# Climate change, soil, forest and agriculture

* Agriculture is the major land use. Currently ≈1.2–1.5 billion hectares are under crops, with another 3.5 billion hectares being grazed

* The agriculture and livestock use 70% of water extracted and, together with forestry, occupy 60% of Earth's land surface. Livestock production alone uses globally 80% of cropland and pasture. Food systems consume 30% of global energy

* The millions of staff managing agricultural and food are the main group of natural resource managers on the planet.

# Agriculture can contributes to climate change

* 30% of GHG come from agriculture – for example methane emissions from livestock and manure, and nitrous oxide emissions from chemical fertilisers

* Agriculture alters the Earth's land cover, which can change its ability to absorb or reflect heat and light.

* Land use change such as deforestation and desertification, together with use of fossil fuels, are the major anthropogenic sources of carbon dioxide

* In Europe, North America ,a combination of intensive farming practices, food storage, retail systems and habits generates high emissions of greenhouse gases and a high food waste per person.

BUT agriculture can also be an important global source of environmental goods such as climate change mitigation, protection of watersheds and the conservation of biodiversity, especially of agricultural biodiversity

# How? Changing the way we do it

* To promote a sustainable intensification of agricultural production while reducing emissions of greenhouse gases and other negative environmental impacts of agriculture. (implementing sustainable practices as C sequestration, rational fertilization, etc..).
  * Promoteing rational fertiliation and organic fertilization
  * Increasing C sequestration
  * Enhancing pests biological fight
  * Preserving soil structure and characteristics. No-till systems
  * Reducing soil labours
  * Improving water management
  * Using alternative energy sources
  * Improving animal nutrition performance

* To develop, facilitate and reward systems that allow MULTI BENEFIT agricultural livelihoods and ecosystems more productive and resilient, with a focus on improving crop yields and nutrition.
* To develop strategies for minimizing ecosystem degradation and rehabilitate degraded environments.
* To empower marginalized food producers (especially women) to increase the  production and to improve richness distribution

# Agriculture /Food supply and climate change.

- Climate change will affect, undoubtedly, crops productivity, biochemical cycles and species distribution. i.e.

  - Shortage on water availability or unequal distribution will lead to changes in agricultural patterns.
    - New crop distribution
    - New agricultural practices
  - Higher Tº and different soil moisture will "redefine " nutrient cycling
  - Extreme "heat waves" will reduce crop yield
  - Changes on seasonal Tº and rainfall will provoke changes on plant phenological evolution (flowering, blossoming..)

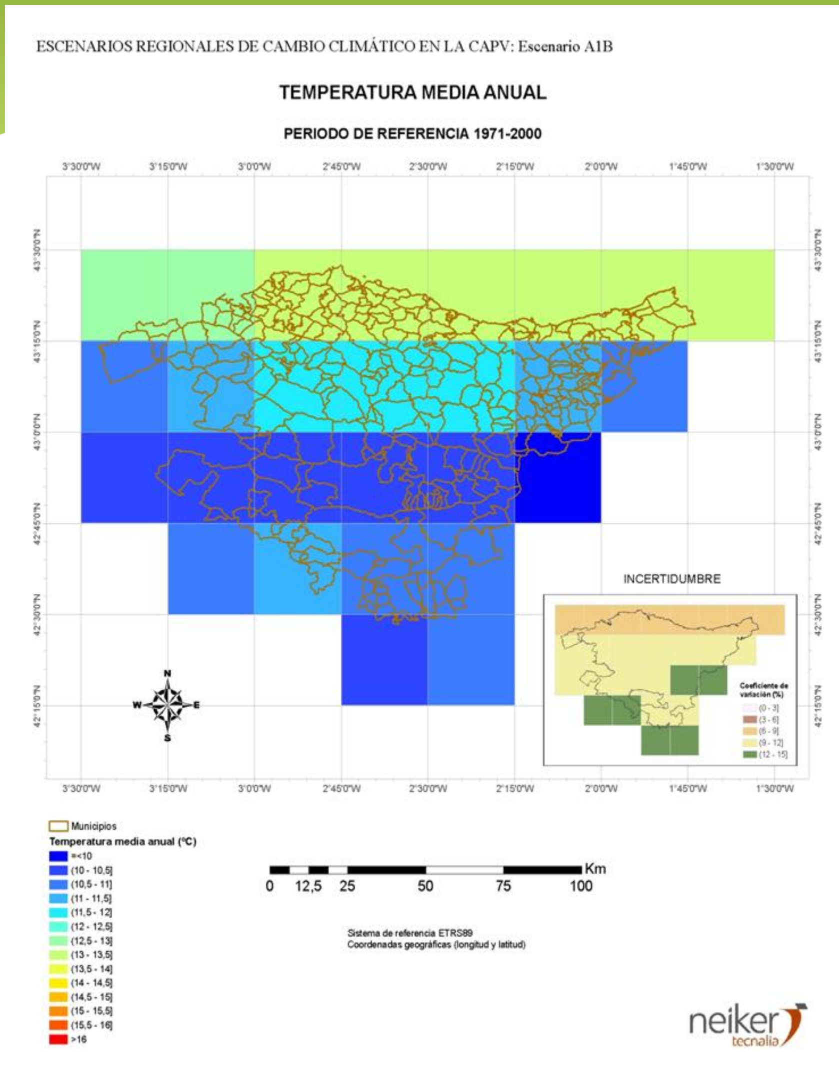
- Many weeds, pests and fungi thrive under warmer temperatures, wetter climates, and increased CO2 levels. The ranges of weeds and pests are likely to expand northward. Moreover, increased use of pesticides and fungicides may negatively affect human health

