iSAGE

Innovation for Sustainable Sheep and Goat Production in Europe

CIHEAM

iSAGE WORKSHOP

Innovations to improve the sustainability in the sheep and goat sector

10-13 December 2019, Zaragoza (Spain)

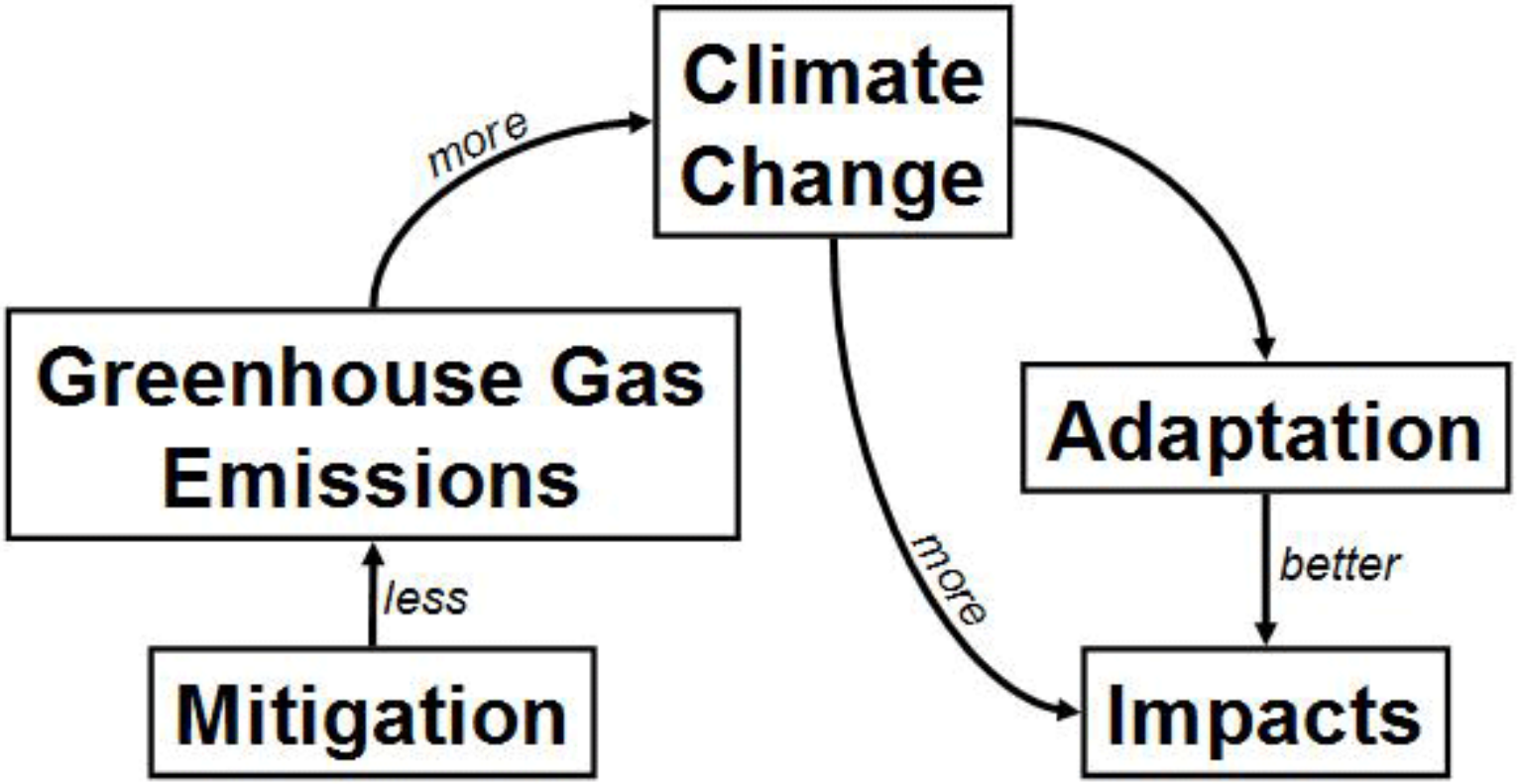
Impact of climate change and adaptation options for sheep and goat systems in the Mediterranean area

bc3 BASQUE CENTRE FOR CLIMATE CHANGE Klima Aldaketa Ikergai

Climate change:

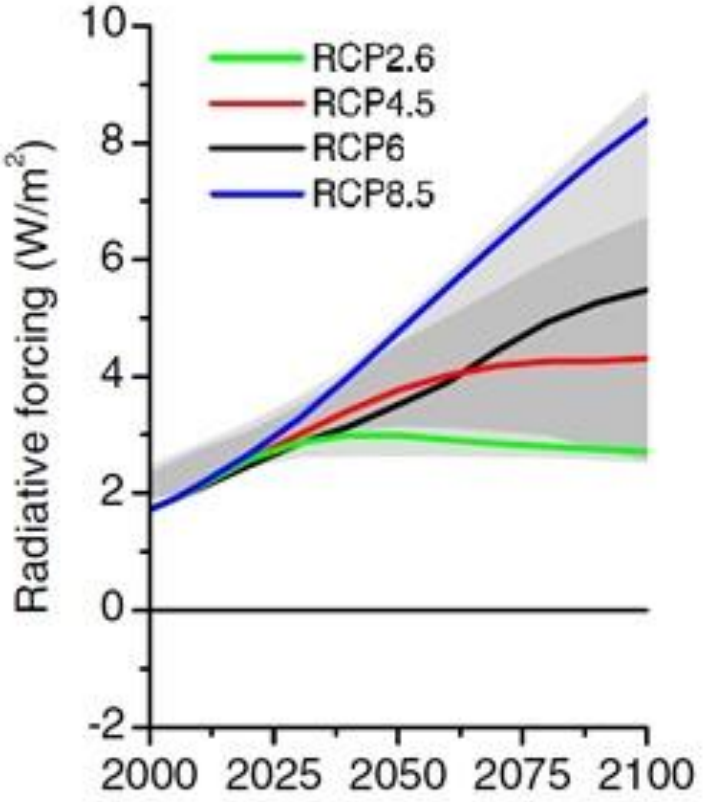
Solutions to face climate change:

