HOW TO ADAPT THE AGRO-PASTORAL SYSTEMS TO GLOBAL CHANGE: EXPERIMENTAL APPROACHES FOR DESIGNING SUITABLE ALTERNATIVES

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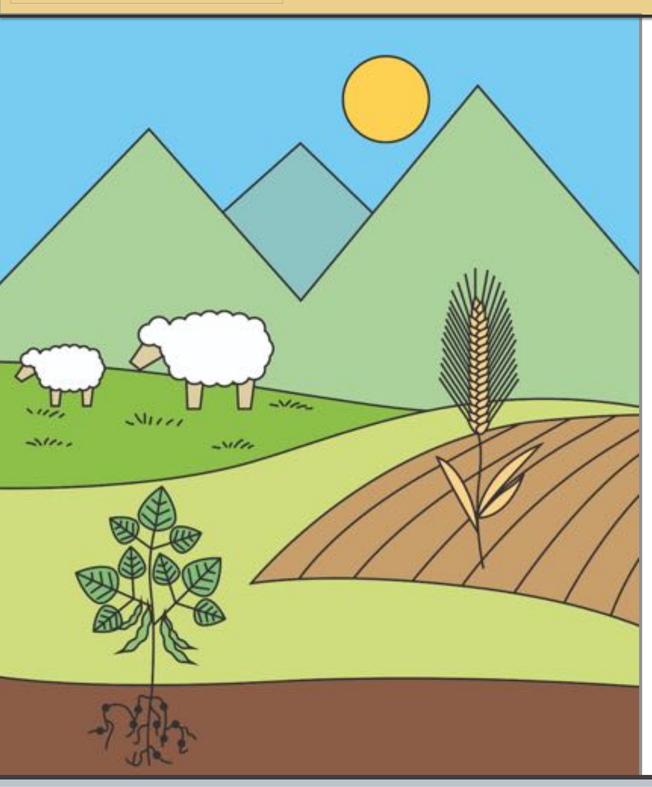


The global change, which includes climate change (warming, drought, etc.) and land use change, has been defined as the most change driver governing the planet future. These changes modify plant growth and productivity, food quality, and productive systems' sustainability and resilience. In fact, global change is transforming food production systems, such as agricultural crops and extensive grazing in mountain areas, altering species distribution, production practices and land use.

In this context, basic and applied research is needed to understand, not only the impact of climate change on plant production and quality, but also the adaptation capacity of agricultural crops and grassland resources to climate change, seeking new strategies to minimize its negative impact and to favour production sustainability under the future climatic conditions.

Specifically, in our research group (IT1022-16), the following three experimental approaches are been performed currently:

EXPERIMENT 1

Fig 1. Field trial

Fig 2. Greenhouse

Fig 3. Growth chamber

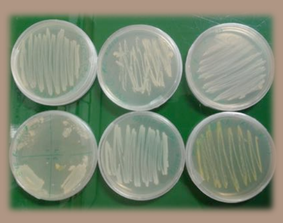


Fig 4. Petri dish culture of rhizobia

Fig 5. 12 varieties of common beans

Fig 6. rhizobia nodules

Fig 7. bean plants on pots

OBJECTIVE

Search for a high efficiency *Phaseolus vulgaris* rhizobia symbiotic association, to increase the production of common beans in drought conditions.

METHODOLOGY

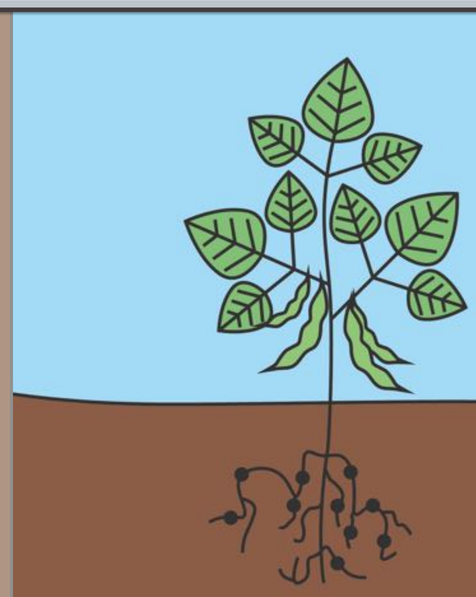
12 varieties of common beans and several rhizobia strains have been evaluated under well-watered and drought conditions in field trials, greenhouse and growth chamber conditions.

