

Evaluating the demand for water for agricultural use for adaptation to climate change at the subbasin level

Maite Jiménez-Aguirre^{1,2,*}, Carmen Galea^{1,2}, Sofía Garde-Cabellos^{1,2}, David Rivas-Tabares^{1,2}, Barbara Soriano^{1,2}, Paloma Esteve-Bengoechea¹, Irene Blanco-Gutiérrez^{1,2}, Jon Lisazo^{1,2}, Carlos H. Díaz-Ambrona^{1,2}, David Pérez^{1,2}, Leonor Rodríguez-Sinobas², Margarita Ruiz-Ramos^{1,2}, Isabel Bardají^{1,2}, Ana M. Tarquis^{1,2}.

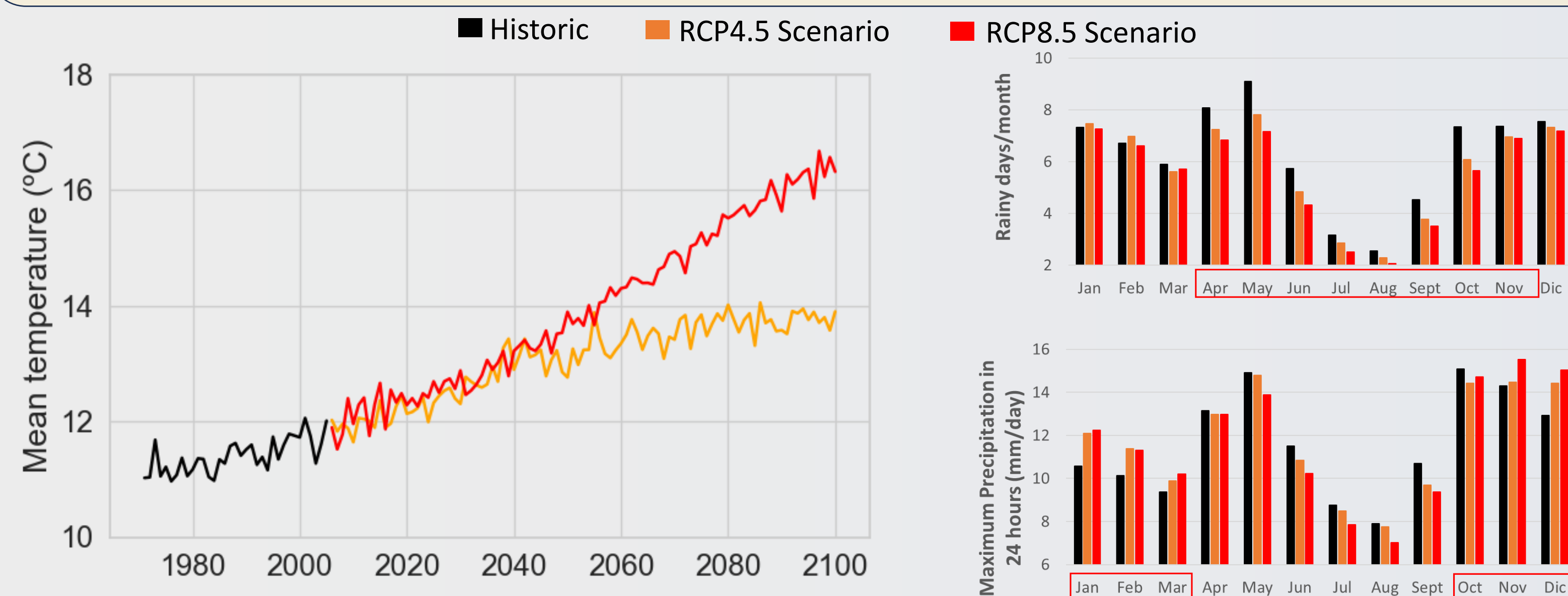
¹ Centro de Estudios e Investigación para la Gestión de Riesgos Agrarios y Medioambientales (CEIGRAM), Universidad Politécnica de Madrid (UPM)

² Escuela Técnica Superior de Ingeniería Agronómica, Alimentaria y de Biosistemas (ETSIAAB-UPM)

* mt.jimenez@upm.es

CONTEXT

Given the decrease in water availability for agriculture caused by climate change (CC) in Mediterranean environments, it is necessary to use water efficiently in food production. As stated in the PNACC (National Plan for Adaptation to Climate Change), knowing the water demand for agricultural use before and after adaptation to CC is essential, as well as optimizing basin monitoring.



GENERAL OBJECTIVE

Design a methodology and optimal monitoring of water demand for agricultural use at the sub-basin level using PNACC indicators, replicable and scalable to other regions and even at the national level.

STUDY CASE

The pilot basin "Arroyo de la Balisa" (242 km²) belongs to "Comarca agraria de Cuéllar" (agricultural region of Cuéllar) in the province of Segovia (Castilla y León, Spain).

It is a mountainous area with an altimetric variation from 747 to 1011 masl. The climatic regime is **sub-arid Mediterranean**, with an average annual rainfall of **427 mm/year** and characterized by **extreme dry summers**.