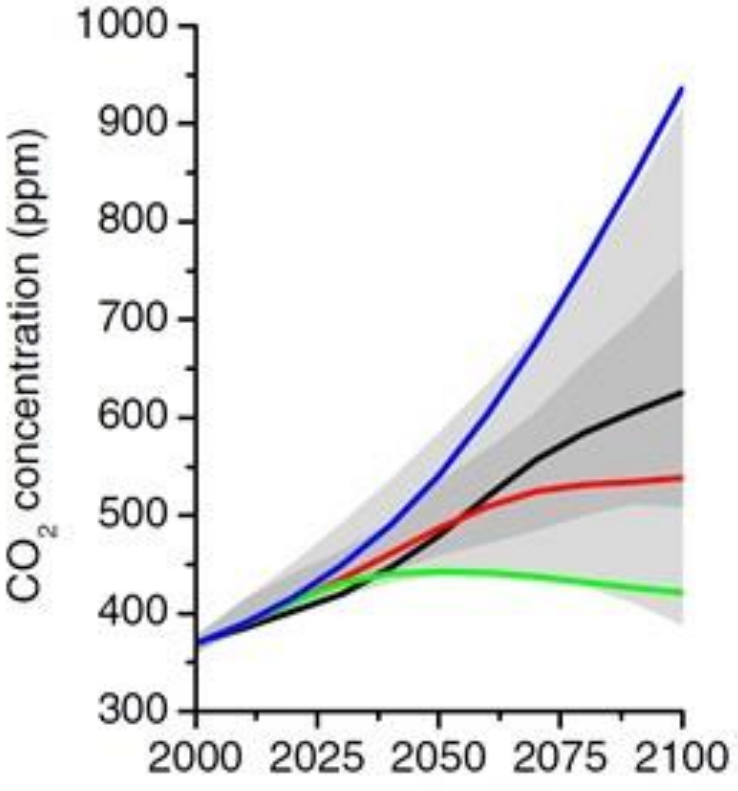
Climate change mitigation and adaptation



Impacts of climate change

Relative concentration pathways (RCPs):





Galán 2017 adaptado de van Vuuren et al. (2011).

Impacts of climate change

Relative conce

Midrange scenario (RCP4.5)

Extreme scenario (RCP8.5)

CAMBIO CLIMÁTICO ›

Agricultores alemanes fracasan en su demanda al Gobierno por no proteger el clima

El tribunal da la razón al Ejecutivo y considera que hay que respetar su margen de acción

