



EXPLORING CLIMATE CHANGE ADAPTATION STRATEGIES FROM THE PERSPECTIVE OF MEDITERRANEAN SHEEP FARMERS

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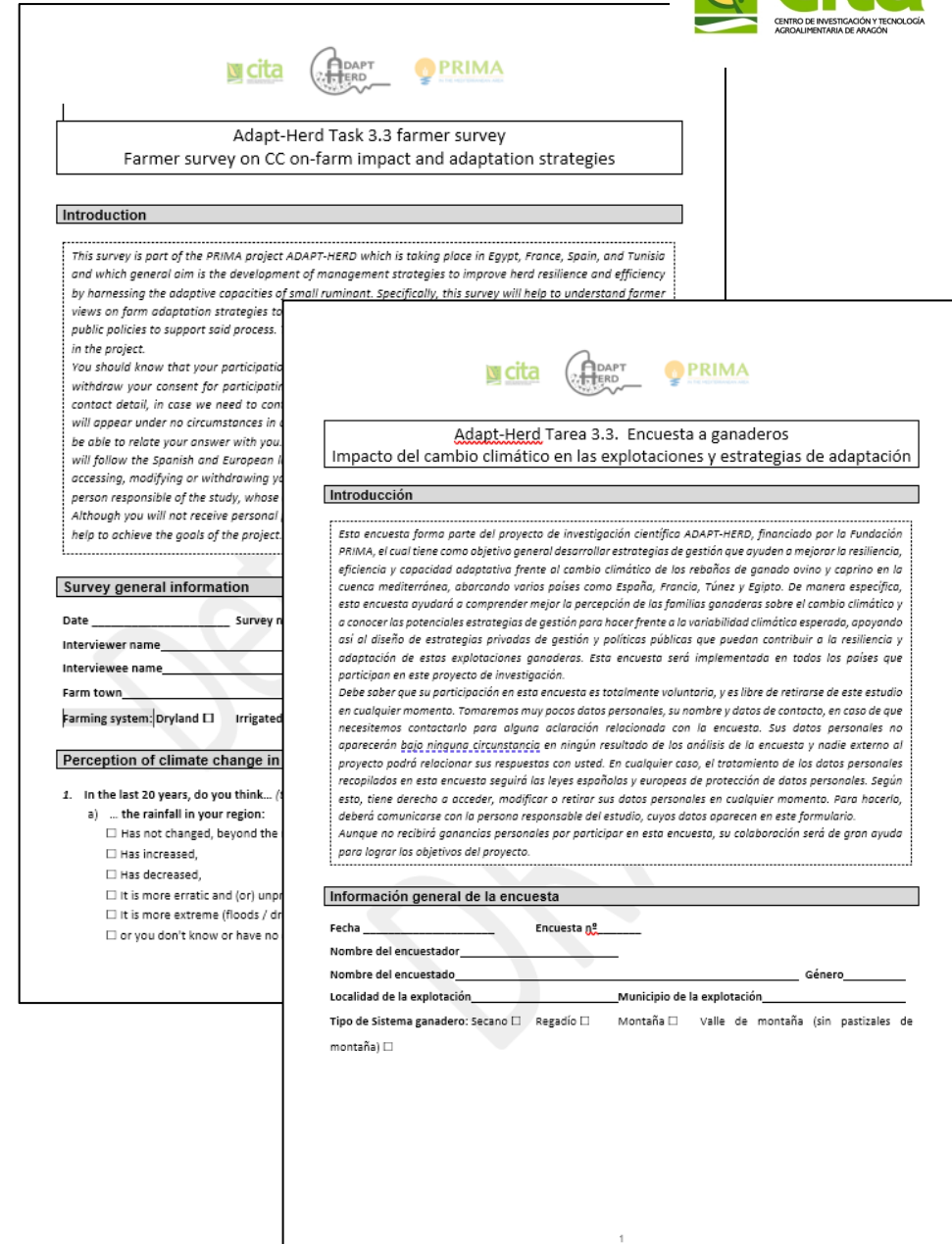
**CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA
AGROALIMENTARIA DE ARAGÓN**

- **Climate change is a reality** in the field
 - There is uncertainty of the extent of the impact... but it will certainly increase
- **Traditional livestock farming systems in the Mediterranean area have adapted** to seasonal (**summer**) and periodic (**droughts and heat waves**) extreme climatic events for centuries.
- Farming systems “attached” to the environment (e.g. small ruminant farming systems) are still adapted.
- Adaptation strategies are usually studied and proposed **using top –down approaches**
 - Farmers are **already adapting to the new conditions**
 - **Actions and strategies from top-down approaches** are usually **difficult to implement** on farms.

