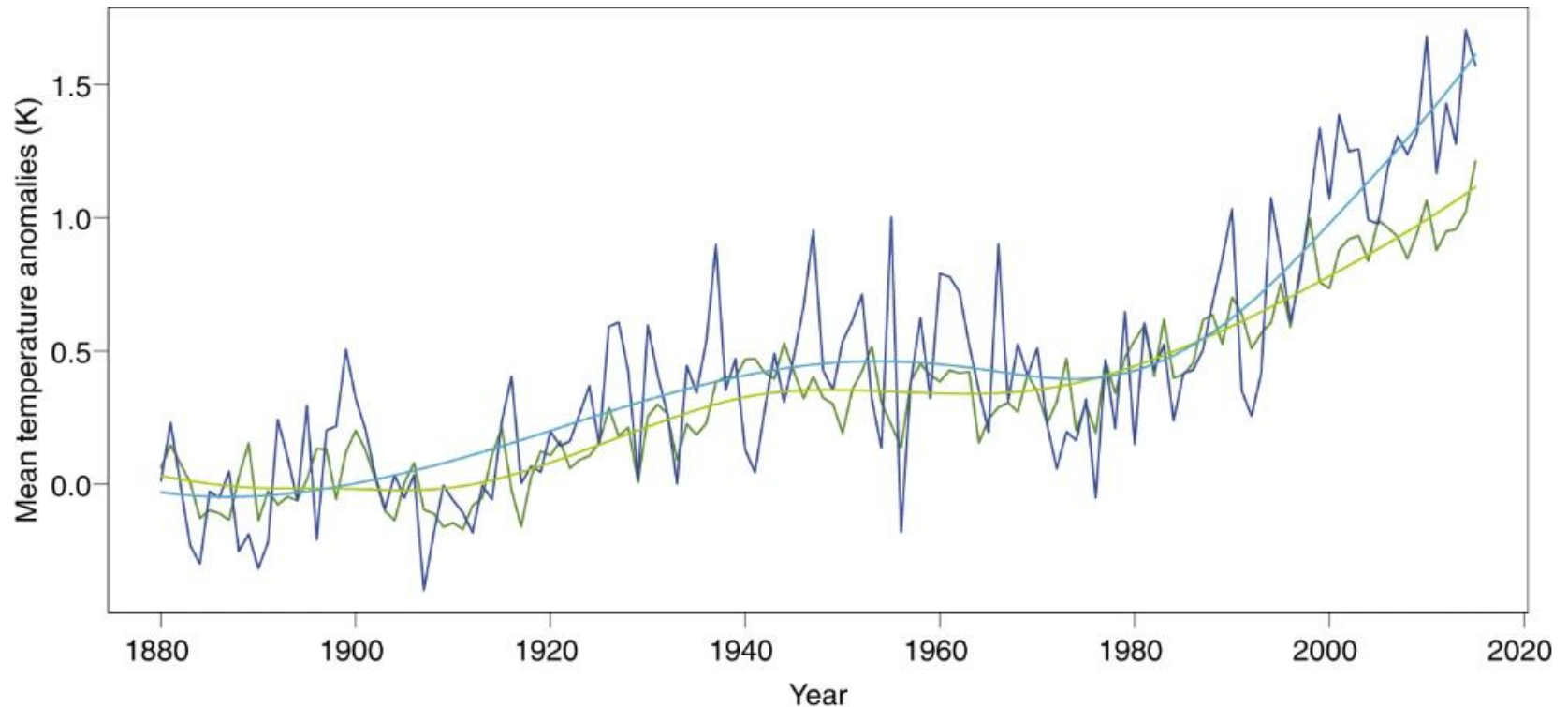
Entering into a warming world...



Into a warming world... IPCC 2014



Into a warmer and drier **Mediterranean...**

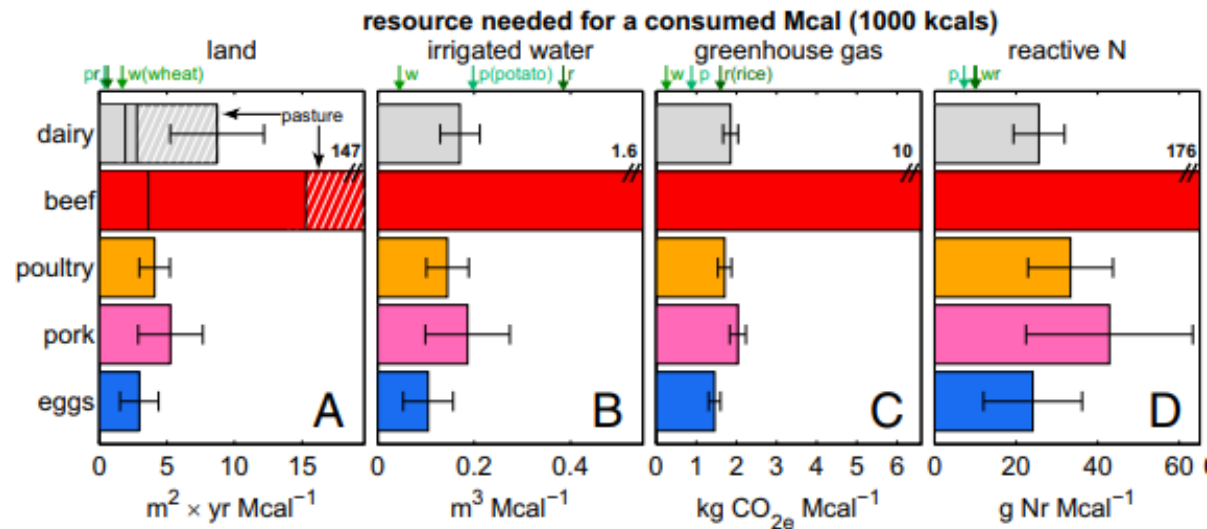
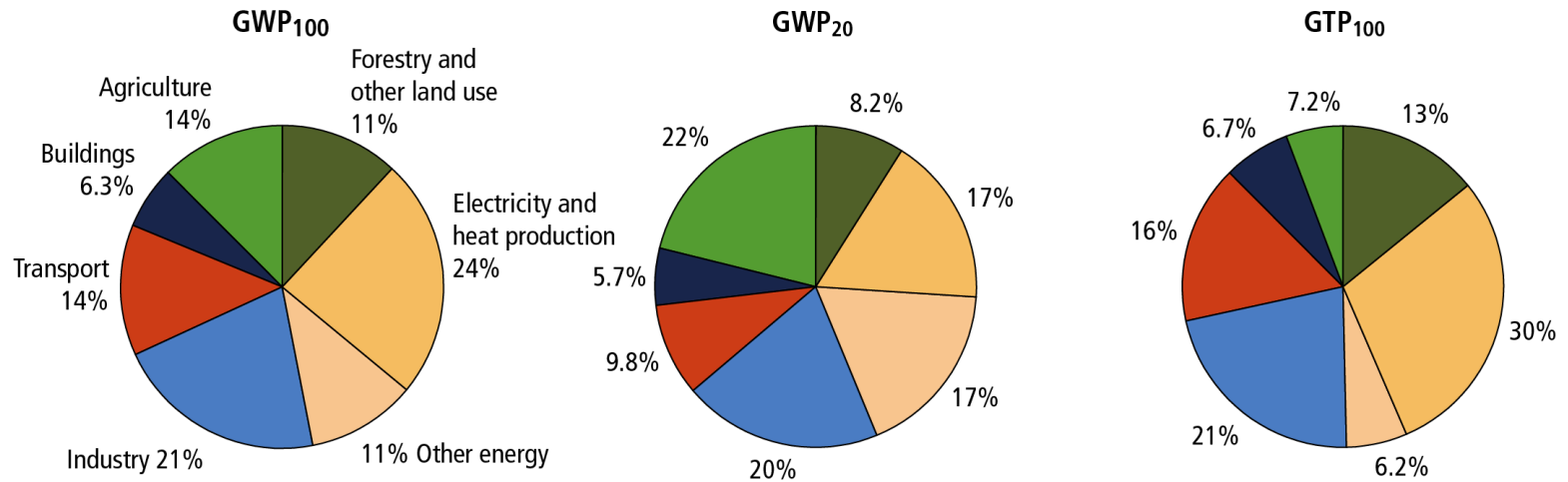


