# Possible impacts of climatic changes on the productivity of natural grasslands in Ovalle, Coquimbo region, Chile.

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## 1. Introduction

The productivity of natural grasslands is strongly linked to the climatic conditions of the considered area, mainly to the rainfall and to the humidity stored in the soil. Therefore, any change in climate can have serious consequences. In Chile, the Coquimbo region is within the zone classified as arid and semi-arid. During the year, precipitation is concentrated in the winter months. There is also great interannual variability, mainly due to the phenomenon of El Niño, Southern Oscillation (ENSO), which in its cold phase often produces extreme droughts that can last for several years, whereas an increase in amount and intensity of precipitation can be expected in the warm phase it can be produce increases in the amount and intensity of precipitation. Studies on precipitation in the center-north of Chile in the 20th century show a positive trend between the 1970 and 1980 years and a negative trend during the last 3 decades. For the period 1979-2005, the temperatures have a slight increase in the valleys of the central-north zone. Changes in the precipitation regime can induce variations both in the yields and in the seasonality of the grasslands, affecting mainly the small agricultural communities, which see their income reduced and the level of food self-sufficiency. In the Coquimbo region, most of these communities base part of their income on the production of pastures, which are used as food for the goats that produce milk and cheese. The objective of this work was to establish the possible impacts that climatic changes can have on the productivity of natural grasslands in the commune of Ovalle, Coquimbo region.

## 2. Methodology

### Study Area

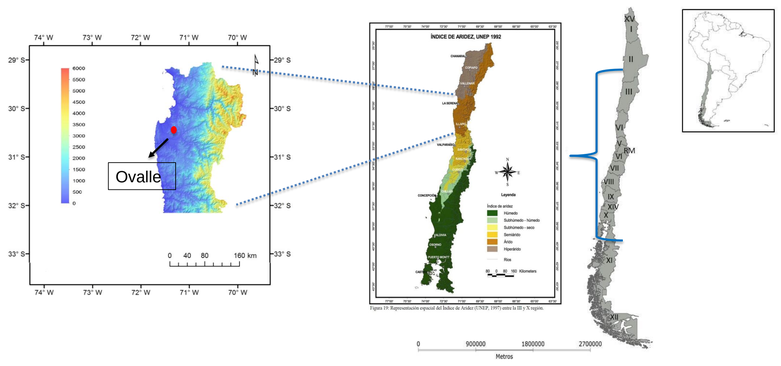


Figure 1. Study area

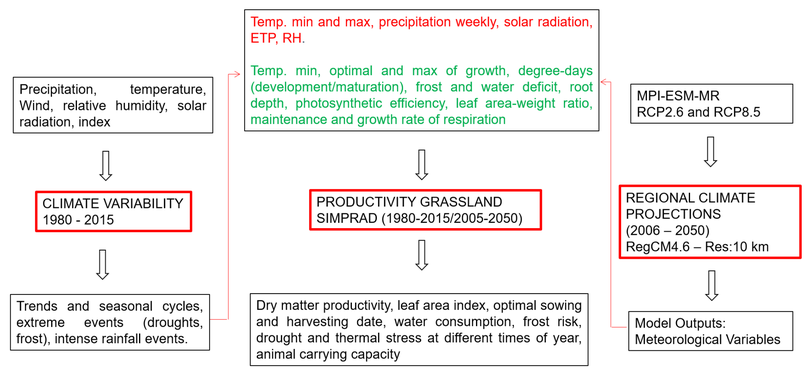


Figure 2.Diagram methodology

### Data

- Meteorological: General Directorate of Water (DGA)
- Regional projections: Center for Climate and Resilience Research (CR2)/Ministry of Environment (MMA)

## 3. Results

### Observational

It can be seen that productivity, in general, follows rainfall (Figure 3). According to what is observed in figure 4, productivity and precipitation cease to have such a direct relationship, when rainfall is higher than the average for the region (average period 1980-2015 in Ovalle 107 mm).

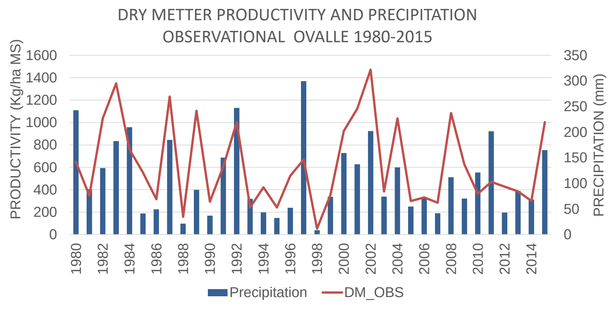


Figure 3. Productivity DS grassland and precipitation observational, 1980-2015,

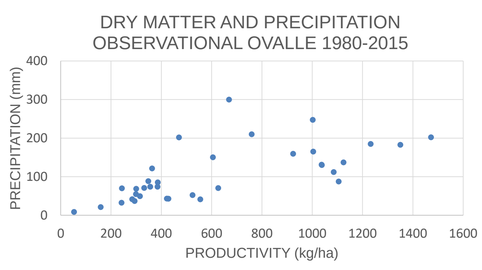


Figure 4. Productivity and precipitation 1980-2015

The productivity of the dry matter, as a result of the future projections, for the middle of the 21st century (Figure 5), shows a decrease under both scenarios, being the RCP8.5 where a greater fall in the productivity is observed.