- ¿What do Mediterranean farmers think they should do to adapt to climate change?
- ¿Are adaptation strategies dependent on farming systems and countries?
 - ¿What can we learn from all these?

Farmer survey

- Farmer and farm profile
- Farmer views of climate change impact
- Farm actions to adapt to climate change:
 - Future climate change scenarios based on IPCC projections
 - Closed questions about farm adaptation actions

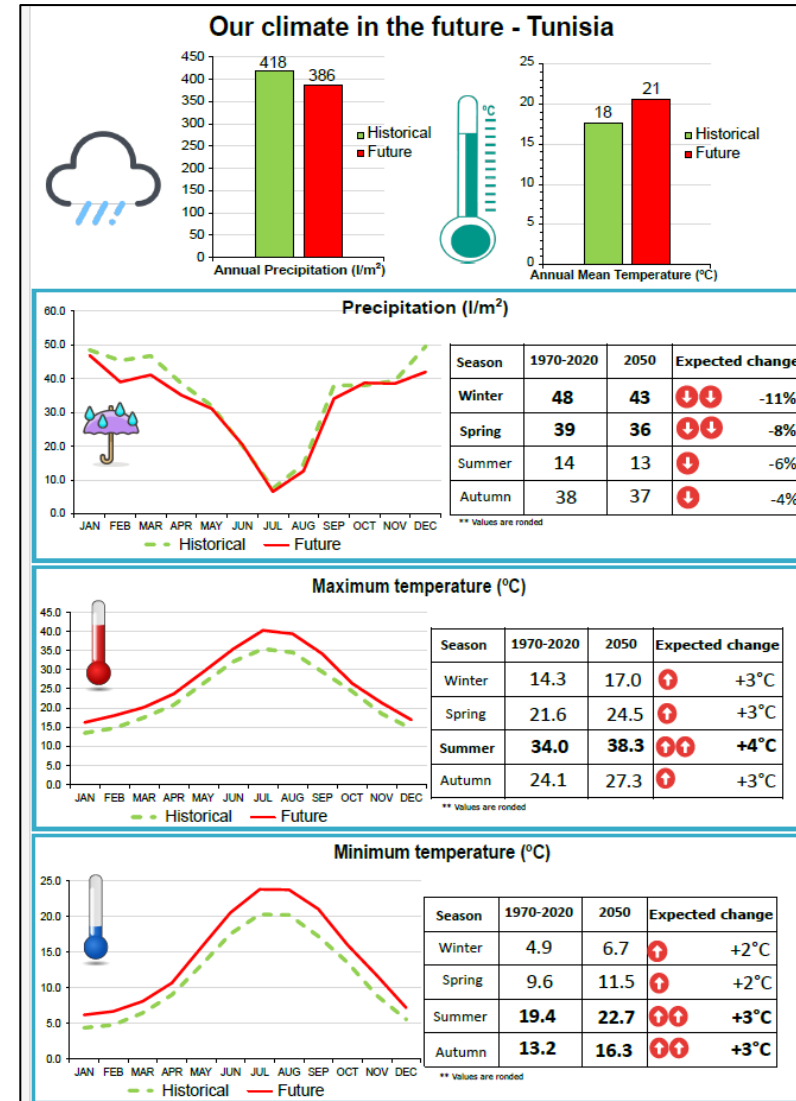


The image shows two versions of a survey form for 'Adapt-Herd Task 3.3 farmer survey'. The top version is in English, and the bottom version is in Spanish. Both forms include logos for CITA, ADAPT-HERD, and PRIMA. The English form has a title box: 'Adapt-Herd Task 3.3 farmer survey' and 'Farmer survey on CC on-farm impact and adaptation strategies'. It includes an 'Introduction' section with text about the PRIMA project and a 'Survey general information' section with fields for Date, Interviewer name, Interviewee name, Farm town, and Farming system (Dryland or Irrigated). The Spanish form has a title box: 'Adapt-Herd Tarea 3.3. Encuesta a ganaderos' and 'Impacto del cambio climático en las explotaciones y estrategias de adaptación'. It includes an 'Introducción' section and a 'Información general de la encuesta' section with fields for Fecha, Encuesta nº, Nombre del encuestador, Nombre del encuestado, Localidad de la explotación, Municipio de la explotación, and Tipo de Sistema ganadero (Secano, Regadío, Montaña, Valle de montaña).

Climate change scenarios (IPCC 2050)

- Scenarios specific for each study region
- Temperature and rainfall
- Similar patterns :

Increase in temperature and decrease of rainfall, particularly in summer



15. Now, let us talk about **grazing and feeding aspects**.

15.1. Would you extend or reduce the grazing season to adapt to the above-described conditions?

Extend grazing season , reduce grazing season , would not modify grazing season , *do not know* .

15.2. Would you extend or reduce the managed grazing area you use?

Extend grazing area , reduce grazing area , would not modify , *do not know* .

15.3. Would you extend or reduce the rangelands area you use?

Extend grazing area , reduce grazing area , would not modify , *do not know* .

15.4. Would you increase or decrease increase diets provided in stable?

Increase , decrease , would not modify , *do not know* .

15.5. Would you increase or decrease food purchase?

Increase , decrease , would not modify , *do not know* .

- **Feeding and grazing:** grazing season and area (managed and natural), diets provided in stable, food purchase
- **Pastures and feeding crops management:** species and varieties
- **Flock management:** flock size, breeds, batching system and choice of reproductive animals (breeding)
- **Reproductive management:** lambing season(s) and reproduction rate
- **Infrastructures:** farm facilities and machinery