Annual mean air temperature anomalies are shown with respect to the period 1880–1899, with the Mediterranean Basin (blue) and the globe (green) presented with (light curves) and without (dark curves) smoothing. Data from <http://berkeleyearth.org/>

Cramer et al 2018. Climate change and interconnected risks to sustainable development in the Mediterranean

Agriculture contribution to climate change

(b) Contributions by sectors to total GHG emissions using different metrics



Reasons for concern when analysing CC

- Consequences are too unequal
- Uncertainty
- Deciding on the solutions that are appropriate (the how issue)
- Some examples

Reasons for concern when analysing CC

- **Consequences are too unequal**
- Uncertainty
- Deciding on the solutions that are appropriate (the how issue)
- Some examples



Consequences are too unequal

Description or risks and opportunities	Level of risk and opportunity in the agroclimatic regions of Europe				
	Boreal	Alpine	Atlantic	Conti- nental	Mediterranean
Risks					
1. Disruption of zoning areas and decreased crop productivity					
2. Increased risk of floods					
3. Increased risk of drought and water scarcity					
4. Increased area with need of supplemental irrigation					
5. Deterioration of water quality					
6. Deterioration of soil quality and desertification					
7. Loss of glaciers and alteration of permafrost					
8. Sea level rise intrusion in coastal agricultural areas					
9. Increased risk of agricultural pests, diseases, weeds					
10.Deterioration of livestock conditions					
Opportunities					
1. Increase in optimal farming conditions and increased crop productivity					
2. Optimal water availability					
3. Improvement in livestock productivity					
4. Improvement of energy efficiency in glasshouses					

Climatic Change
DOI 10.1007/s10584-011-0344-x

From climate change impacts to the development of adaptation strategies: Challenges for agriculture in Europe

Ana Iglesias • Sonia Quiroga • Marta Moneo • Luis Garrote

Received: 8 April 2010 / Accepted: 8 September 2011
© Springer Science+Business Media B.V. 2011

Adaptative capacity is also unequal

Reg Environ Change (2011) 11 (Suppl 1):S159–S166
DOI 10.1007/s10113-010-0187-4

ORIGINAL ARTICLE

Towards adaptation of agriculture to climate change in the Mediterranean

Ana Iglesias · Raoudha Mougou · Marta Moneo ·
Sonia Quiroga

- Adaptative capacity index:
 - Economic capacity
 - Human and civic resources
 - Agricultural innovation
- Tested on SRES scenarios

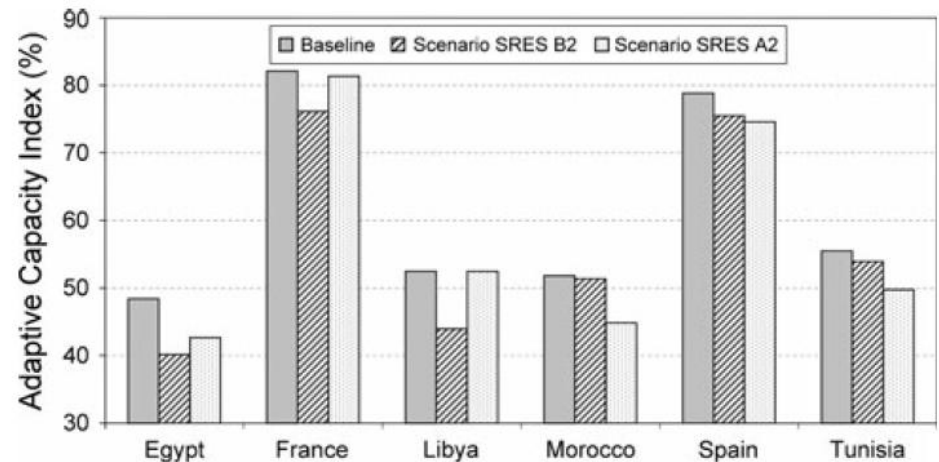
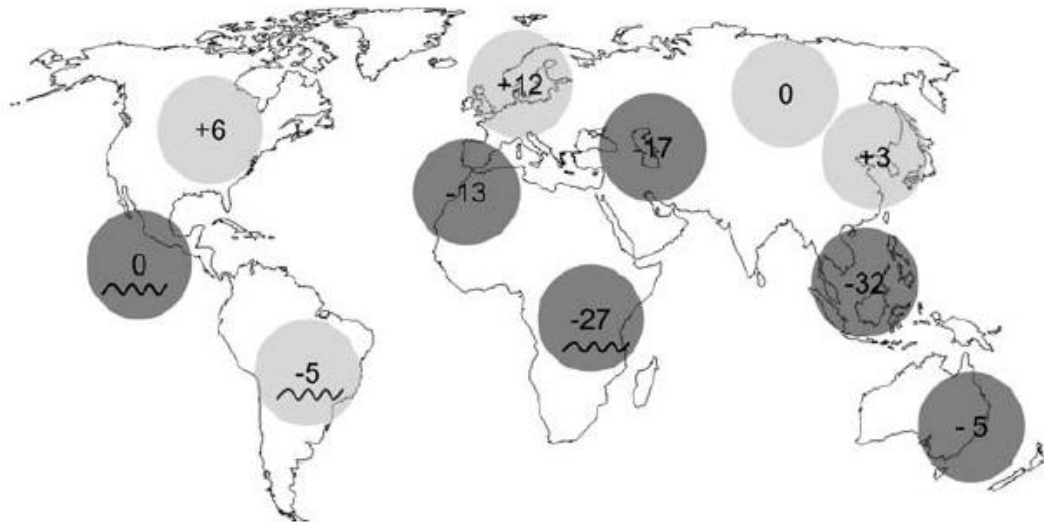