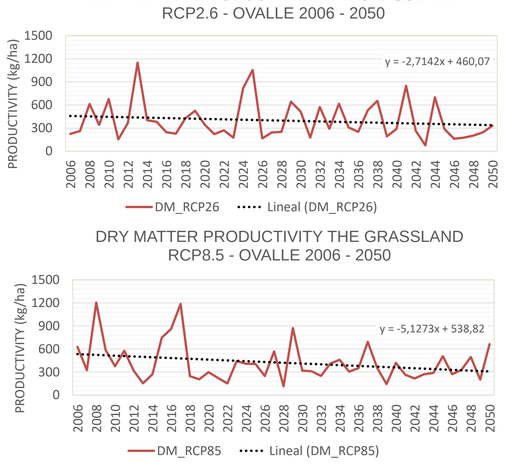


Figure 5. Dry matter productivity and trends 2006 -2050 for RCP2.6 and RCP8.5.

Pasture productivity based on future projections seems to have a less direct relationship between them (Figure 6), mainly in the RCP26. It is important to remember that other climatic variables, geo-morphological and geographical characteristics, also determine productivity.

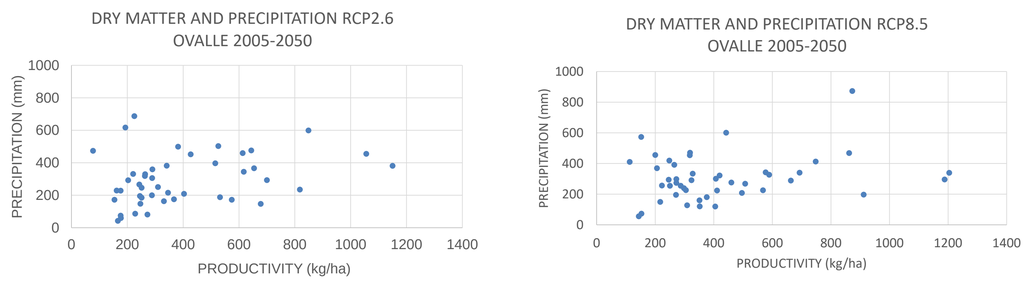


Figure 6. Productivity and precipitation RCP2.6 and RCP8.5

The extreme temperatures projected for the month of July, would increase, being the minimum temperature the one that would have a greater increase (approximately 2 ° C), while the maximum temperatures only show a greater increase in the scenario RCP8.5. Probably, an increase of the minimum temperatures, would imply a decrease of frosts that can damage to the plant, being able to avoid a diminution of the productivity due to other factors

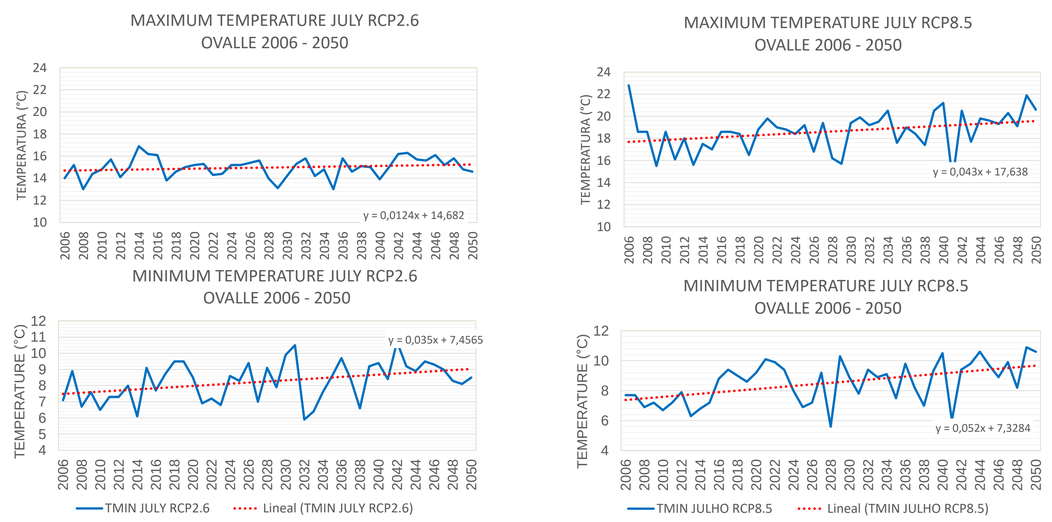


Figure 7. Extreme temperature and trends in july for RCP2.6 and RCP8.5

## 4. CONCLUSION

The objective of this work was to make a first exploratory analysis of the possible impacts of future climate changes and the productivity of the natural grassland, using climate and agroclimatic modeling tools. According to these results, the grassland would be affected by changes in the climate, being several factors that can affect together, so it is important to make a deeper analysis. In addition, it is important to validate the climate model, since it may be delivering biases in the productivity results of the grassland.

## Acknowledgment

CORDEX Central America and South America Training Workshop on Downscaling Techniques
Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)

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