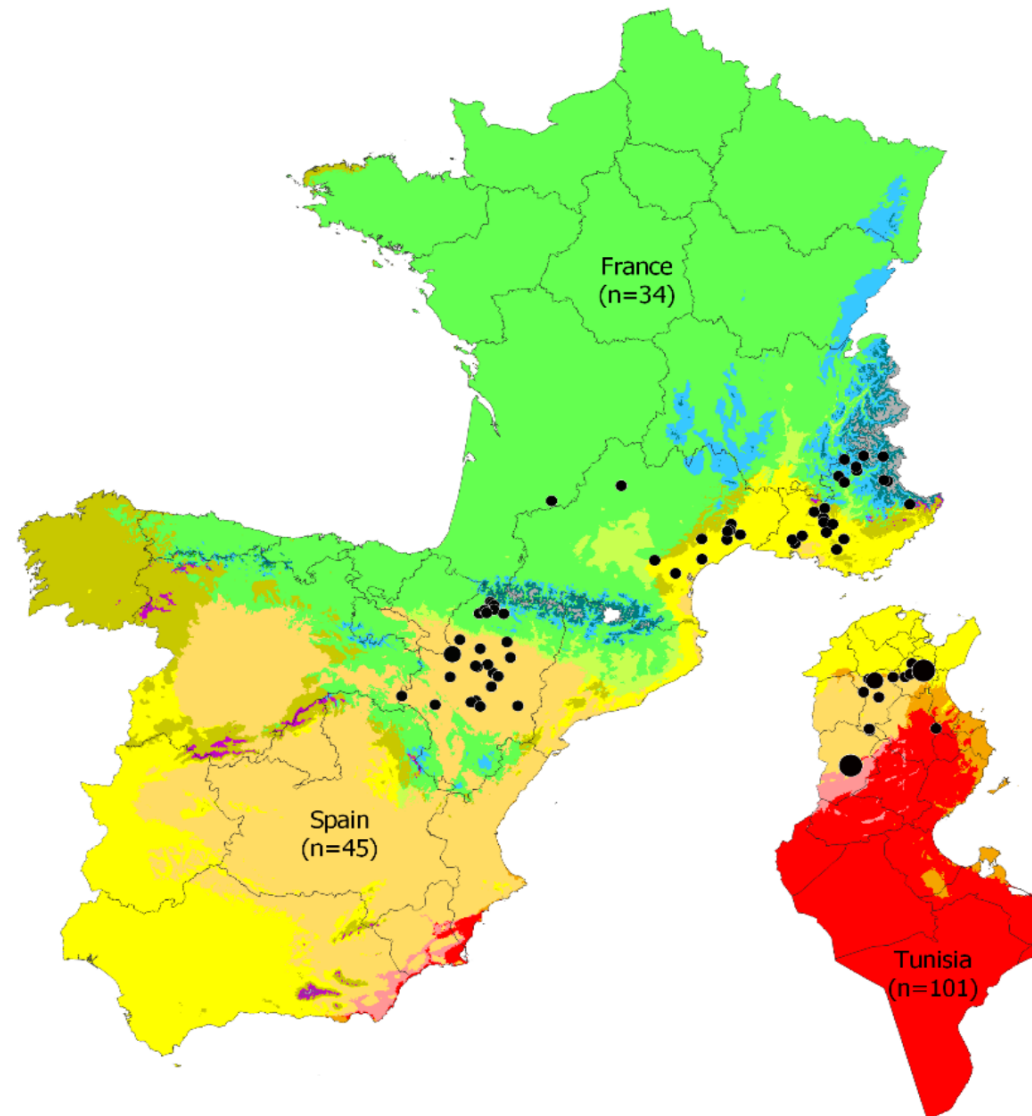
205 surveys

Egypt (n=46)

France (33)

Spain (45)

Tunisia (81)



Areas studied

Surveyed farms

- n : [1-4]
- n : [5-10]
- n : [30-36]

Köppen climate (Beck et al., 2018)

- BWh Arid, desert, hot
- BSh Arid, steppe, hot
- BSk Arid, steppe, cold
- Csa Temperate, dry summer, hot summer
- Csb Temperate, dry summer, warm summer
- Cfb Temperate, no dry season, warm summer
- Cfc Temperate, no dry season, cold summer