Fig. 2 Adaptive capacity index for the agriculture sector in selected Mediterranean countries (values range from 0 (lowest adaptive capacity) to 100 (highest adaptive capacity))

Reasons for concern when analysing CC

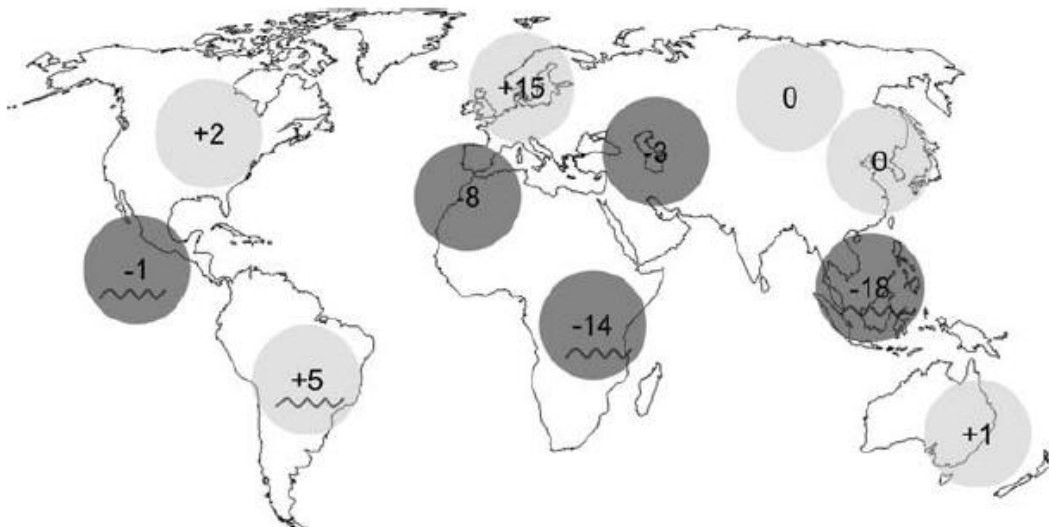
- Consequences are too unequal
- **Uncertainty**
- Deciding on the solutions that are appropriate (the how issue)
- Some examples

How can agriculture deal with an uncertain future?



Consistent distribution of risks and opportunities

Changes in land productivity under two scenarios



Iglesias et al. (2011) Looking into the future of...

How farmers deal with
uncertainty?

How farmers deal with uncertainty?

Ongoing National project

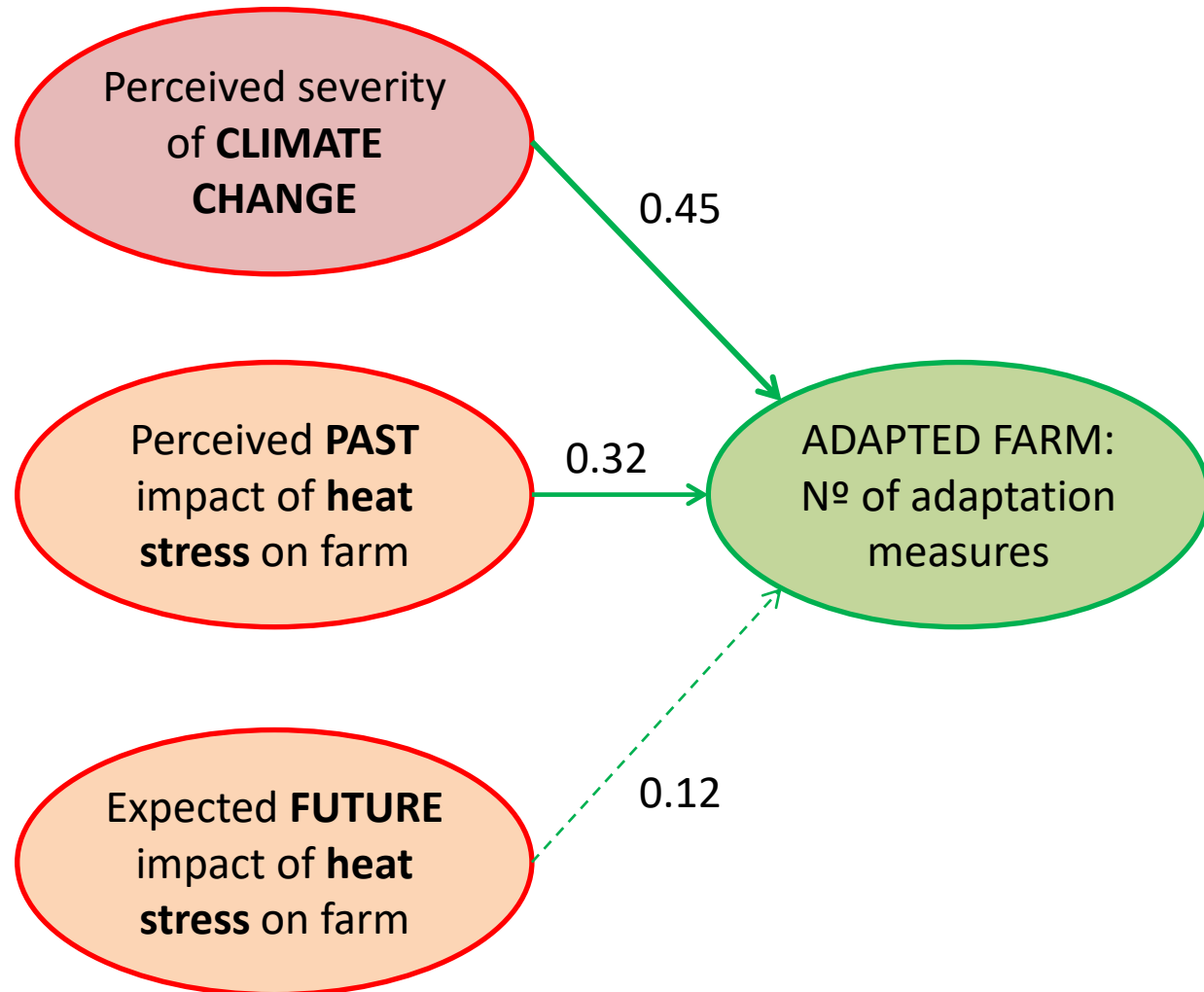
Adaptation to heat stress in
the context of CC