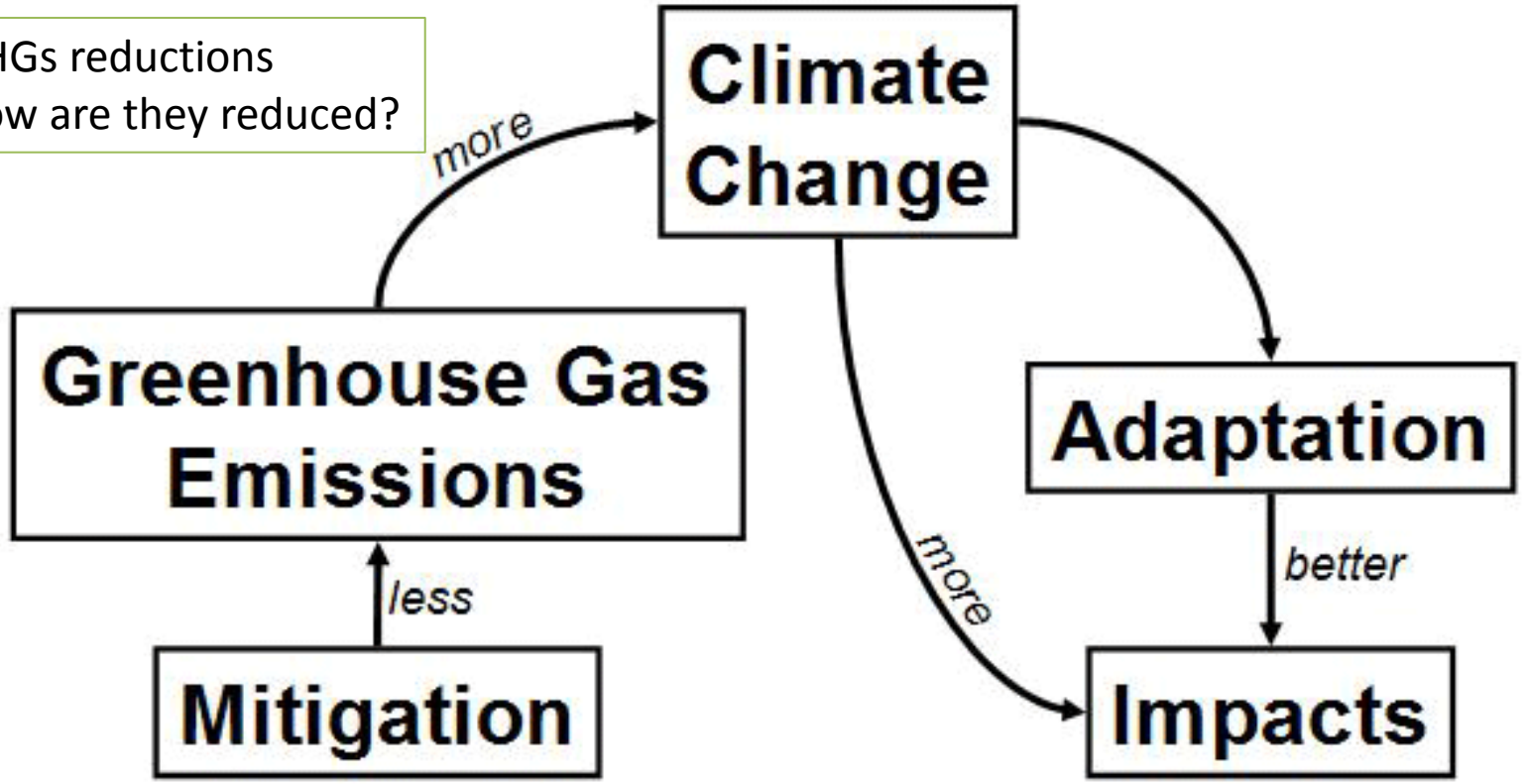
ANA CARBAJOSA

Berlín - 31 OCT 2019 - 18:06 CET

Solutions to face climate change:

Climate change mitigation and adaptation

- GHGs reductions
- How are they reduced?



Solutions to face climate change:

Climate change mitigation and adaptation

Protesta masiva de los granjeros en Holanda por su mala imagen en la lucha contra el cambio climático

Columnas de tractores salidos de todas las regiones han provocado el mayor atasco de la historia camino de La Haya, donde esperan manifestarse unos 10.000 afectados

ISABEL FERRER

La Haya - 1 OCT 2019 - 20:33 CEST

Granjeros bloquean la autopista A28 con sus tractores entre Hoogeveen y Meppel en los Países Bajos durante las protestas de este martes. VINCENT JANNINK (EFE)

Solutions to face climate change:

BBC NEWS

Science & Environment

Climate policies 'will transform UK landscape'

By Roger Harrabin
BBC environment analyst

1 November 2019

Climate change

Britain's countryside will be transformed by policies to combat climate change, the government's former chief environment scientist says.

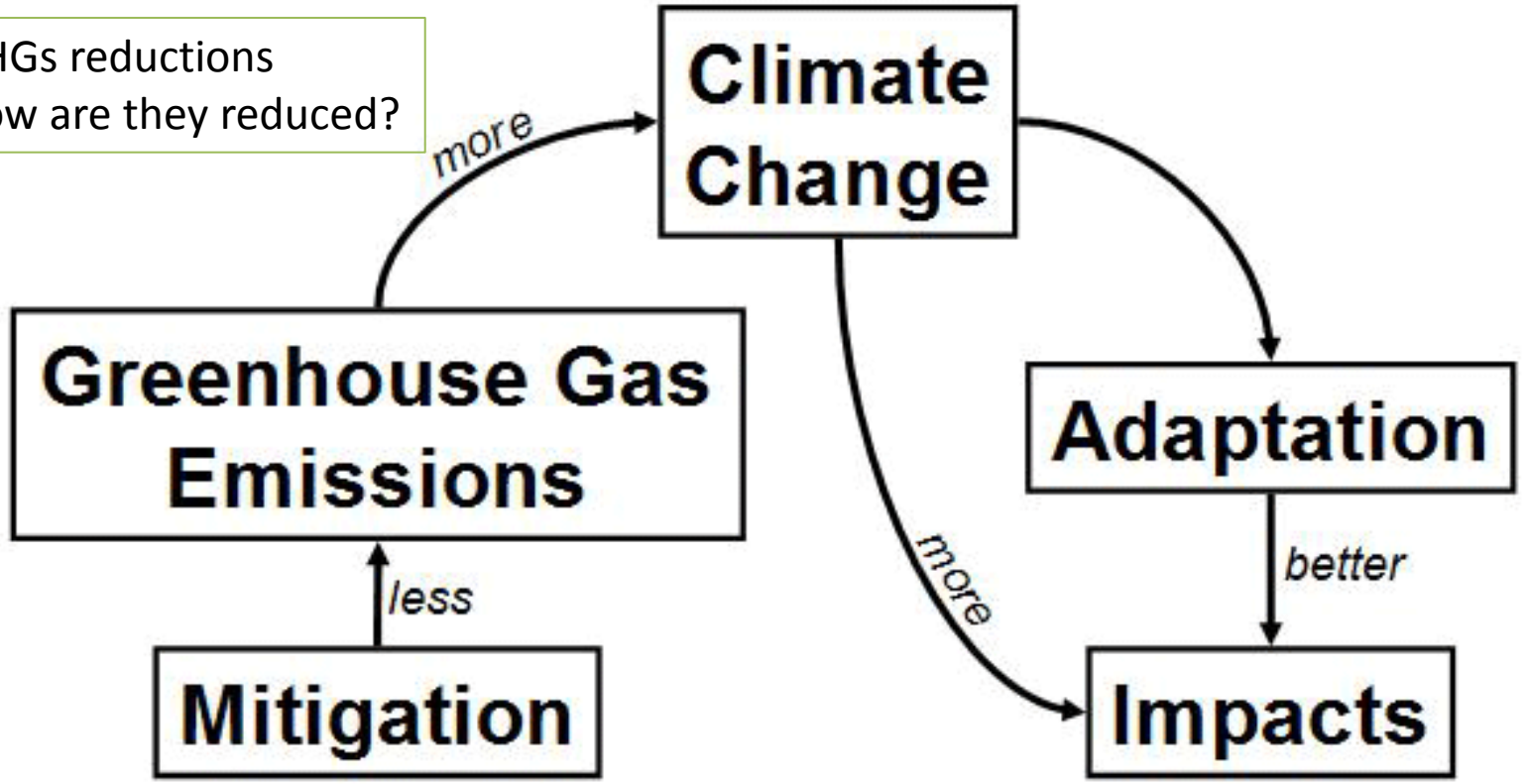
Professor Sir Ian Boyd said climate policies after Brexit will alter the landscape more than most people expect.