- Dsb Cold, dry summer, warm summer
- Dfb Cold, no dry season, warm summer
- Dfc Cold, no dry season, cold summer

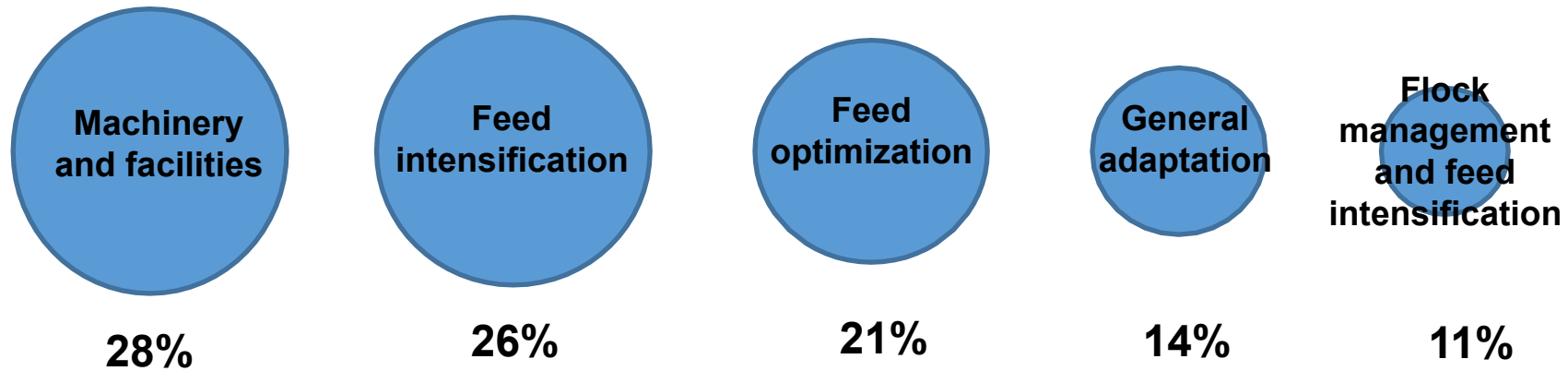
0 100 200 km



1. Identification of adaptation strategies: **cluster analysis** (K-modes)

2. Relationship of strategies (**discriminant analysis**) with
 - Countries and farming systems,
 - Farmers perception about climate change,
 - Farmer profile,
 - Farm features.