Spanish **dairy sector**:
cows, sheep, goats

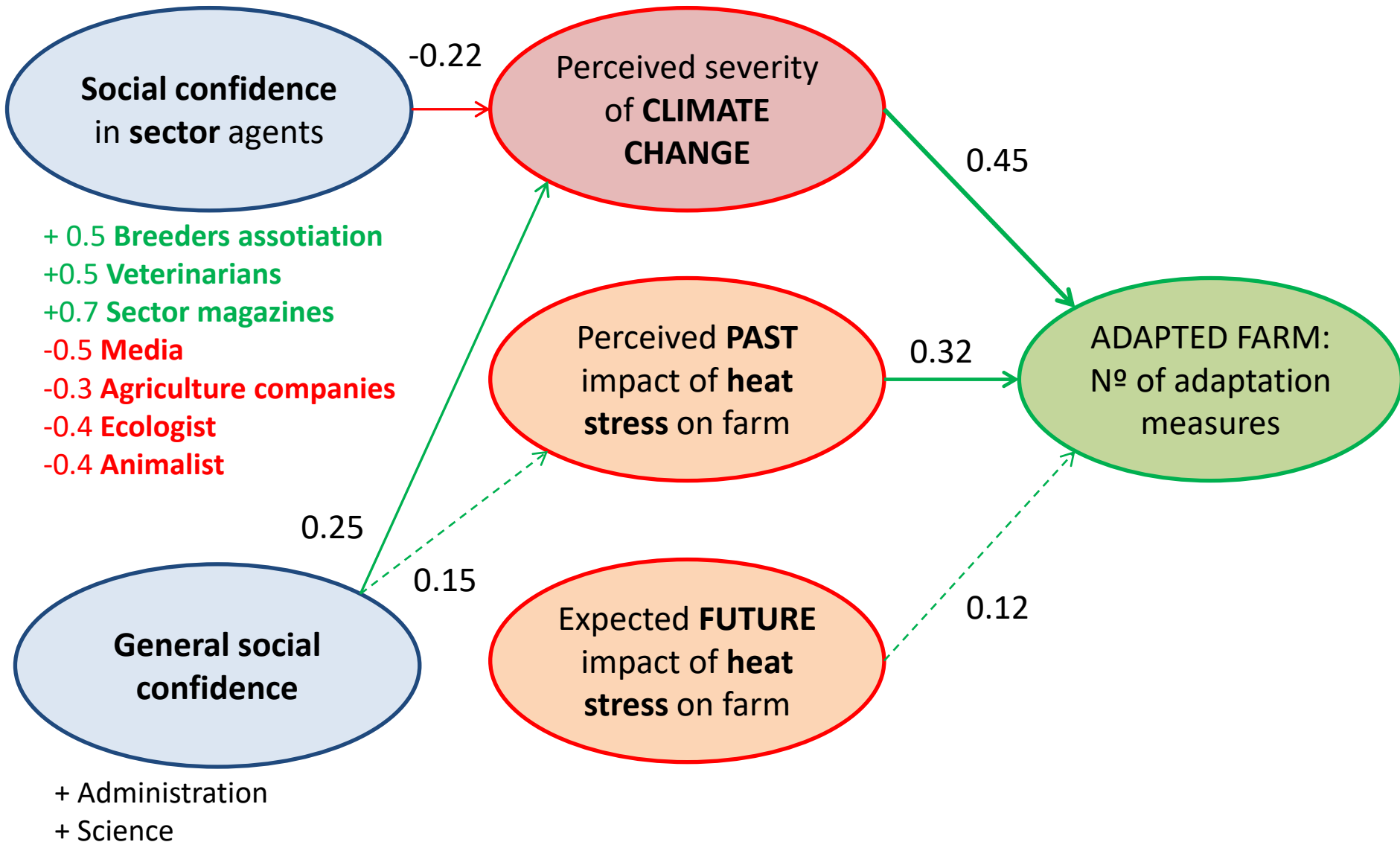
Analysis of **50 Manchega**
farms adaptation measures
and farmer concerns



How farmers deal with uncertainty?



How farmers deal with uncertainty?



Reasons for concern when analysing CC

- Consequences are too unequal
- Uncertainty
- **Deciding on the solutions that are appropriate (the how issue)**
- Some examples

LCA y proximity products

LCA FOR AGRICULTURE

Do foods imported into the UK have a greater environmental impact than the same foods produced within the UK?

J Webb • Adrian G. Williams • Emma Hope •
David Evans • Ed Moorhouse

Received: 17 August 2011 / Accepted: 29 March 2013 / Published online: 24 April 2013
© Springer-Verlag Berlin Heidelberg 2013

Abstract

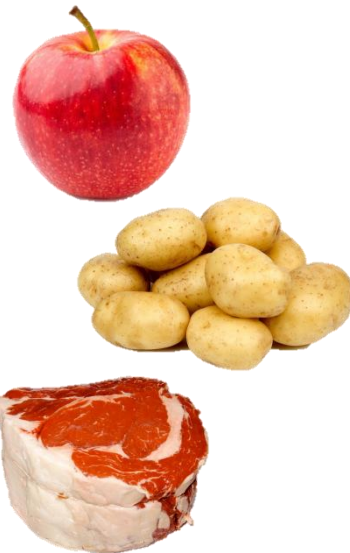
Purpose This study of seven foods assessed whether there are modes or locations of production that require significantly fewer inputs, and hence cause less pollution, than others. For example, would increasing imports of field-grown tomatoes from the Mediterranean reduce greenhouse gas (GHG) emissions by reducing the need for production in heated greenhouses in the UK, taking account of the additional transport emissions? Is meat production in the UK less polluting than the import of red meat from the southern hemisphere?