There will be many more trees and hedges but far fewer grazing animals as people eat less red meat, he said.

Solutions to face climate change:

Climate change mitigation and adaptation

- GHGs reductions
- How are they reduced?



Regional impacts of climate change in the Mediterranean area

Regional implications for small ruminant production systems in Europe:

- Climate change impacts will vary among the different European sub-regions

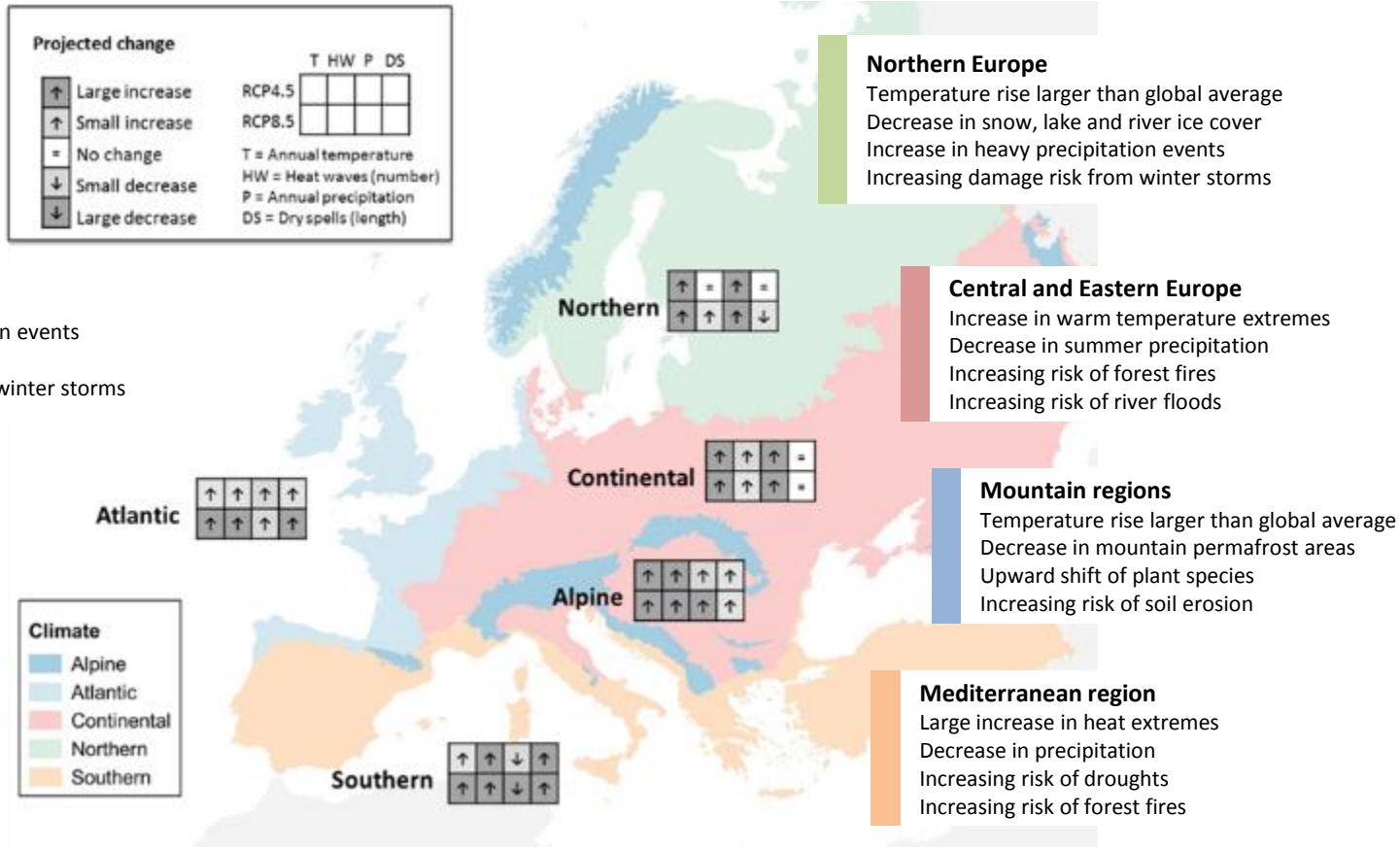


Figure - General trends of several climate variables for European sub-regions. Indices represent changes for 2071-2100 with respect to 1971-2000 based on RCP4.5 and RCP8.5 scenarios (Pardo et al 2017 based on Jacob et al, 2014).

