iSAGE model farm and challenging scenarios

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Challenges in Mediterranean/European small ruminants sector-Policies

- Different policies affect/may affect in future
- Agricultural policies (CAP), climate change (Paris Agreement) and environmental regulations
- Policies need to be considered in integrated frameworks and not in isolation







The tool at farm level













The tool to analyse farm scenarios:



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Simulates the effect of management x genetics x soil x climate on

> Farm environmental performance (losses of N and C {and sinks of soil SOC}) Basic economics Other atributes of sustainability

Boundaries: Farm, includes pre-farm gate emissions Generic submodels Main use: strategic run what-if scenarios (current, future)



6 Flocks : 3 ewe/doe, adult male, lambs/kids, Young (Non-kids/lambs)

Each flock is simulted (daily) feeding according to:

- Management
- availability of farm feed
- weight/weight gain/loss
- production level



MJ simulated intake/day ewe





6 Flocks : 3 ewe/doe, adult male, lambs/kids, Young (Non-kids/lambs)

DRY MATTER INTAKE



Kg DM simulated intake/day ewe for each type of feed





How much do they excrete? (urine & faeces)

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N balance (simulated) at the Flock level SIMSSR



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Examples at farm level (meat sheep)-impacts climate change at farm level





Modelled with SIMS_{SR} (Del Prado et al. 2019) •

- Breed: rasa Aragonesa
- Meat production (lamb)
- 1.5 births/year
- Location: Zaragoza (Spain)
- Number of ewes: 550

FEED

- Grazed marginal land (pastures)
- Grazed rainfed alfalfa
 - Alfalfa hay (homegrown harvest or purchased)
 - Cereals (homegrown barley)
 - Barley straw (homegrown barley)
 - Concentrates

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We need to buy more forage and concentrates are required because of reduced yields due to climate change



Examples at farm level (dairy sheep)adaptation to climate change at farm level

More adapted/resilient animal breeds and grass/pasture breed

The greatest emphasis should be on targeting traits that can have synergistic effects with more than one stressors for animals (e.g. animals with enhanced productivity and fertility regardless of climate) and plants (e.g. grasses that can both tolerate drought and flooding).



Increase animal thermo-tolerance and/or fertility



ANIMAL TRAITS

- Enhanced thermotolerance (HT-Breed)
- Enhanced fertility (Fert-Beed)

Dairy sheep system in Greece (Chios breed)





Increase animal thermo-tolerance and/or fertility



Production in Europe

Examples at farm level (meat sheep)innovation



INNOVATION AND SUSTAINABILITY

The sustainability of the sheep farms can be achieved by making them economically and socially viable. In this sense by incorporating the ROA allele, profitability can be increased without reducing the use of coarse pastures that are only grazed by sheep. It maintains livestock farming in the rural area thus preventing the abandonment of villages and maintain the

surrounding landscape.





The ROA alelle has been successfully spread across the Rasa Aragonesa sheep population increasing to those farms willing technically prepared to increase prolificacy



The ROA allele increases prolificacy without increasing fertility or lamb mortality



Farmer management of twin lambings and attention to lambs to avoid mortality are key to make the most of the introduction of the ROA allele in the flock



Genetic management at farm and population level is key to avoid downsides of the ROA allele related to infertility caused by homozygosity

PROLIFICACY GENES INCREASE FARM PROFITABILITY WITHOUT INCREASING FLOCK SIZE OR INTENSIFYING PRODUCTION



- Breed: rasa Aragonesa
- Meat production (lamb)
- Location: Zaragoza (Spain)
- Number of ewes: 550



FEED

- Grazed mountain pastures
- Grazed rainfed alfalfa
- Alfalfa hay
- Cereals (homegrown barley)
- Barley straw (homegrown barley)
- Concentrates





Modelled with $SIMS_{SR}$ (Del Prado et al. 2019)









Examples at farm level Reducing grazing in marginal land (for extensive systems), ¿is it good/bad for the environment?



Example: meat sheep rasa-aragonesa in Spain

How much arable land would it be required to produce meat at different grazing level?





SAGE Innovation for Sustainable Sheep and Goat Production in Europe How much arable land would it be required to produce meat at different grazing level?

Reducing grazing requires a shift from using marginal land (not suitable for other agricultural purposes except forest) to using more arable land (land suitable to grow crops that can be directly consumed by humans)





Do emissions drop by reducing sheep grazing in marginal land?





Are (small) ruminants to blame for climate change?







https://www.youtube.com/watch?v=NbO4EEaH7YM&t=29s

Innovation for Sustainable Sheep and Goat Production in Europe Modelling impacts of climate change, adaptation measures and GHG trade-offs/synergies in small rums. in Europe

Elena Galán

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Sustainability, that's it!

Guillermo Pardo

Maria Almagro

Inmaculada Batalla

Asma Jebari

Aitor Andone

Thanks

Gracias

Merci



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