Methods We carried out a life-cycle inventory for each commodity, which quantified flows relating to life-cycle assessment (LCA) impact categories: primary energy use, acidification, eutrophication, abiotic resource use, pesticide use, land occupation and ozone depletion. The system boundary included all production inputs up to arrival at the retail distribution centre (RDC). The allocation of production burdens for meat products was on the basis of economic value. We evaluated indicator foods from which it is

possible to draw parallels for foods whose production follows a similar chain: tomatoes (greenhouse crops), strawberries (field-grown soft fruit), apples (stored for year-round supply or imported during spring and summer), potatoes (early season imports or long-stored UK produce), poultry and beef (imported from countries such as Brazil) and lamb (imported to balance domestic spring–autumn supply).

Results and discussion Total pre-farm gate global warming potential (GWP) of potatoes and beef were less for UK production than for production in the alternative country. Up to delivery to the RDC, total GWP were less for UK potatoes, beef and apples than for production elsewhere. Production of tomatoes and strawberries in Spain, poultry in Brazil and lamb in New Zealand produced less GWP than in the UK despite emissions that took place during transport. For foods produced with only small burdens of GWP, such as apples and strawberries, the burden from transport may be a large proportion of the total. For foods with inherently large GWP per tonne, such as meat products, burdens arising from transport may only be a small proportion of the total.

UK



España



Nueva
Zelanda



Brasil



Reduce meat consumption and intensify systems?



Why eating less meat is the best thing you can do for the planet in 2019

Eating meat has a hefty impact on the environment from fueling climate change to polluting landscapes and waterways

- Here's how to make it painless for you - and others
- Welcome 2019 with vegan and vegetarian recipes



Avoiding meat and dairy is 'single biggest way' to reduce your impact on Earth

Biggest analysis to date reveals huge footprint of livestock - it provides just 18% of calories but takes up 83% of farmland



FAO report 2006



18% of total GHG

- Land use and degradation
- Food production for feed
- Animal production
- Manure management
- Processing and transport

Ganadería: 7100 Tg CO₂eq y⁻¹

Transporte: 5656 Tg CO₂eq y⁻¹

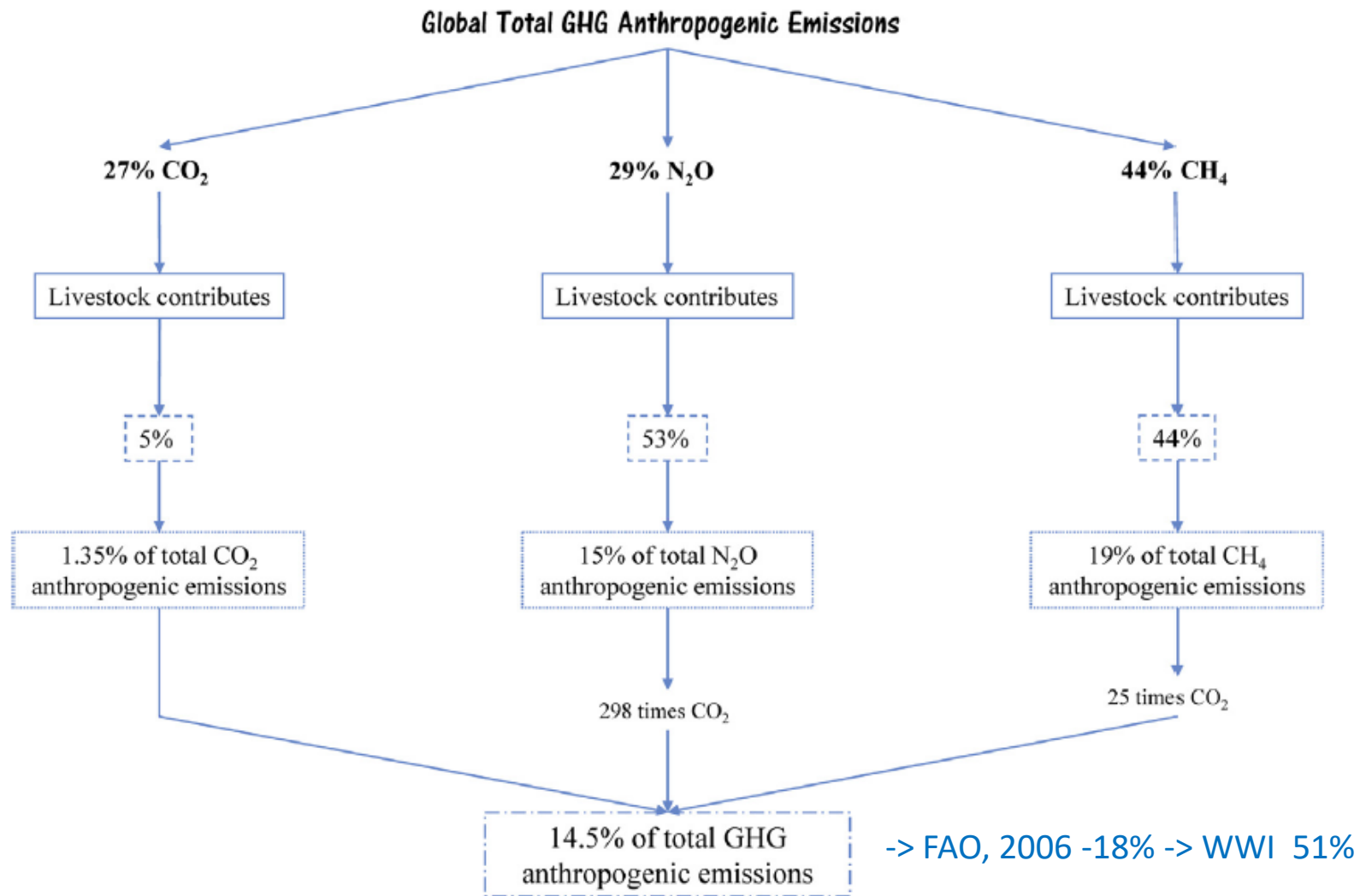


Fig. 3. Contribution of livestock to the total GHG anthropogenic emissions.