Regional implications for small ruminant production systems in Europe:

- Climate influences distribution of vegetation and small ruminant systems across Europe

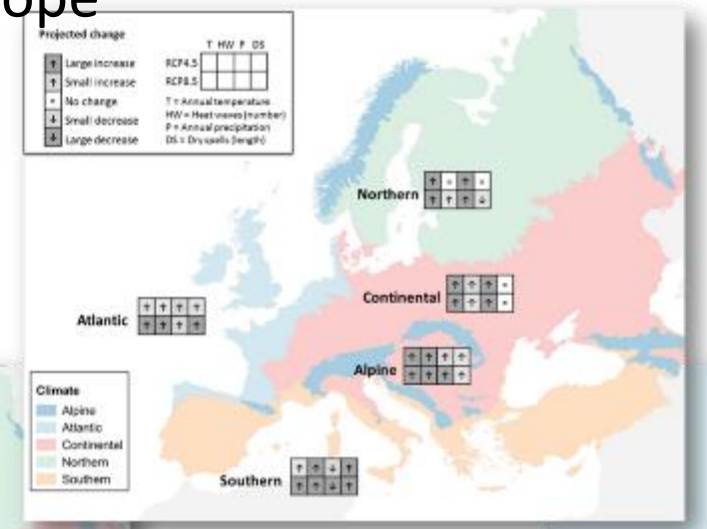


Fig.1- Climate change projections

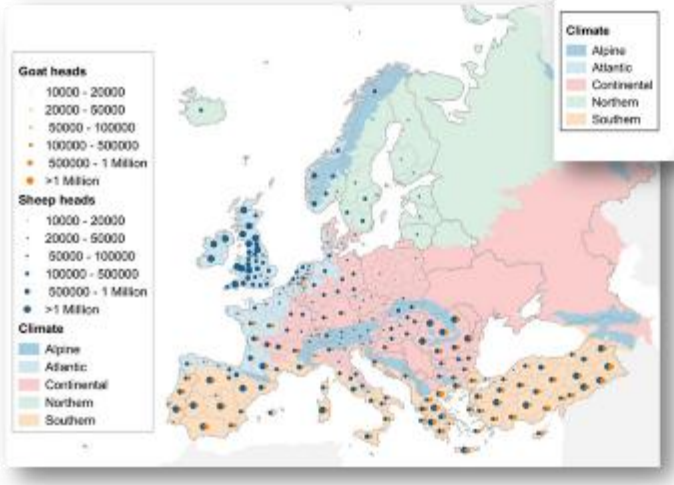


Fig.2 - Distribution of small ruminant livestock in Europe

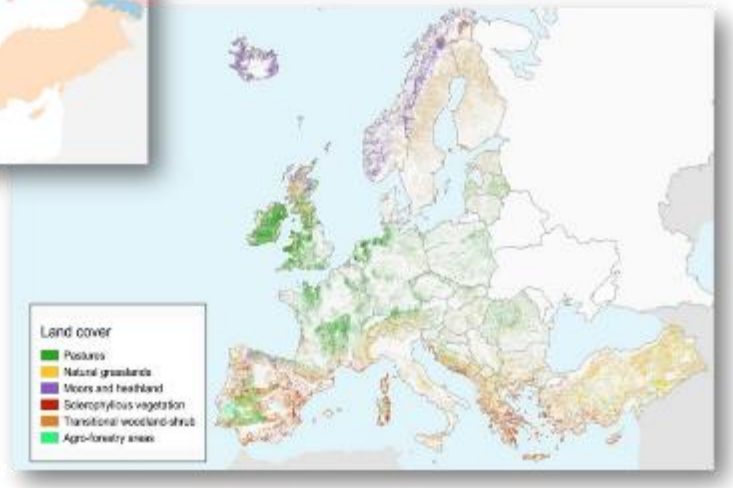


Fig.3 - Distribution of grasslands and scrublands in Europe

Adaptation strategies in the Mediterranean area

Regional impacts of climate change:
E) Southern (Mediterranean) region

- Reduction in forage yields due to less rainfall and risk of drought projection
- Grazing season is expected to be shortened. Grazing activity will suffer from irregular patterns due to extreme events.
- Encroachment (increase of shrubs)
- Soil erosion and degradation
- Heat stress in animals: more frequency and length of heat waves



Southern (Mediterranean) region

General adaptation strategies for forage production to face CC

- Increase pasture diversity:
  - to enhance resilience under variable climatic conditions
  - to adapt to potential shortages of protein sources (mixed legume-grass)
- Reduce tillage:
  - soil moisture conservation
  - long-term productivity (increase soil organic matter)
- Improved plant breeding (long-term):
  - developing varieties that can survive long drought periods and recover rapidly following autumn rains (e.g. tall fescue, cocksfoot and Lucerne varieties)

E) Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feed resources:

E) Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feeds:

- Integrated approaches:
  - soil and water protection (cover crops)

E) Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feeds:

- Integrated approaches:
  - soil and water protection (cover crops)
  - different feeds aligned to different seasonal constraints (agro-forestry)

- In winter grass growth preferably beneath tree canopy
- In early summer grasses dry later beneath canopy because the shelter/buffering effect of trees on temperature


Dehesa system in Sierra de Gata, Extremadura (Spain)
Source: http://reservabiologicacampanarios.es/

Pasture under trees in winter

Pasture under trees in early June

Pictures taken in Iberian dehesas (CW Spain) by D. Howlett and A. Carrara, respectively

E) Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feeds:

- Integrated approaches:
  - soil and water protection (cover crops)
  - different feeds aligned to different seasonal constraints (agro-forestry)
  - fire-risk protection (grazing management)

E) Southern (Mediterranean) region

Adaptation measures to cope with heat stress:

- Prevention/mitigation of heat stress conditions
  - -Indoors: stock density, barn orientation/dimensions, ventilation, spraying
  - -Outdoors: provide protection with trees or artificial shelters
- Feeding/Nutritional management:
  - -shifting meals to late afternoon or evening, increasing number of meals
  - -low fibre diets (decrease forage:concentrate), increase energy, supplements (fat-rich feeds, whole flaxseed)
- Animal breeding
- Reproduction techniques

Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feed resources:

- Mediterranean systems traditionally had to adapt

Thank you!

iSAGE Training Course

10-13 December, Zaragoza, Spain

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Modelling approaches to analyse heat stress

Testing the modelling approach (lamb growth)

- Breed: rasa Aragonesa
- Location: Zaragoza (Spain) (June-July 2017)
- Effect of heat on Lamb growth (born in May)
- Period of study: from weaning (13.9 kg LW) to slaughter (22 kg LW)
- Number of ewes: 550, 650 lambs sold/yr (40% born in May)

Diet composition (wean to slaughter)

FEED	%	GE MJ/kg DM	DE MJ/kg DM	ME MJ/kg DM
Barley	33.6%	18.4	14.8	12.4
Maize	27.3%	18.7	16.1	13.6
Soybean Meal	23.6%	19.7	18.2	13.6
Wheat	6.4%	18.2	15.6	13.1
straw	9.0%	18.2	8	6.5

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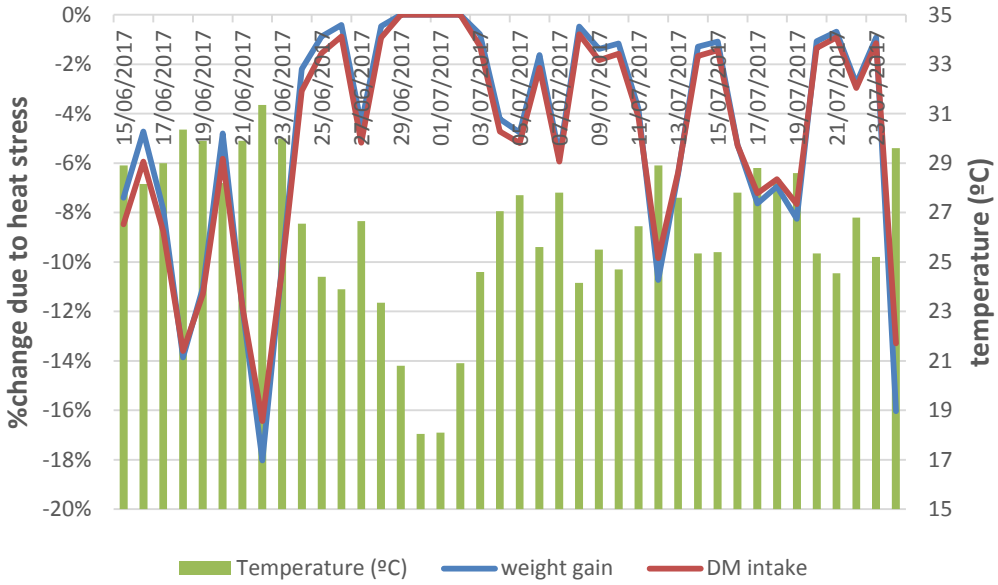
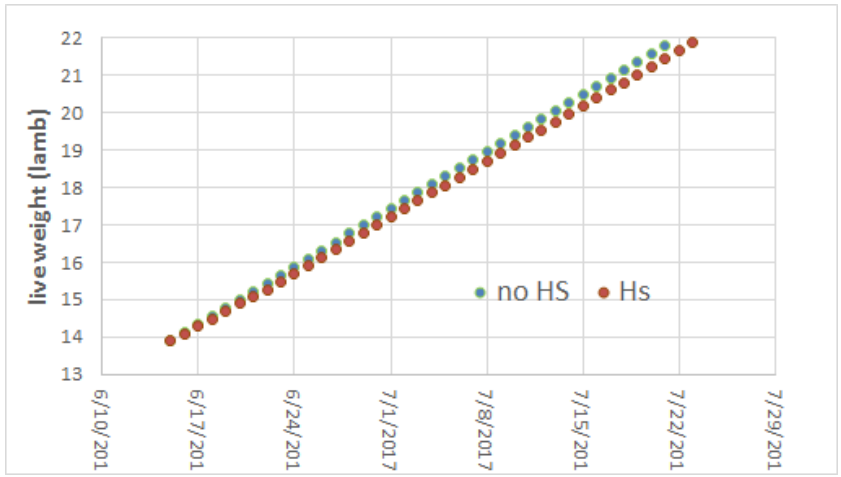
Effect of heat on Lamb growth & DM Intake