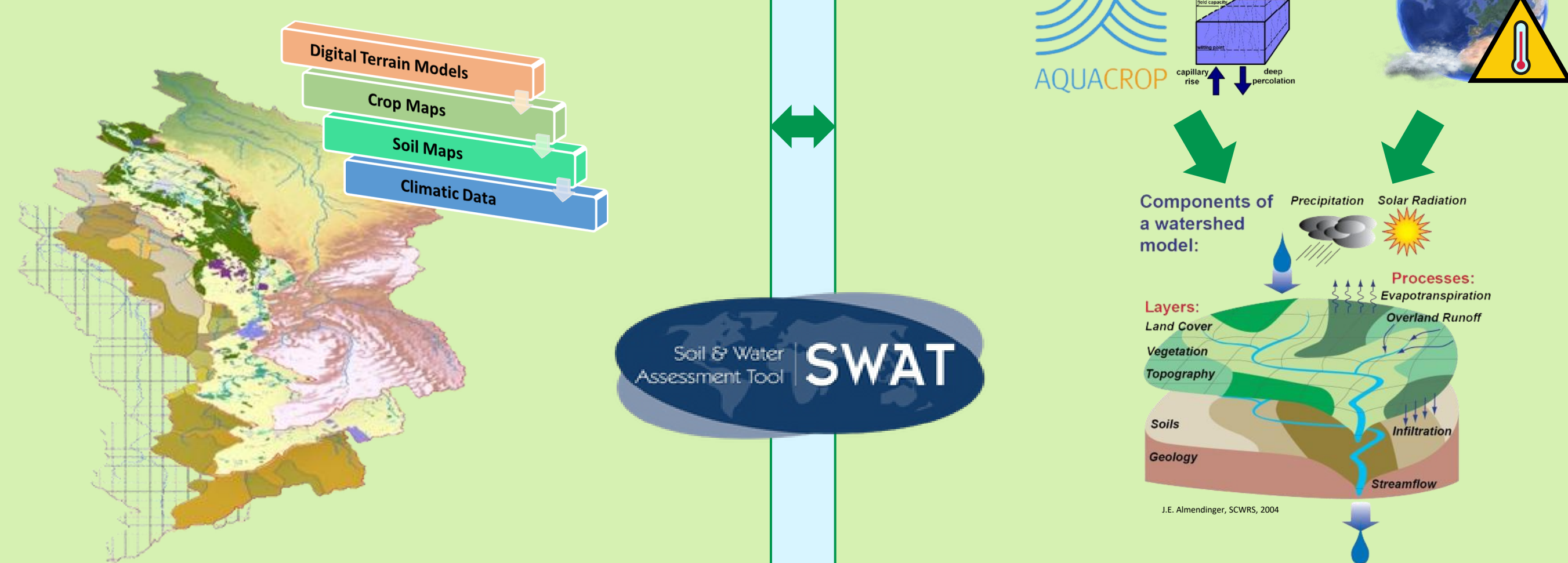
(Ribas-Tabares et al., 2022)

METHODOLOGY

- ◆ **Pilot case** in sub-basin 443 "Arroyo de la Balisa" (SCAB), within the Cea-Eresma-Adaja system (CEA) in the Duero river basin, in Segovia..
- ◆ Thesis and previous work with 10 years of historical data, European project: TALE.
- ◆ **Water demand modeling**: SWAT y Aquacrop
- ◆ **Co-creation** in workshops and interviews:
 - ◆ **Select adaptations** to simulate, considering the CAP eco-regimes and environmental programs from the regional authority (Comunidad Autónoma) compatible with the CAP, WFD and the Green Pact. Evaluate results
 - ◆ Allow **replicability and scalability** to larger watersheds and national scale.
- ◆ Global climate change projections CMIP6, AR6 IPCC and/or regionals EUROCORDEX, at least for two RCPs scenarios (4.5 y 8.5).
- ◆ **Simulations** with/without adaptation
- ◆ Economic evaluation
- ◆ Results translation to **PNACC indicators**