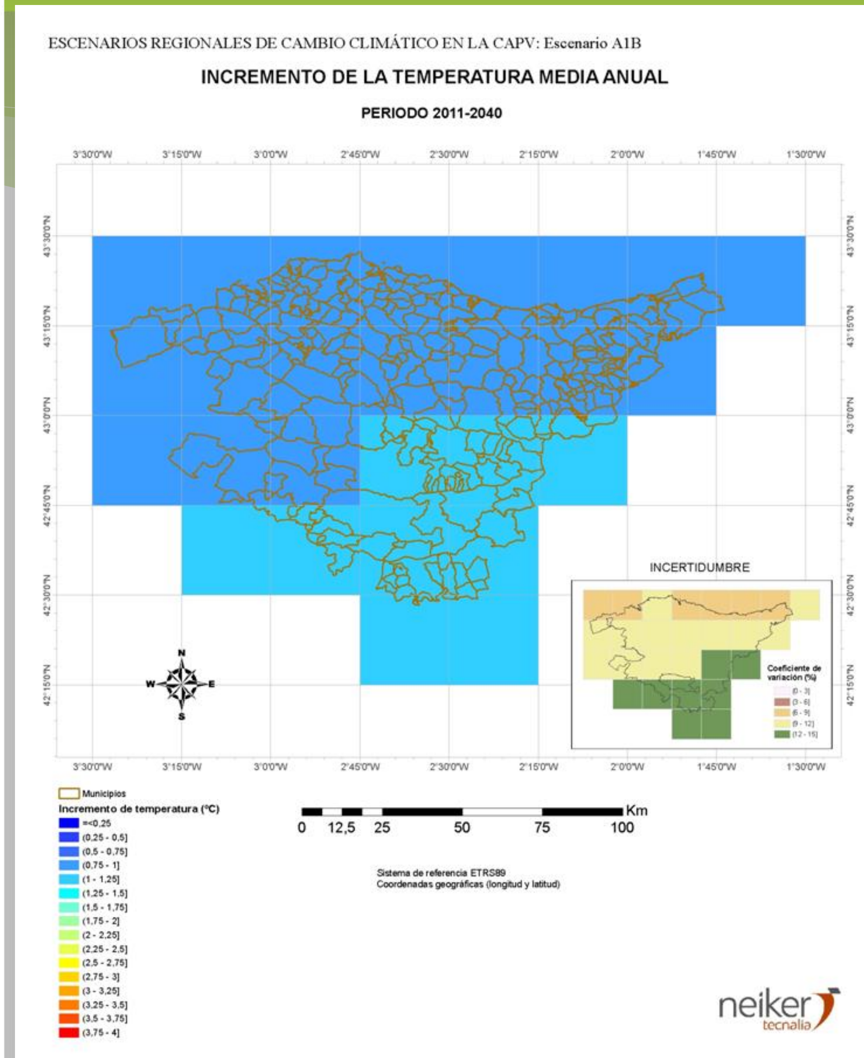
It is essential to consider the current and expected climatic changes to obtain the highest land performance with the lowest environmental impact.

This is a fundamental part of Sustainable Intensification of Agricultural Production

# How is Climate Change affecting the CAPV?

# Climatic scenarios



# Temperature-Precipitation-Evaporation-Wind-RAD. SHORTWAVE:

Average daily temp increases: 1.25 - 4 ° C in A2, and 1-3 ° C in B2. Max temp. 0.18 º C / decade, T ª min.
0.35 º C / decade

Increase more accused in spring and summer, 0.1 - 0.2 º C / decade with respect to the other stations.

Minimum temp: more generalized increase in all seasons,

Max temp: no significant increase in winter and autumn in many of the series studied.

Increased number of days and warm nights and fewer cold days and nights.