Global warming potential (IPCC, 2007)

Dióxido de carbono (CO₂) -> 1 / Metano (CH₄) ->25 / Óxido nitroso (N₂O) -> 298

Dual trend in animal production

Intensification, specializations and industrialization

Areas with favorable
agroecological and market
conditions



- Disconnected from the territory
- Focus on production of market goods



Dual trend in animal production

Marginalization and abandonment



Linked to the territory

Multifunctional animal production

Public goods and ecosystem
services

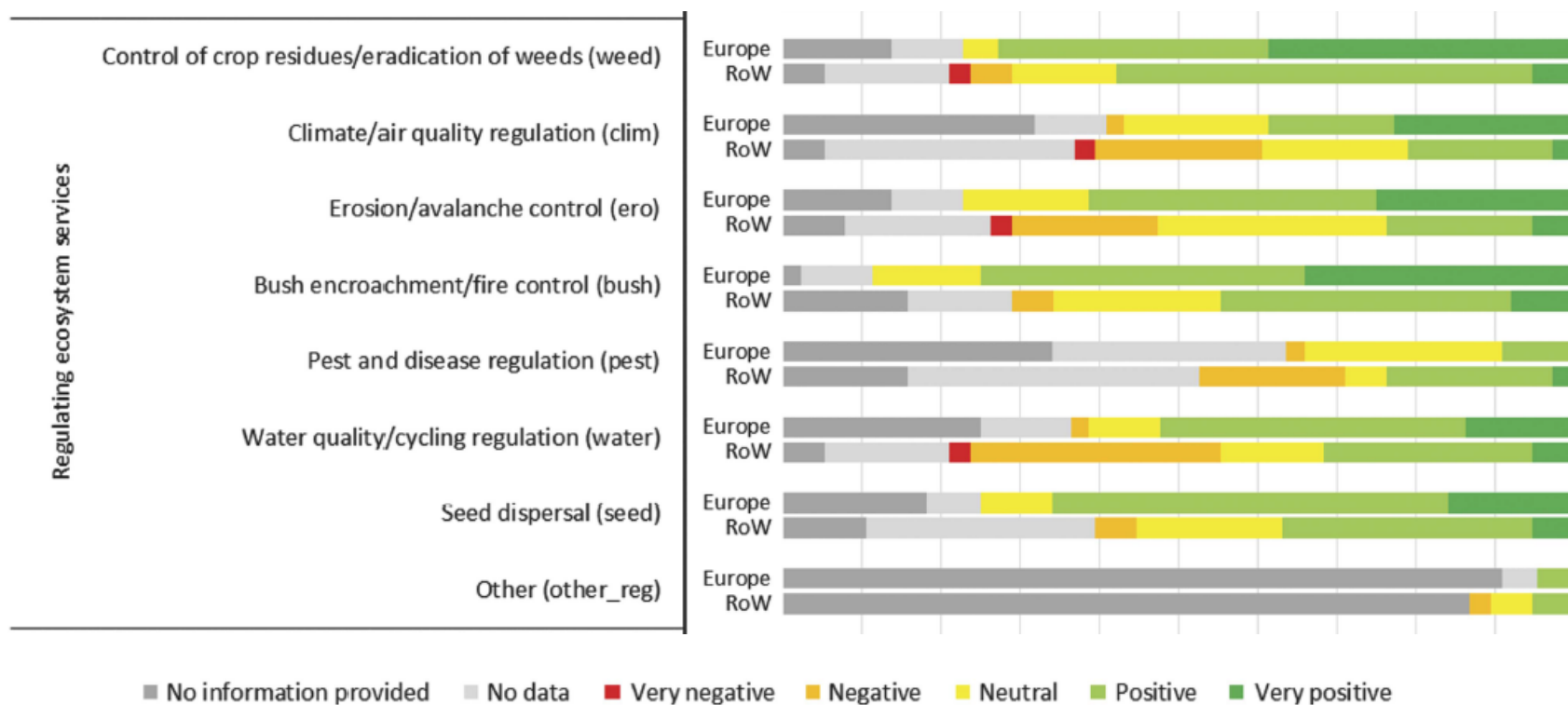
Remote areas and/or harsh
agroecological conditions



Livestock and Ecosystem Services

Perception of livestock ecosystem services in grazing areas

G. Leroy^{1†}, I. Hoffmann¹, T. From¹, S. J. Hiemstra² and G. Gandini³



Greenhouse gases from livestock

- Intensive systems are more “efficient” but...
- ¿what about the rest of ecosystems services?

	kg lamb live weight (CO ₂ -eq/kg)	kg lamb meat (CO ₂ -eq/kg)
Pasture-based	25.9	51.7
Mixed	24.0	47.9
Zero-grazing	19.5	38.9

ES: ecosystem services.

Ripoll-Bosch et al, 2013



	Contribution		
	CO ₂ (%)	CH ₄ (%)	N ₂ O (%)
Pasture-based	7.9	61.6	30.5
Mixed	21.0	57.6	21.4
Zero-grazing	29.1	59.4	11.5

ES: ecosystem services.



¿What about the rest of ES?

	Without ES allocation		With ES allocation	
	kg lamb live weight (CO ₂ -eq/kg)	kg lamb meat (CO ₂ -eq/kg)	kg lamb live weight (CO ₂ -eq/kg)	kg lamb meat (CO ₂ -eq/kg)
Pasture-based	25.9	51.7	13.9	27.7
Mixed	24.0	47.9	17.7	35.4
Zero-grazing	19.5	38.9	19.5	39.0

ES: ecosystem services.