Lamb growth reduction and DM intake (%)





2 extra days with heat stress

450 g DM extra/lamb

228 kg extra concentrates

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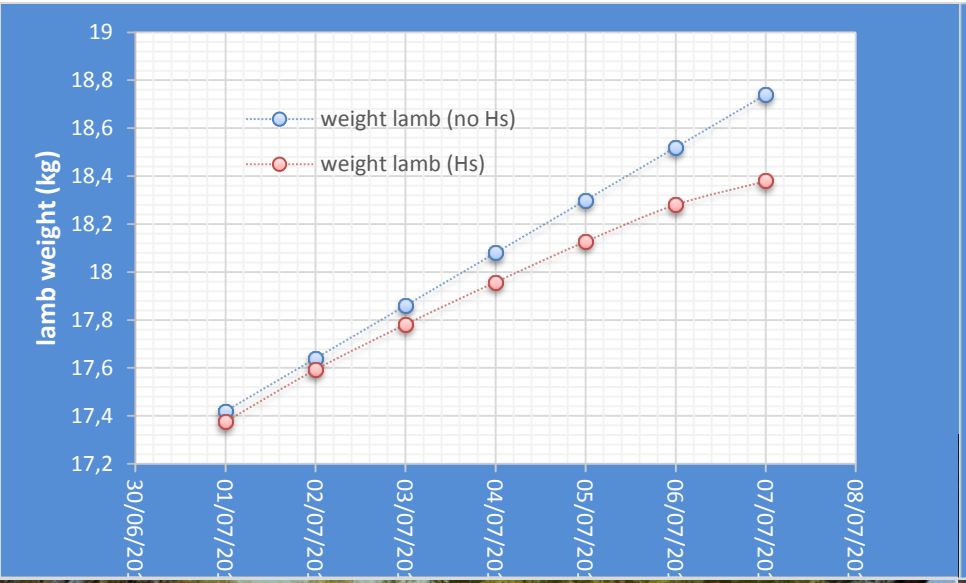
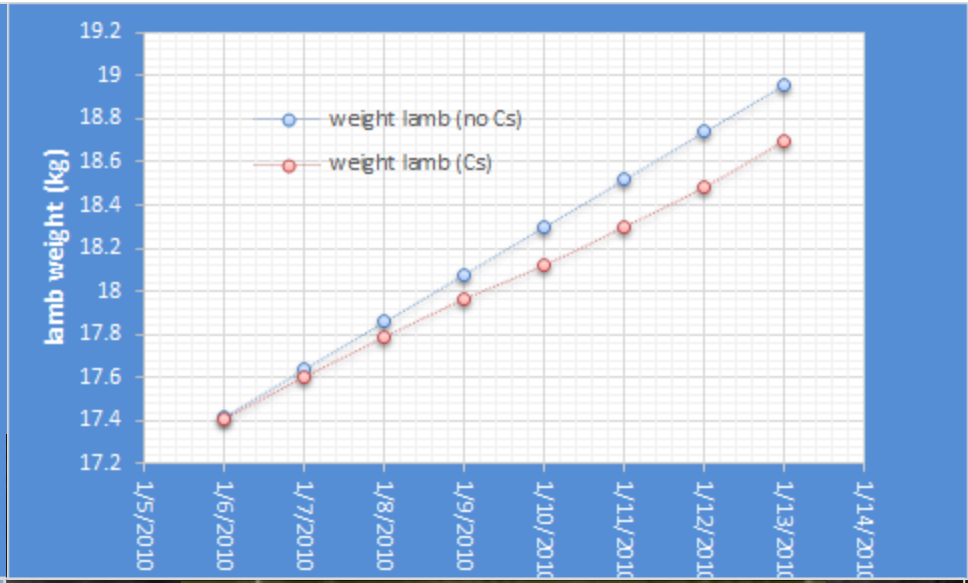
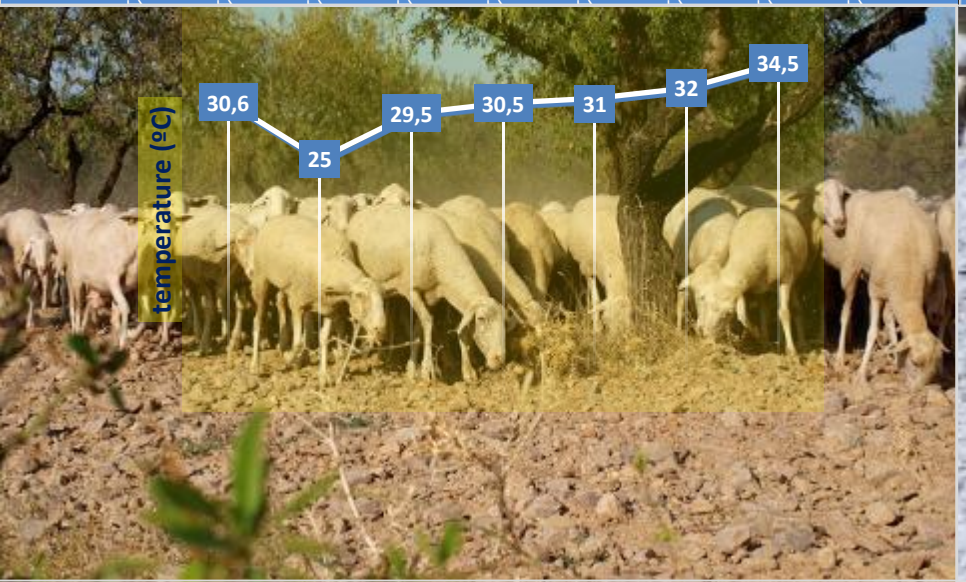
Extremes (heat and cold wave)