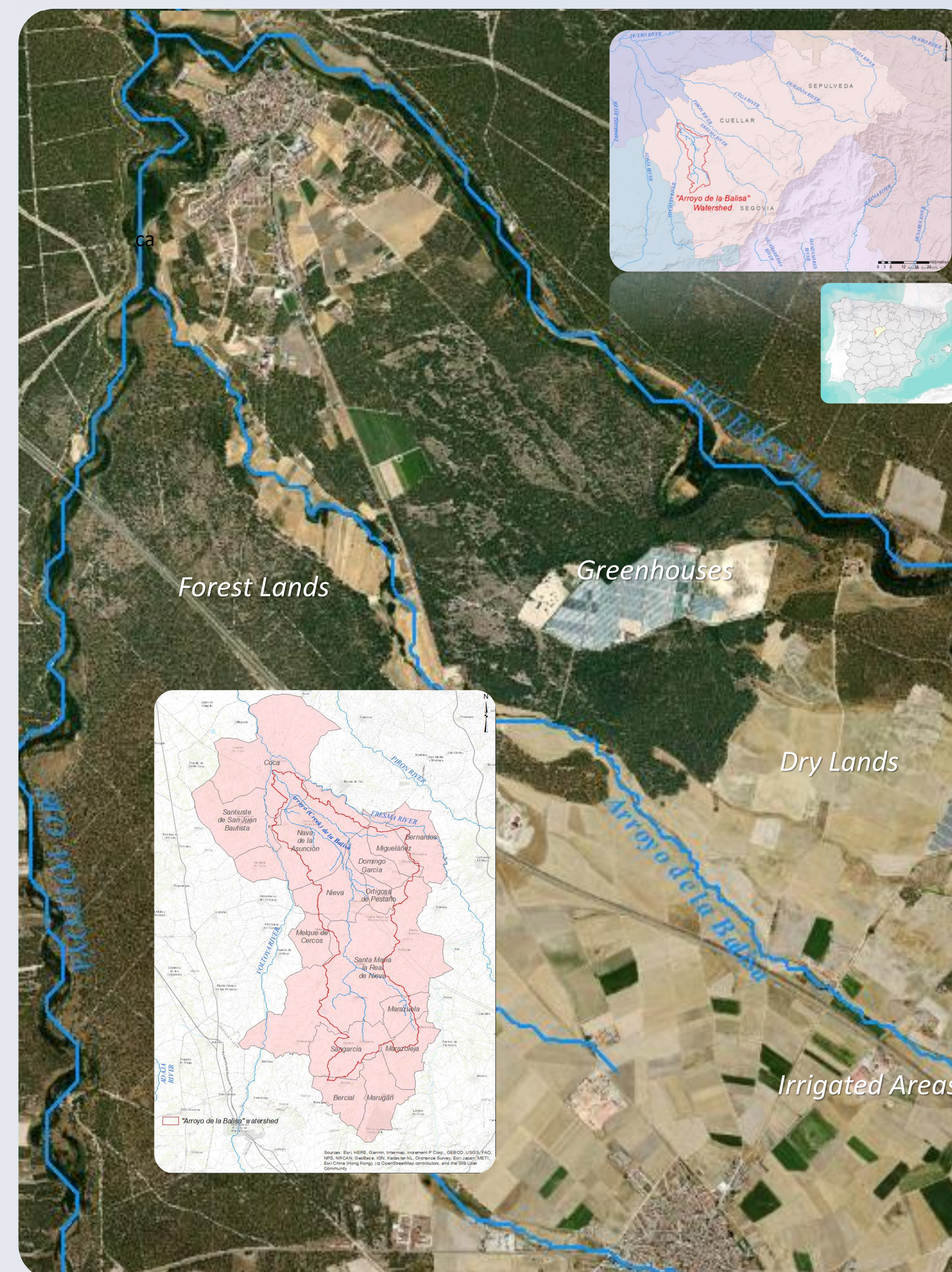
SPECIFIC OBJECTIVES & WORK FLOW

- 1 Build the model of **water demand for agricultural use** at the sub-basin level, replicable and scalable to other regions, in order to estimate PNACC indicators.
- 2 Analyze water demand for agricultural use in future situations **with/without** adaptation to climate change.



- 3 Co-create with farmers and other stakeholders:

- ◆ The selection of agricultural practices and CC adaptation measures to optimize agricultural water demand and ensure environmental and socioeconomic sustainability.
- ◆ The possible incentives for inclusion in eco-regimes or CAP agri-environmental programs and study the best ways of implementation.



EXPECTED & PRELIMINAR RESULTS

- ◆ Complete pilot basin "Arroyo de la Balisa" **characterization**
- ◆ Definition of the **Stakeholders involved** who selected the CC **adaptation strategies** compatible with WFD, Green Pact and CAP (Workshop celebrated on March 12th 2024):
 - **Stakeholders**
 - ◆ Farmers
 - ◆ Administration (local/regional/national)
 - ◆ Scientific community (Researchers & experts)
 - ◆ Civil Society (Ecologist, Natural Associations, etc...)
 - **Adaptation strategies**
 - ◆ Transformation to irrigation systems
 - ◆ Crop rotation.
 - ◆ Change of varieties
 - ◆ Improvement of irrigation management
 - ◆ Conservation agriculture
 - ◆ Crop schedule adaptation
- ◆ **Water demand under simulation and its evaluation** for the adaptation strategies selected.
- ◆ Criteria and information for **up scaling**.
- ◆ **PNACC indicator 29. SOCIETY'S ATTITUDE TOWARDS ADAPTATION TO CLIMATE CHANGE (%)**
 - ◆ Current need for change: 54%
 - ◆ Future need for change: 68%

AGUAGRADA project is funded by the Biodiversity Foundation of Spanish Ministry for the Ecological Transition and the Demographic Challenge, through the Grants call in competition regime for the execution of projects that contribute to implementing the National Plan for Adaptation to Climate Change 2021-2030.
Duración: 2023 - 2025

PRINCIPAL INVESTIGATOR: Ana M^a Tarquis
CONTACT: Maite Jiménez
CEIGRAM - UPM. Paseo de la Senda del Rey 13, 28040 Madrid (Spain)
Email: aguagrada@gmail.com
Telephone: +34 91 067 13 69 / 13 85