ES value as a function of PAC agri-environmental payment



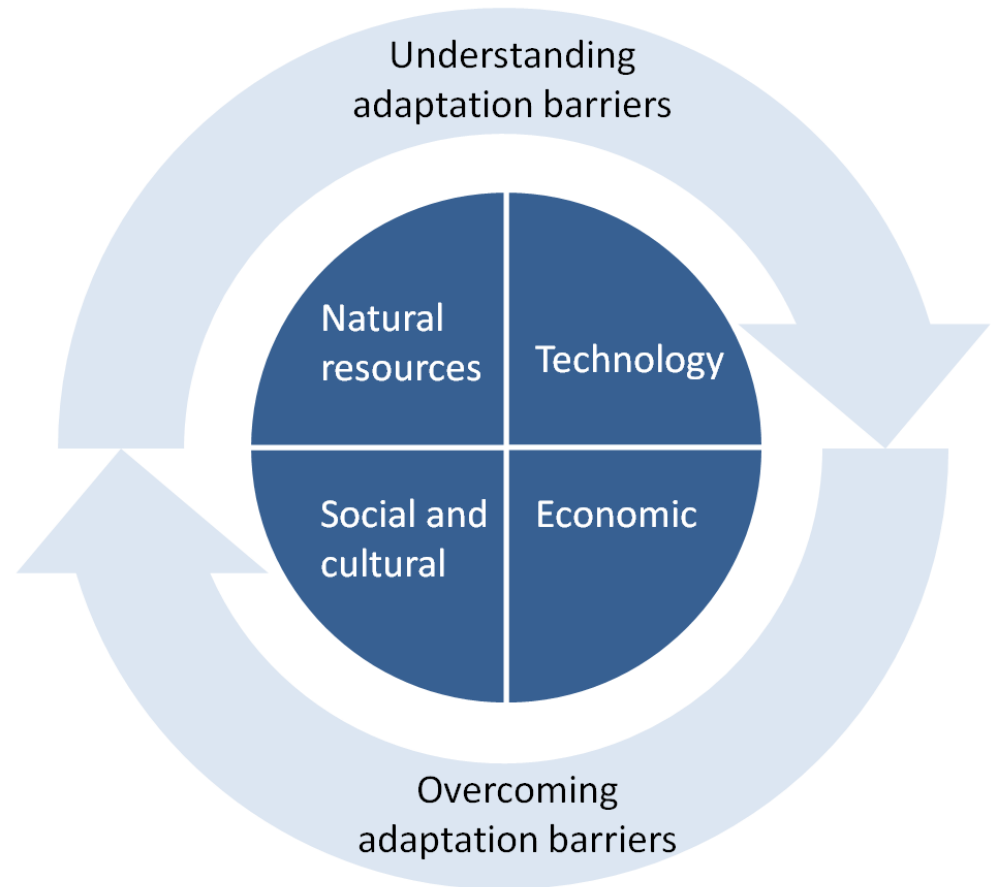
Accounting for multi-functionality of sheep farming in the carbon footprint of lamb: A comparison of three contrasting Mediterranean systems

R. Ripoll-Bosch ^{a,*}, I.J.M. de Boer ^b, A. Bernués ^{a,d}, T.V. Vellinga ^c



Reasons for concern when analysing CC

- Consequences are too unequal
- Uncertainty
- Deciding on the sol (the how issue)
- **Some examples**





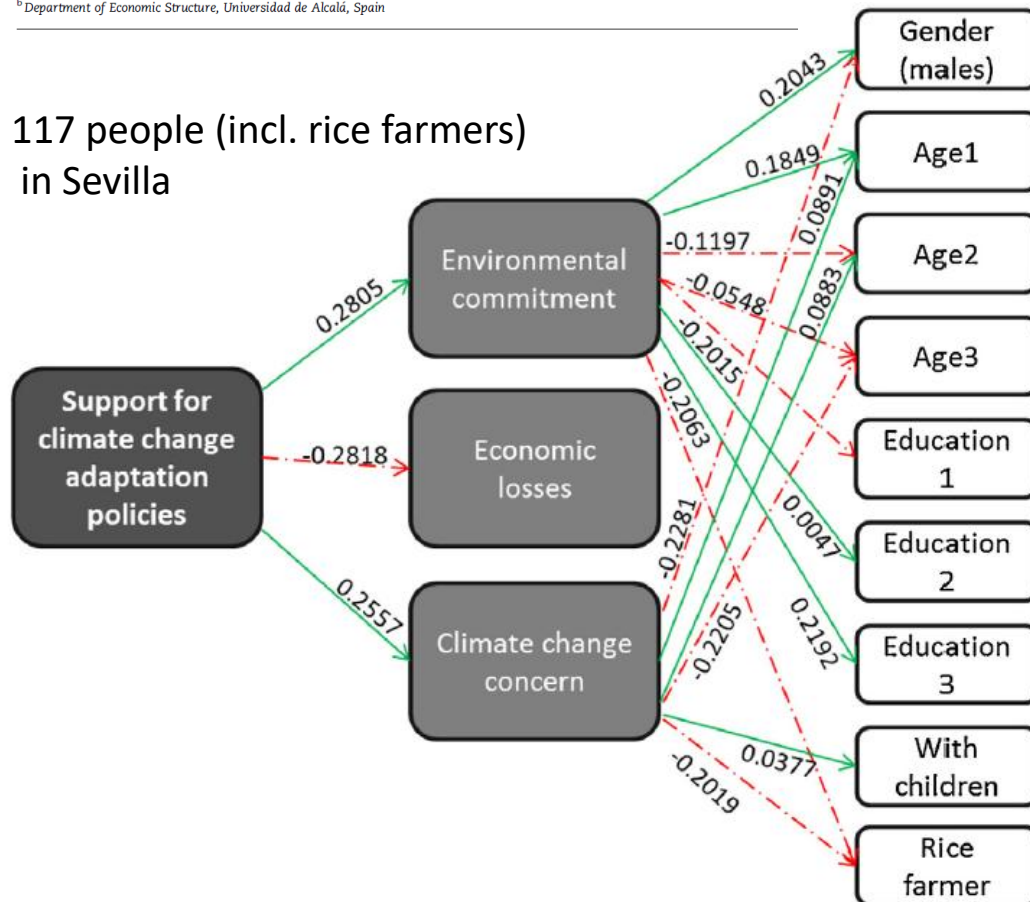
Exploring public support for climate change adaptation policies in the Mediterranean region: A case study in Southern Spain

S. García de Jalón^a, A. Iglesias^{a,*}, S. Quiroga^b, I. Bardají^a

^a Department of Agricultural Economics and Social Sciences, Universidad Politécnica de Madrid, Spain















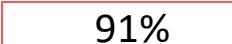



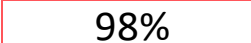



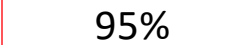


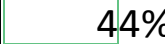







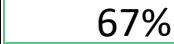






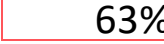


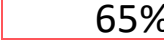






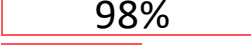




^b Department of Economic Structure, Universidad de Alcalá, Spain

117 people (incl. rice farmers)
in Sevilla



- Considerable potential for improving societal support for adaptation policies
- Economic losses and low CC concern are key barriers
- Need of extension, education and farmer economic support