Adaptation strategies



Adaptation measures (Modification of...)		Type of adaptation strategies				
		FARM MACHINERY AND FACILITIES (n=58)	FEED INTENSIFICATION (53)	FEED OPTIMIZATION (43)	GENERAL FARM ADAPTATION (29)	FLOCK MANAGEMENT AND FEED EXTENSIFICATION (22)
Cultivation	Plant species* and varieties	No modification	No modification	No modification	Change	Change
Grazing	Grazing season	No modification	Reduce	Extend	Extend	Extend
	Managed grazing area	No modification	No modification	Extend	Extend	Extend
	Natural rangeland area	No modification	No modification	Extend	Extend	Extend
Stable feeding	Diets provided in stable	No modification	Increase	Increase	Increase	No modification
	Amount of food purchased	No modification	Increase	Increase	Increase	Increase
Flock management	Flock size	No modification	Decrease	Decrease	No modification	Decrease
	Batching system	No modification	No modification	No modification	Modify	Modify
	Breeds raised	No modification	No modification	No modification	No modification	No modification
	Selection of more adapted rams**	No modification	No modification	No modification	No modification	Select
Reproductive management	Lambing season	No modification	No modification	No modification	No modification	Modify
	Reproductive rate	No modification	No modification	No modification	No modification	No modification
Facilities and machineries	Improve/build facilities	Improve	No modification	No modification	Improve	No modification
	Introduce new machinery	Introduce	Introduce	Introduce	Introduce	No modification

*Either pastures or feeding crops

**It was highlighted that more adapted rams are usually less productive

Countries and farming systems	Type of adaptation strategies					
	FARM MACHINERY AND FACILITIES (n=58)	FEED INTENSIFICATION (53)	FEED OPTIMIZATION (43)	GENERAL FARM ADAPTATION (29)	FLOCK MANAGEMENT AND FEED EXTENSIFICATION (22)	
Egypt (n= 46)		39%	35%	24%	0%	2%
Intensive (n=15)		47%	53%	0%	0%	0%
Semi-Intensive (14)		50%	29%	21%	0%	0%
Extensive (17)		24%	24%	47%	0%	6%
France (33)		42%	12%	15%	12%	18%
Plain Hills (17)		35%	6%	24%	18%	18%
Pre-Alps (16)		50%	19%	6%	6%	19%
Spain (45)		40%	27%	18%	16%	0%
Irrigated (15)		47%	33%	20%	0%	0%
Dryland (15)		40%	33%	13%	13%	0%
Mountain (15)		33%	13%	20%	33%	0%
Tunisia (81)		10%	26%	23%	22%	19%
Agro-pastoral irrigated (17)		6%	47%	24%	6%	18%
Agro-pastoral rainfed (41)		12%	17%	20%	22%	29%
Agro-sylvo-pastoral (23)		9%	26%	30%	35%	0%

- Farmers see farm **isolation from the environment** (machinery and feed) as the main strategy to adapt to climate change.
 - 80%-46% depending on the country
- Actions related with **reproductive management and breeding** do not seem to be relevant.
- Some farm attached to the environment (e.g. 33% of mountain farms in Spain) pose adaptations related to grazing, feed crop management and batching systems.
- **Limiting factors of farming systems** influence adaptation strategies:
 - Biogeographic: feeding options; pastures availability
 - Technical: irrigation, facilities and machinery
 - Socio-psychological: Rules for the use of pastures, innovative attitudes, livestock farming extension networks, innovation networks.



Thank you!