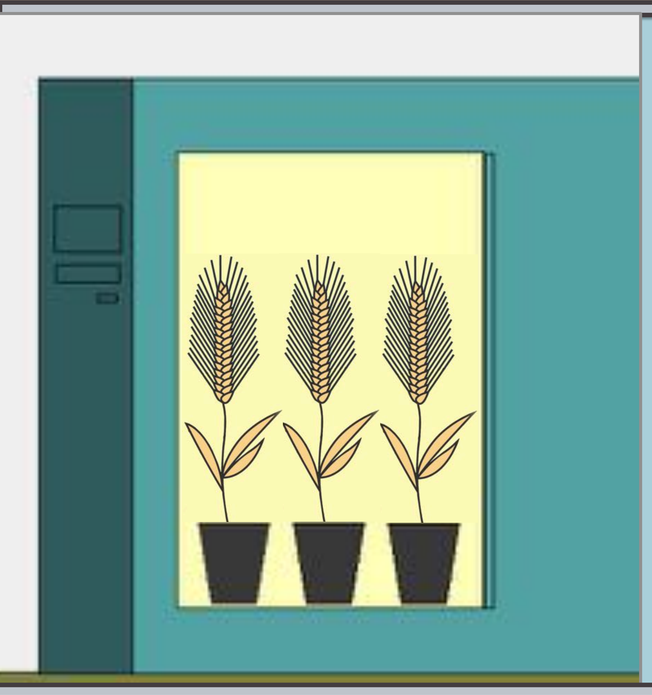
EXPECTED RESULTS

To obtain efficient rhizobia stains against drought to improve the legume sustainable production under climate change conditions and facilitate the improvement of agronomic systems.

BENEFITS

- Decrease of fertilizer and pesticides impact.
- Lower consumption of water resources.
- Increase crop quality and productivity in a sustainable way.





EXPERIMENT 2

CO_2 treatment
400 μ mol CO_2 mol^{-1} air
700 μ mol CO_2 mol^{-1} air

T treatment
23/17°C
26/20°C

Water treatment
Well irrigated
Vegetative drought
Reproductive drought
Vegetative and reproductive drought

Fig 8. Example of an experimental design

Fig 9. Scholander pressure chamber

Fig 10. Osmometer

Fig 11. Microplate reader

Fig 12. gas exchange analyser

Fig 13. Ball mill, MM-400

OBJECTIVE

To understand how climate change affects barley production and quality, and to select which are the most important physiological traits that determine these impacts.

METHODOLOGY

Barley plants were grown in environmental controlled growth chambers where more than one climatic variable together can be simulated. Physiological and metabolic measurements on growth, water relations, photosynthetic, nitrogen, and antioxidants metabolism are done.

RESEARCH INTERESTING TO…

…breeders in order to advice on which plant parameters should they take into account to maintain or maximize productivity and quality with future increases of CO_2 and temperature, and transfer this information to politicians and farmers.

EXPERIMENT 3

Extensive dairy sheep system

Fig 14. Farm/Valley

Fig 15. Latxa breed sheep

Fig 16. Mountain pastures

Other aspects of cosideration

Fig 17. Carbon sequestration

Fig 18. Biodiversity

Fig 19. Ecotoxicity

OBJECTIVE

The aim of the experiment 3 is to analyze the environmental impacts of dairy sheep farms using the LCA methodology (Life Cicle Assesment).

METHODOLOGY

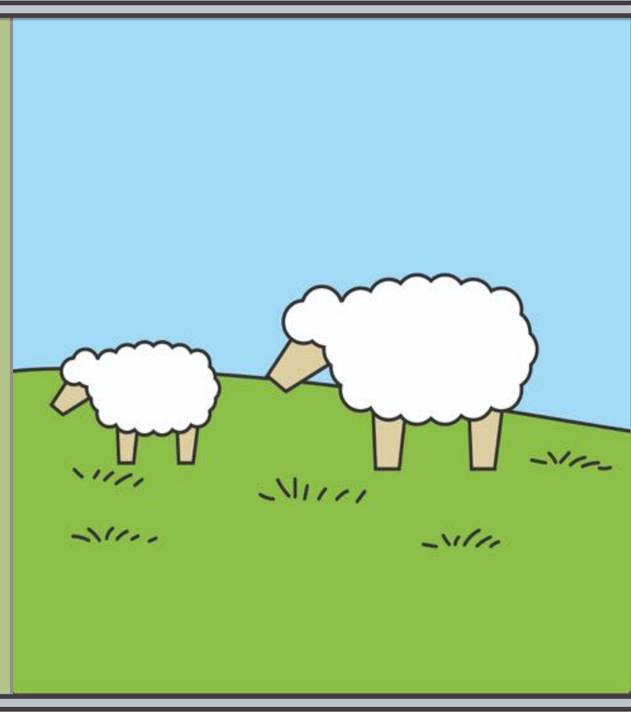
To perform the LCA the data of 30 sheep farms of the Latxa breed have been collected (24 conventional farms and 6 organic farms).

EXPECTED RESULTS

Worse results in the case of organic farms due to the lack of local and specific data and the "productivity-based" view of the methodology.

CONCLUSIONS

It would be necessary to consider other aspects that could balance the comparison between typologies, such as carbon sequestration, biodiversity and ecotoxicity, among others.



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