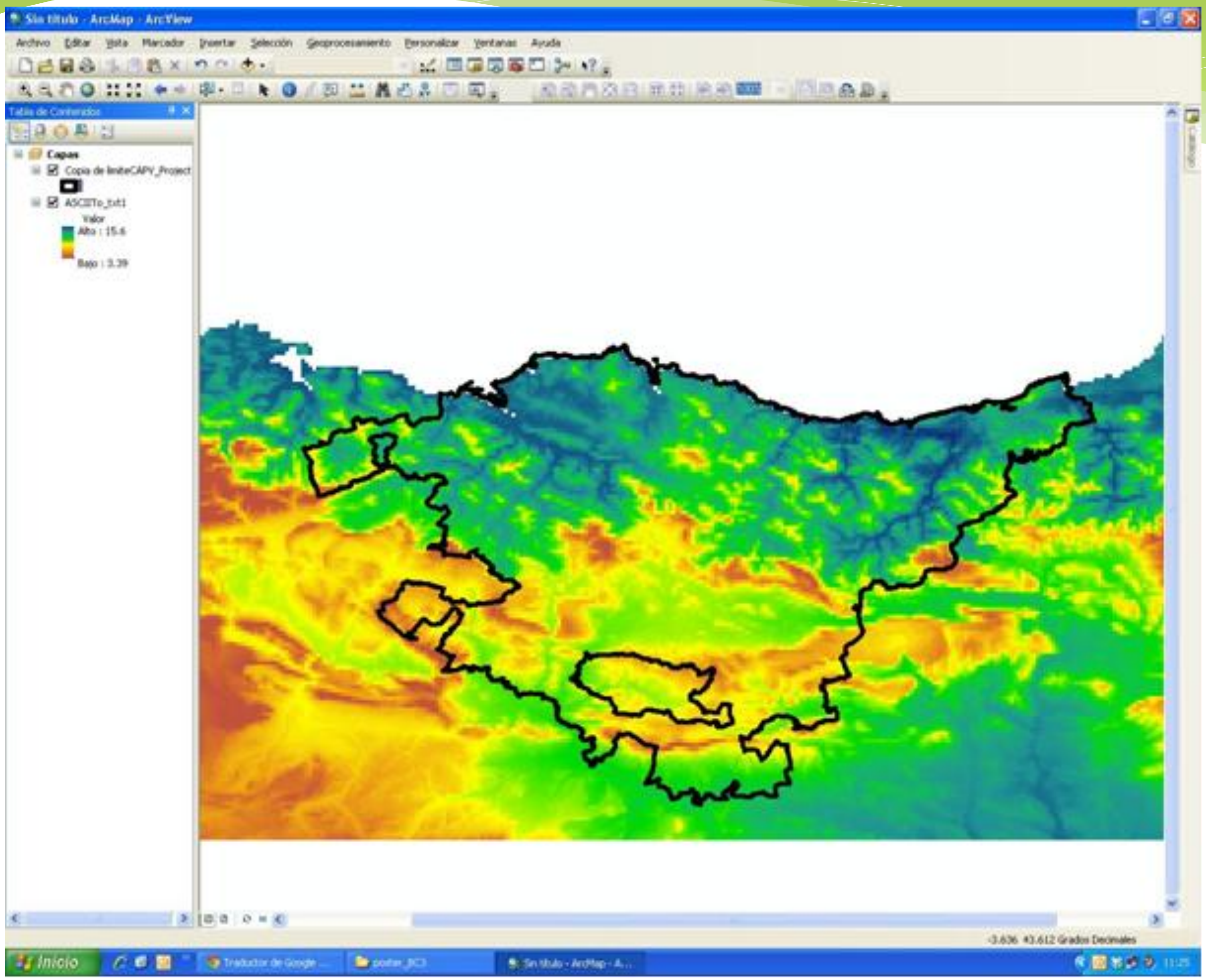
Decreased annual precipitation up to 350 mm in A2 and 275 mm in B2.

Decreased frequency of rain days exceeding thresholds 1, 5 and 10 mm.

Increase the days of over 30 mm (very heavy rain).

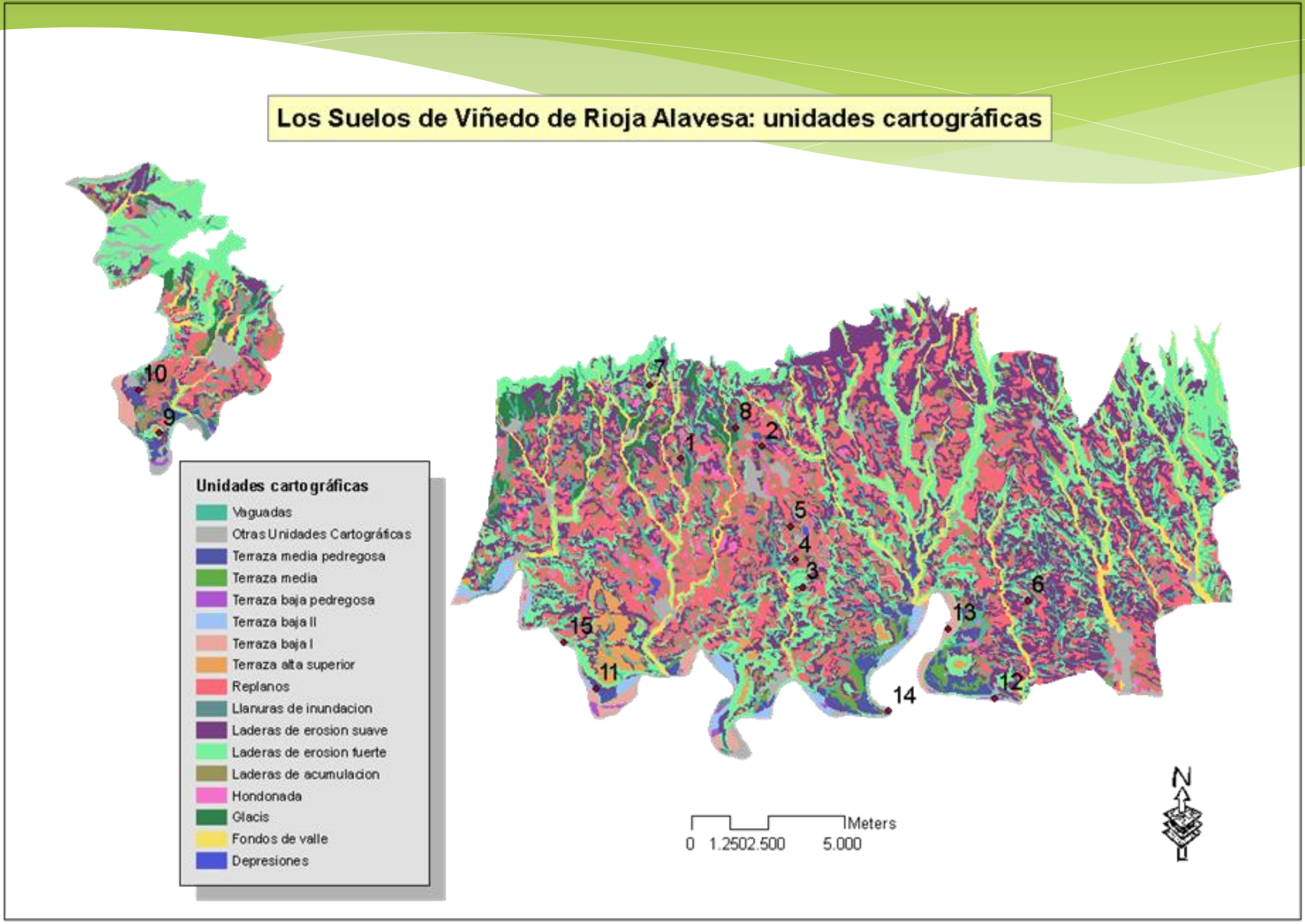
Decrease in wind speed at 10 m, especially in autumn.