Sheep dairy farmers **self-motivated** adaptation to CC

		Innovation introduced in the last 10 years	They have always done it	Have not implement it	Will implement it soon
Technology	Artificial shade	 9%	 33%	 58%	 17%
	Natural shade	 5%	 30%	 65%	 11%
	Fans	 26%	 5%	 70%	 7%
	Aspersión/pulverización	 7%	 2%	 91%	 5%
	Humidificadores	 2%	 0%	 98%	 9%
	Air Conditioning	 5%	 0%	 95%	 3%
	Water distribution	 28%	 44%	 28%	 67%
	Water temperature	 2%	 21%	 77%	 6%
Management	Adjustment milking hours	 19%	 67%	 14%	0%
	Adjustment grazing hours	 12%	 44%	 44%	0%
	Lower animal density	 9%	 28%	 63%	0%
	Diet modification	 9%	 26%	 65%	0%
	Improvement in cleaning	 7%	 53%	 40%	 13%
	Breeding	 0%	 2%	 98%	 2%
	Adjustment birthing dates	 7%	 40%	 53%	0%

Sheep dairy farmers reasons for not using adaptation actions

		Too expensive	Modify farm management	It cannot be applied	It won't work	Haven't heard about it
Tecnología	Artificial shade	21%	8%	38%	13%	4%
	Natural shade	0%	11%	70%	7%	0%
	Fans	63%	3%	17%	7%	3%
	Aspersión/pulverización	58%	0%	13%	16%	8%
	Humidificadores	49%	5%	14%	9%	14%
	Air Conditioning	79%	0%	8%	8%	3%
	Water distribution	0%	0%	25%	8%	0%
	Water temperature	26%	0%	42%	19%	6%
Manejo	Adjustment milking hours	0%	17%	67%	17%	0%
	Adjustment grazing hours	0%	42%	37%	21%	0%
	Lower animal density	0%	28%	48%	20%	4%
	Diet modification	0%	20%	28%	40%	12%
	Improvement in cleaning	0%	25%	31%	25%	6%
	Breeding	2%	2%	17%	24%	51%
	Adjustment birthing dates	13%	43%	30%	13%	0%



Research article

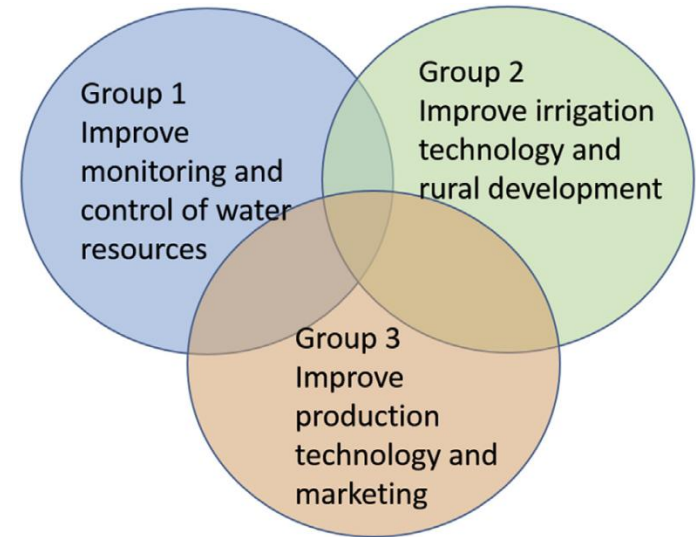
Defining adaptation measures collaboratively: A participatory approach in the Doñana socio-ecological system, Spain

Lucia De Stefano ^{a,*}, Nuria Hernández-Mora ^b, Ana Iglesias ^c, Berta Sánchez ^c

^a Universidad Complutense de Madrid, Facultad de Ciencias Geológicas, c/ José Antonio Novás, 12, 28040, Madrid, Spain

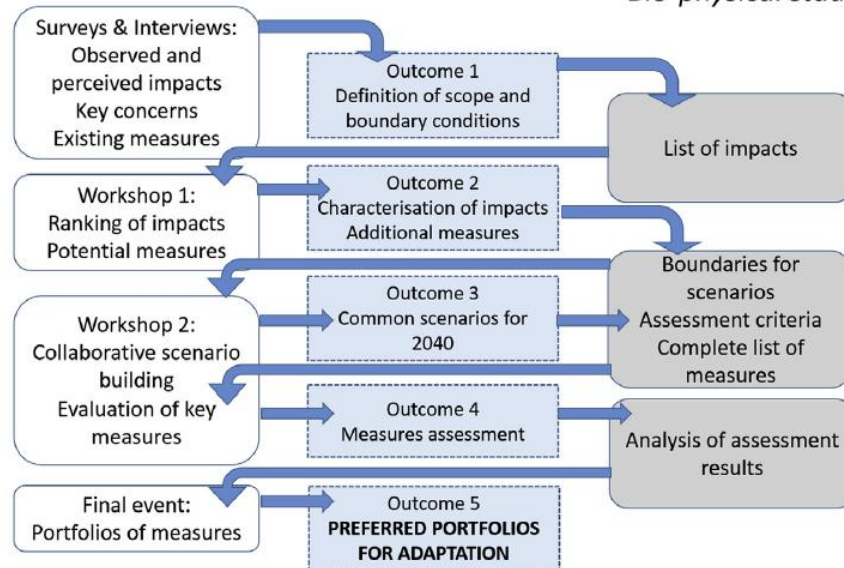
^b Universidad de Sevilla, Facultad de Geografía e Historia, c/ Doña María de Padilla, s/n, 41004, Sevilla, Spain

^c Universidad Politécnica de Madrid, Escuela Técnica Superior de Ingenieros Agrónomos, Departamento de Economía y Ciencias Sociales Agrarias, Avda. Complutense s/n, 28040, Madrid, Spain



Participatory process

Bio-physical studies



Move beyond the dichotomy
agriculture-conservation

Points of convergence:

- Strengthen transparency, participation, and cooperation
- Improve extension
- Increase added value
- Improved commercialization

To wrap up

- Consequences are too unequal
- Uncertainty
- Deciding on the solutions that are appropriate
- Recognize farmers barriers for action implementation



Thank you

Daniel Martín-Collado and Ana Iglesias

JORNADAS MED – PÓLO DA MITRA
27 e 28 de Junho de 2019