Born in May (Heat stress)



Born in January (Cold stress)





Testing the modelling approach (impact on milk& adaptation)

- Breed: Manchega (Spain)
- Effect of heat on milk productivity on Summer period
- Housed

Diet composition

FEED		GE	DE	ME
	%	MJ/kg DM	MJ/kg DM	MJ/kg DM
Alfalfa hay	90%	18.2	10.6	8.4
Corn	10%	18.7	16.1	13.6

4 scenarios

- No HS
- HS (non-adapted)
- HS (adapted-diet)
- HS (Adapted-spraying)

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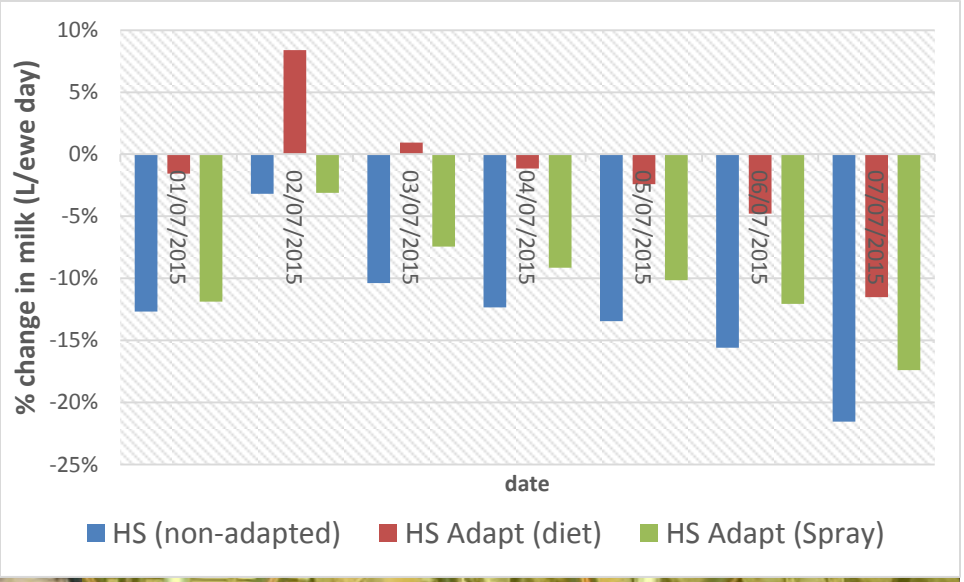
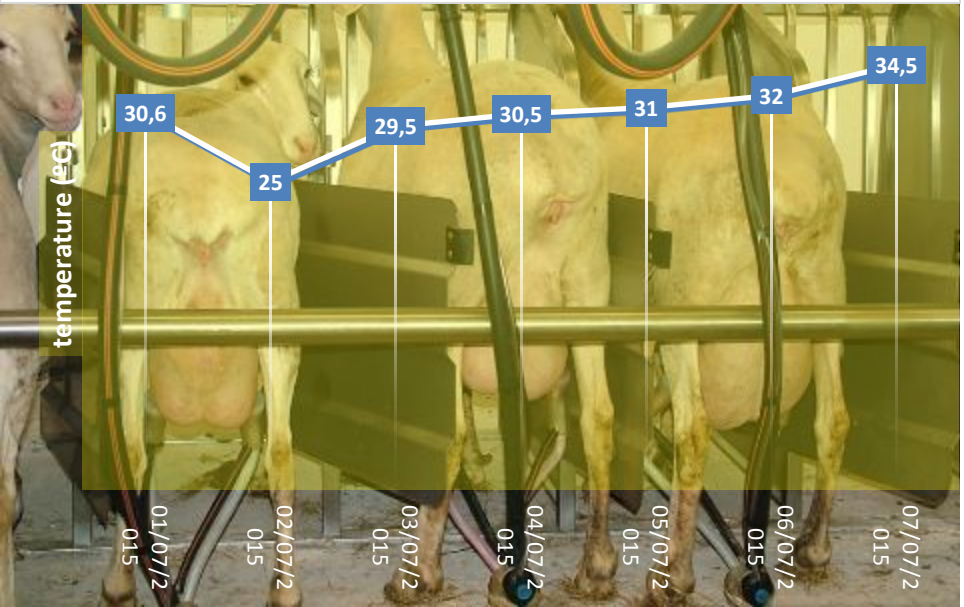
Effect of heat on milk production & DM intake





HS (non-adapted)

Aprox. 13% reduction in milk,
0.12 kgDM extra/L milk

HS (adapt-diet)

More dense diet: more soybean meal
Aprox. 2% reduction in milk,

HS (adapt-spraying)

Small positive effect, aprox. 10% reduction in milk

Southern (Mediterranean) region

Adaptation measures: Flexible grazing and alternative feed resources:

- Mediterranean systems traditionally had to adapt

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