Increased shortwave radiation incident on the surface.


Sin título - ArcMap - ArcView
Archivo Editar Vista Marcador Insertar Selección Geoprocesamiento Personalizar Ventanas Ayuda
Tabla de Contenidos
Capas
Copia de limiteCAPV_Project
ASCIITo_txt1
Valor
Alto : 15.6
Bajo : 3.39
Inicio

1km*1km

* Most of these consequences will be related to soil characteristics, (the same change for different soils will lead to different consequences). This aspect must be included on future scenario prediction


Los Suelos de Viñedo de Rioja Alavesa: unidades cartográficas
Unidades cartográficas
Vaguadas
Otras Unidades Cartográficas
Terraza media pedregosa
Terraza media
Terraza baja pedregosa
Terraza baja II
Terraza baja I
Terraza alta superior
Replanos
Llanuras de inundacion
Laderas de erosion suave
Laderas de erosion fuerte
Laderas de acumulacion
Hondonada
Glacis
Fondos de valle
Depresiones
Meters
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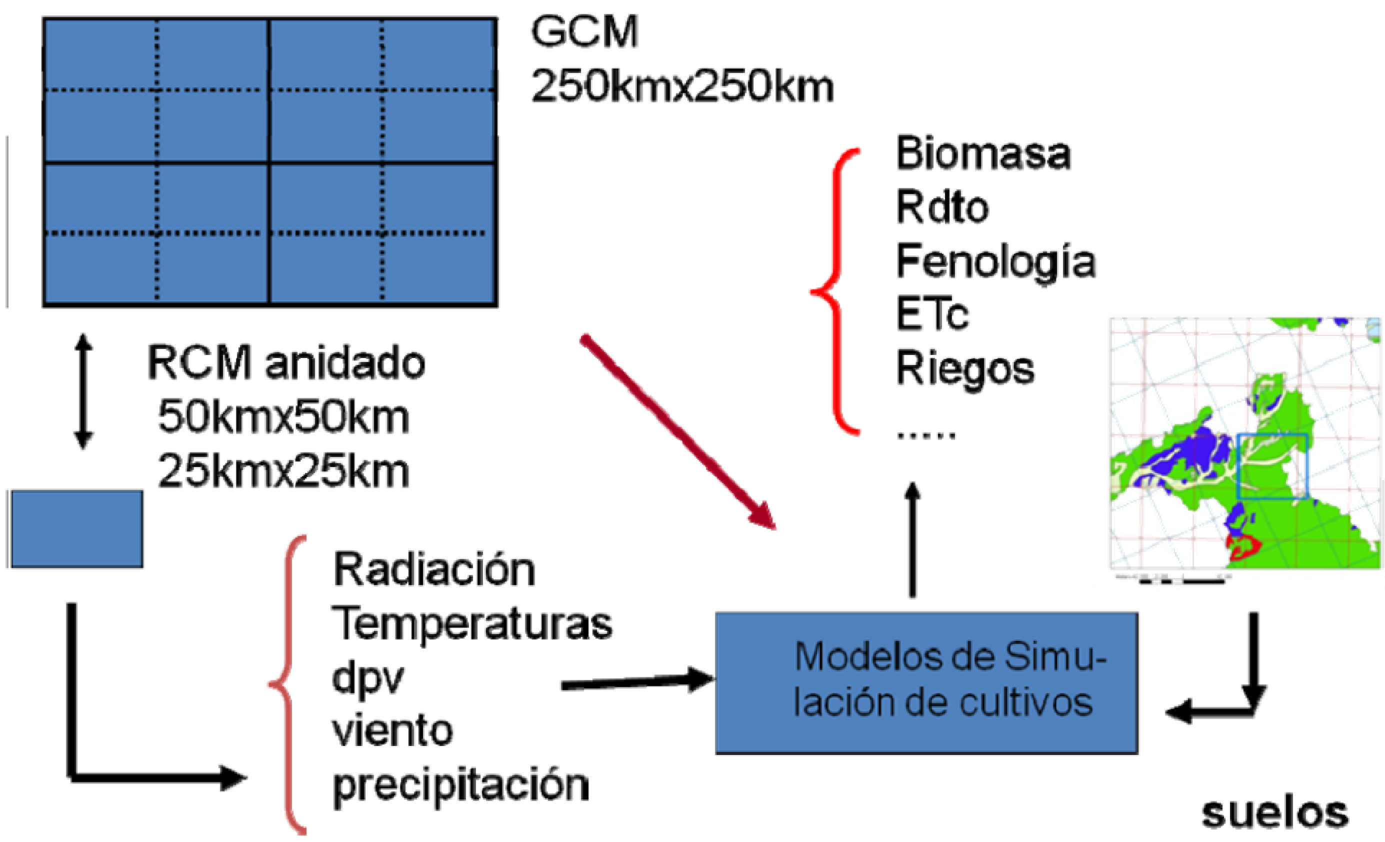
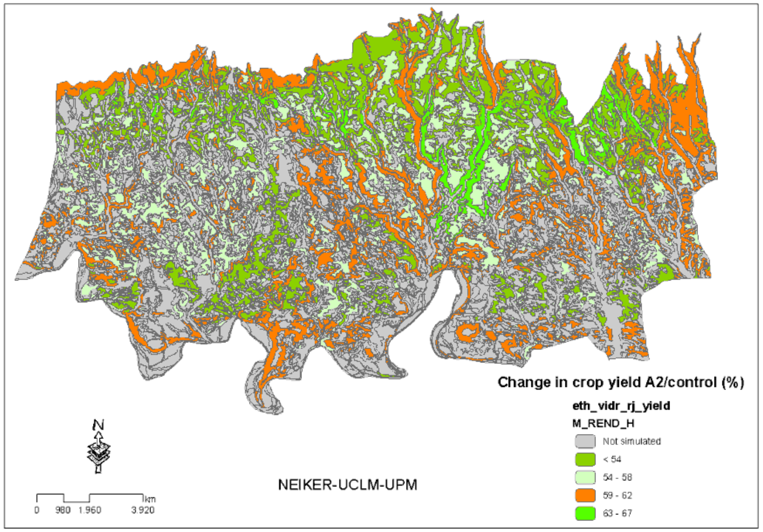
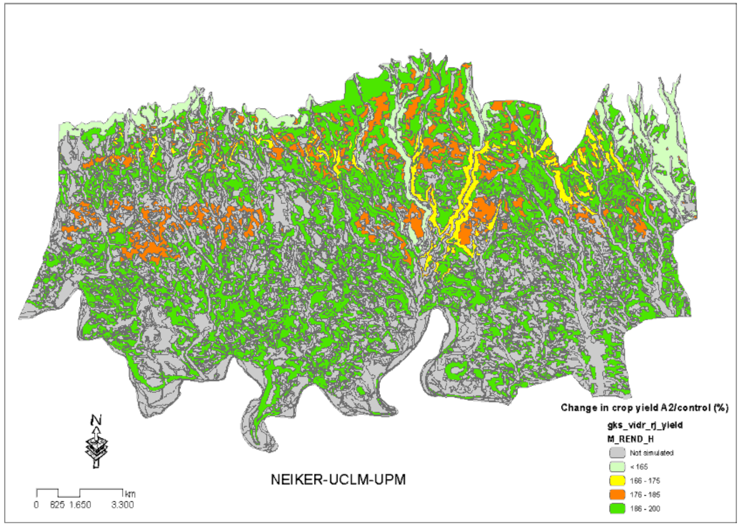



Adaptado de Guereña et al. Agronomy J. (2001); Mínguez et al. J. Physique (2004).

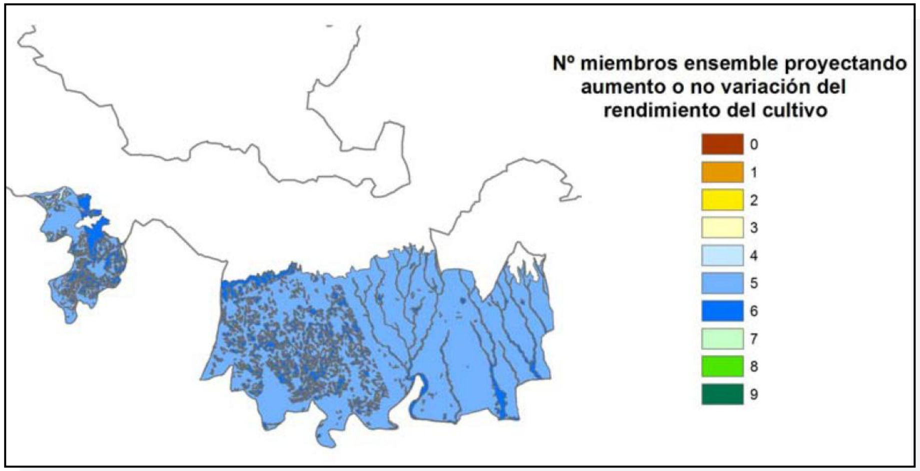
# Vineyards,  preliminary results




**Simulation model STICS-Vid "Tempranillo" with PROMES climate model. Control and A2 scenario. STICS model.**

**Total irrigation 150 mm (till August). Se están simulando medidas de adaptación (Riego adelantado - atrasado).**




Mapa de incertidumbre

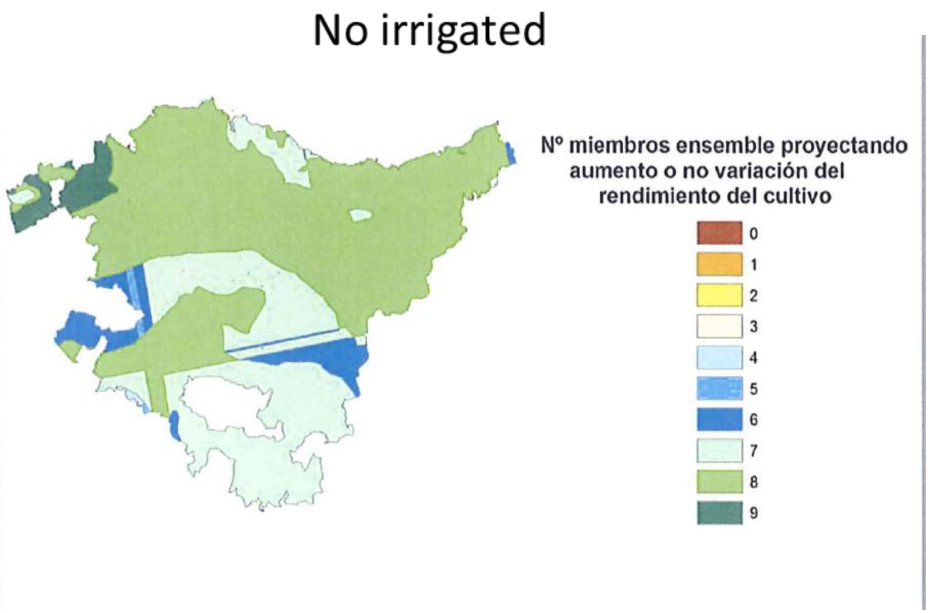
6 RCMs ↑

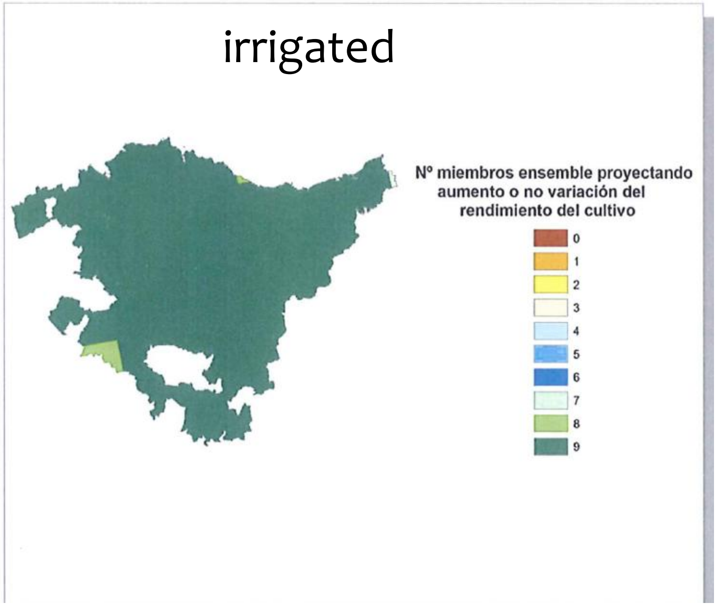
3 RCMs ↓

* The main expected effects are:

* a greater alcoholic degree
* Change in the Irrigation patterns to achieve the increased productivity that the change in temperature enables
* Advancement of harvest date,
* Changes in phenology

When cerals production is studied, most of the models establish an increase on yield if water is not a limiting factor



# Forest species distribution affected by climate change

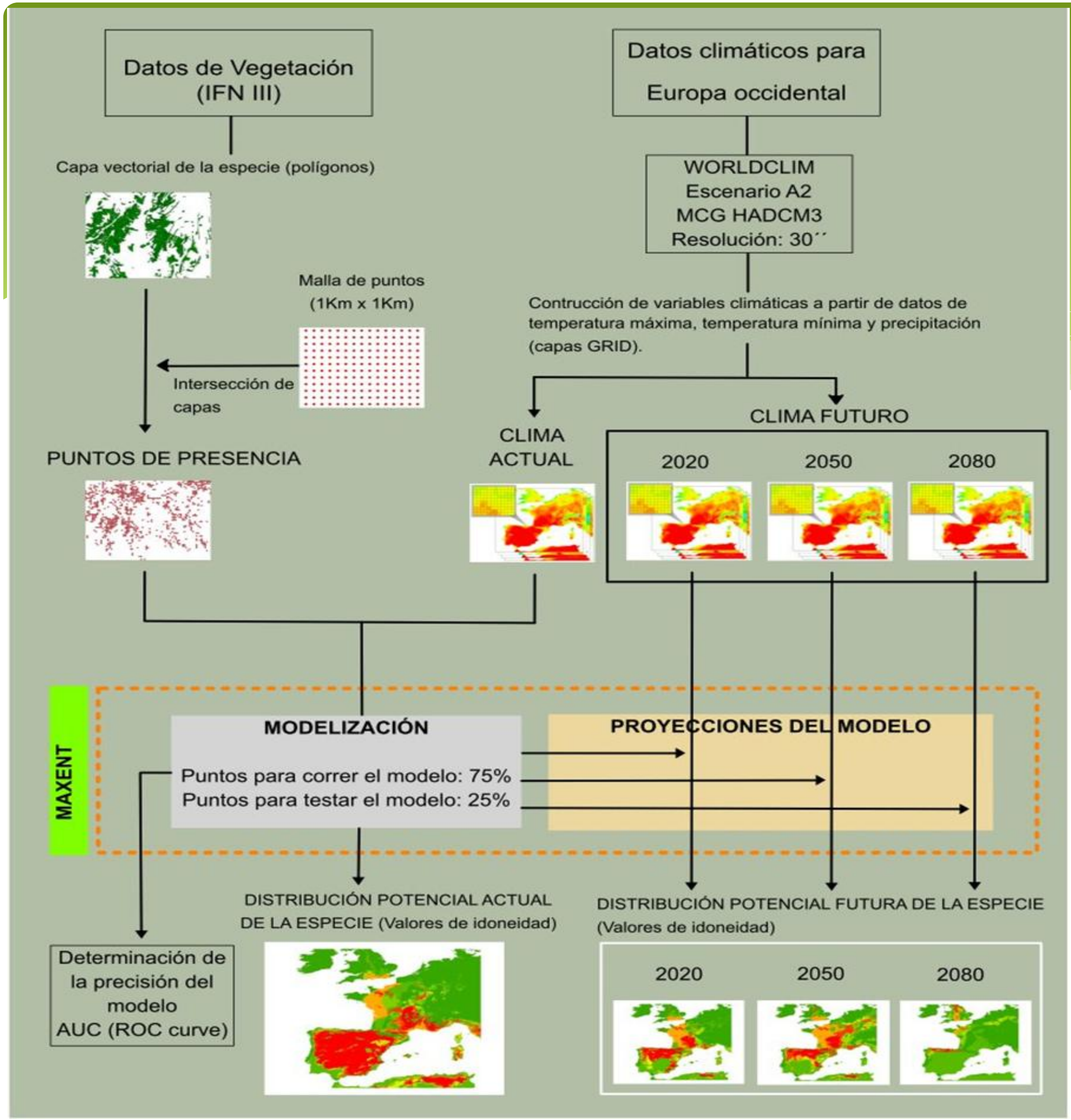
Forests contribute directly and indirectly to food security and nutrition, while providing ecosystem services in agricultural landscapes .

Forests and trees also provide other ecosystem services. Forests influence on the amount of water available and regulate the flow of surface water and groundwater, while maintaining water quality.  They sequester carbon, can be used as windbreaks, and contribute  significantly reducing soil erosion and protection against landslides and floods

# Methodology

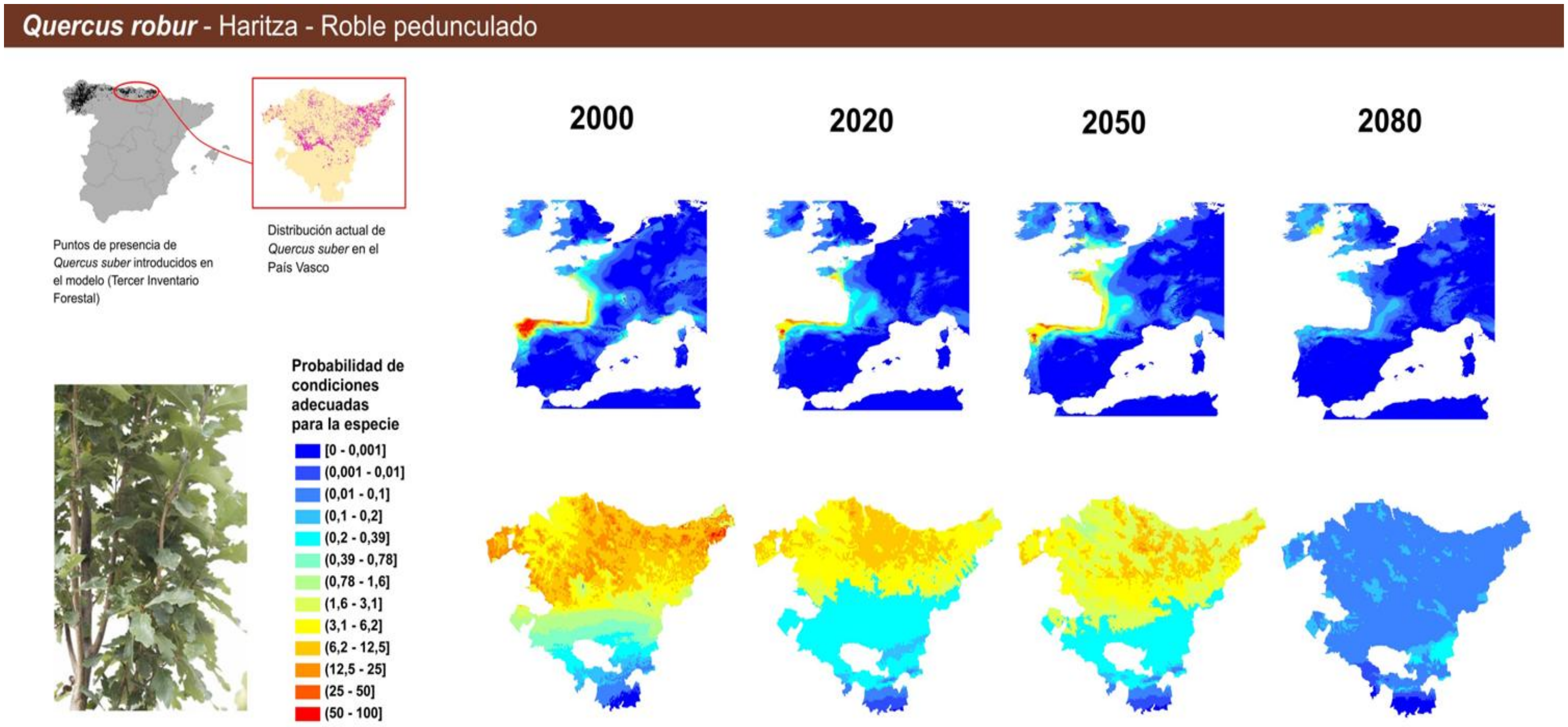
We used the statistical model MAXENT to study the evolution of the niche of the species throughout Western Europe. Presence points used in the models have been extracted from the Third National Forest Inventory;: The right map shows the distribution of oak in the CAPV

The variables in the models, are a set of bioclimatic coverages were constructed from weather data (precipitation and temperature), present and future, which derived from the HadCM3 global circulation model and are available on the website of Worldclim (http://www.worldclim.or

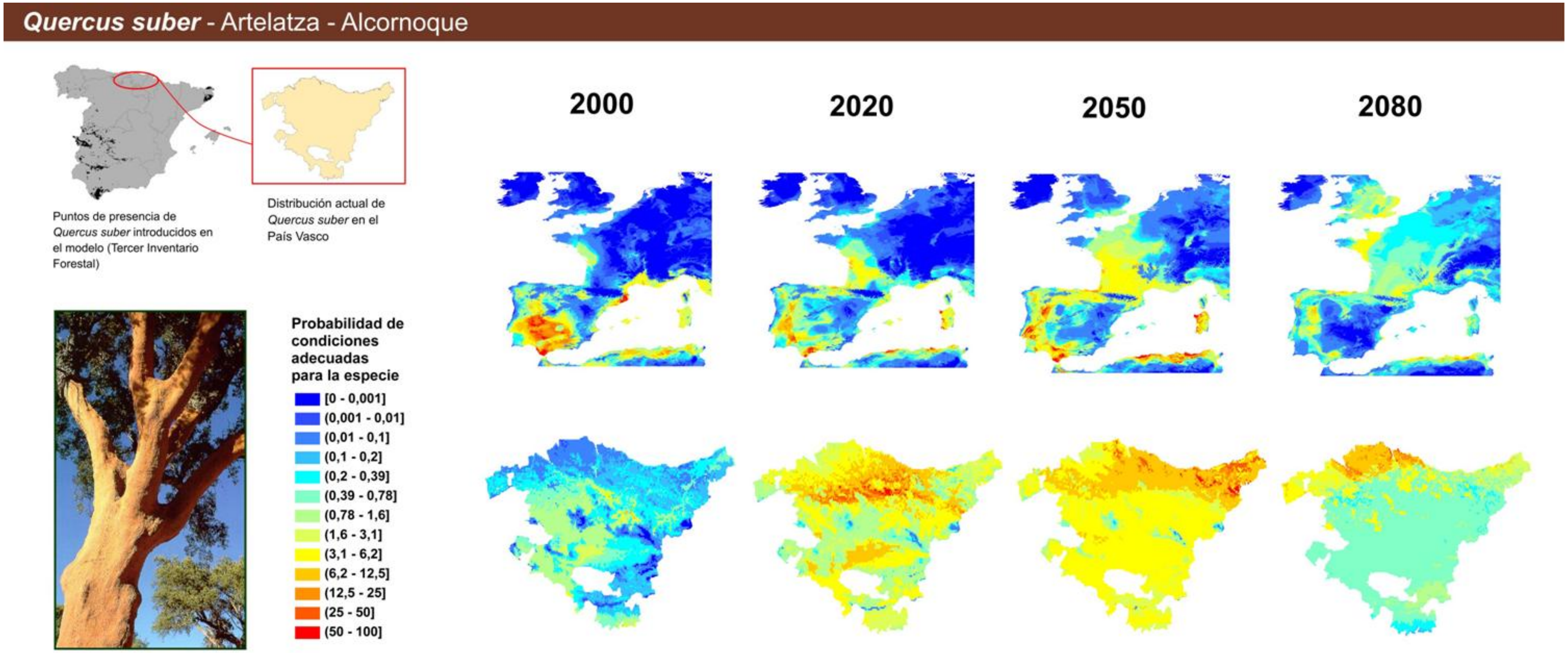


Datos de Vegetación (IFN III)
Capa vectorial de la especie (polígonos)
Malla de puntos (1Km x 1Km)
Intersección de capas
PUNTOS DE PRESENCIA
Datos climáticos para Europa occidental
WORLDCLIM
Escenario A2
MCG HADCM3
Resolución: 30´´
Contrucción de variables climáticas a partir de datos de temperatura máxima, temperatura mínima y precipitación (capas GRID).
CLIMA ACTUAL
CLIMA FUTURO
2020
2050
2080
MAXENT
MODELIZACIÓN
Puntos para correr el modelo: 75%
Puntos para testar el modelo: 25%
PROYECCIONES DEL MODELO
DISTRIBUCIÓN POTENCIAL ACTUAL DE LA ESPECIE (Valores de idoneidad)
DISTRIBUCIÓN POTENCIAL FUTURA DE LA ESPECIE (Valores de idoneidad)
2020
2050
2080
Determinación de la precisión del modelo
AUC (ROC curve)

# *Quercus robur* : Potential niche distribution



# *Quercus suber* : potential niche distribution



Initial results predict a significant impact on the forest scene in the CAPV, as in the case of the studied species, show a clear downward trend of its potential habitat in our area (eg *Q. robur*) to be replaced by Mediterranean species (eg *Q.suber)*, although it has been observed, it is possible that species that are currently in the CAPV, may be able to maintain populations because its current distribution extends into the Mediterranean region (eg *Q. pyrenaica*).

The projected potential habitat refers only to the variables used, but we know that it is clear that there are more variables that affect the actual distribution of a species, The modelling results must always be considered with caution, since the models only intended to simulate possible scenarios based on information provided to them.

The projections should improve in the way of reducing the uncertainty associated with both MDE statistical method itself, as the information entered into it.

But they can provide interesting clues for land management

# How can we adapt to it?

* To pay particular attention to measures aimed at improving the connection elements within forest areas and restoration initiatives and reforestation, control of forest fragmentation on biodiversity, and improve coordination and cooperation within the forestry sector.

* To support reforestation initiatives, aimed at creating diverse forest ecosystems, for example, natural regeneration and / or maintenance or restoration of forest biodiversity (wetlands, dead wood, bushes, etc..).

* To  identify the types and location of planting sites and types of planting (species, provenances, density, etc..) that best meet the objectives related to biodiversity and environmental conditions in the area.
* To include changes in management intensity, hardwood/softwood species mix, timber growth, harvesting patterns within and between regions, rotation periods, salvaging dead timber, shifting to species or areas more productive under the new climatic conditions, landscape planning to minimize fire and insect damage

* Altering inputs such as varieties/species to those with more appropriate for the environmental conditions
* Wider use of technologies to "harvest" water, conserve soil moisture
* Managing water to prevent water logging, erosion, and nutrient leaching where rainfall increases
* Altering the timing or location of cropping activities
* Improving the effectiveness of pest, disease, and weed management practices through wider use of integrated pest and pathogen management
* Using climate forecasting to reduce production risk