

## **AGROCLIMA-SSP v1.0 a tool for Scientific Support to Policies for strategy assessment in agricultural systems under climate change scenarios**

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A tool to support decision makers in the design of new irrigation planning is being constructed. Information for decision makers (from Agricultural Extension Services to Ministries relating to Infrastructures for Irrigation Planning) on the impacts of climate change on yields and water requirements, as well as the need to consider changes in the cropping areas and systems is difficult to convey because of the uncertainties linked to climate projections. This explains the need for tools to assist evaluation and dissemination of climate impact projections that do not over-simplify, but yet present clear outputs without loss of content.

An improved transfer of results on impacts, uncertainties and adaptations that incorporate the feed-back from decision makers can be done through tools that synthesise main conclusions while avoiding generalisations that hide regional differences, and individual crop and cropping options results. These tools should be designed to facilitate participation and interaction of different users or partners, always through the modelling expert, and in this context AGROCLIMA-SSP is being constructed.

### **Methodology**

The construction of the tool includes two phases:

Phase I- AGROCLIMA-SSP v.1.0: Building of a navigator that includes all impact analyses undertaken by AgSystems-UPM and MOMAC-UCLM including work in the PRUDENCE (Mínguez et al., 2007) and other projects and analyses (Ruiz-Ramos et al., 2009) focussing on the Central Iberian Peninsula. Crop models were connected to different ensembles of Regional Climate Models (RCMs) for each cropping option-location-scenario. Results were ordered as: 1) impacts: variation of crop yield in future (A2 IPCC-SRES scenario) vs current scenario, together with trend averages and inter-annual variability, and analyses of extreme events for temperature and water deficits, and CO<sub>2</sub> effect on crops; 2) uncertainties associated with the projections for: sign of impact and response to future scenario, inter-annual variability, extreme event indexes, and spatial resolution of soil data; and 3) simulated results of specific adaptations proposed when projections of decreasing yield obtained with low uncertainty.

This tool has been written in visual basic.net, needs only Windows OS, and is simple to install and use. It has been designed for expansion; more crops and analyses can be added to the explorer tree, and there is provision for greater spatial resolution for simulations undertaken with data from the project ENSEMBLES.

Phase II- Open simulation experiments: Distribution of AGROCLIMA-SSP v.1.0, with an instruction manual, to the decision makers and to extension services. This phase requires establishing formal collaboration with extension services to receive their feedback, i.e. new proposed simulation experiments, check the suitability of different or new cultivars for the regions studied, and improvements to the tool. Once these new experiments have been simulated, Phase I should be applied again to include the user's feedback and in a new version of the tool.(v.2.0)

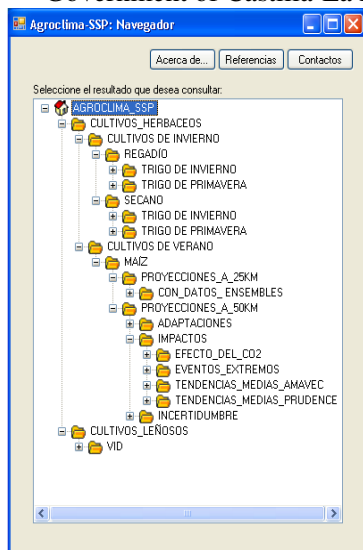
### **Results and discussions**

Evaluation of climate change impacts on agricultural systems through modelling chains (climate to crop models) are subjected to a variable sum of uncertainties. Consequently, although impact projections are non-homogenous in sign and magnitude, there is a tendency to generalise conclusions, and ignore uncertainties. Response to climate scenarios of crops and cultivar performance, may differ significantly according to initial conditions and management, and further, reveal pathways for beneficial adaptation. Results are presented as non-aggregated productivities specifying what crops or cultivars are considered.

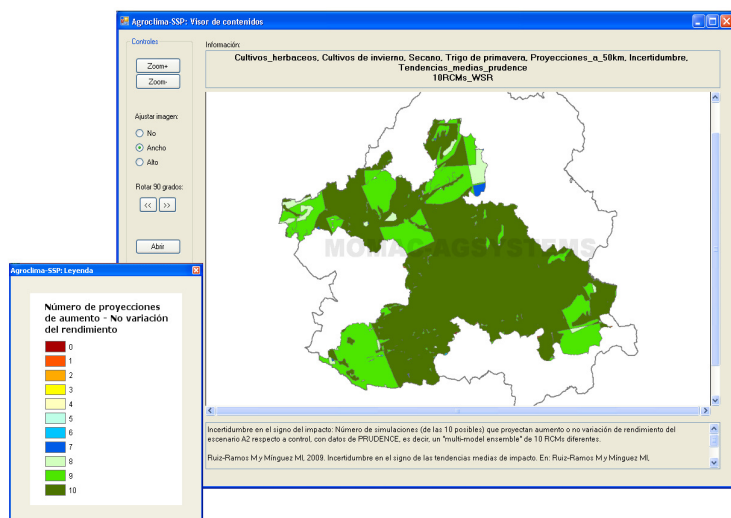
Phase I produced v.1.0 of AGROCLIMA-SSP and includes impact projections on 6 crops: irrigated maize, winter and spring wheats under rainfed or irrigated conditions, and vines (Fig. 1), and corresponding uncertainties, and adaptations. Vine results are preliminary and not conclusive. AGROCLIMA navigator?? shows spatial analyses (Fig. 2) and further analyses associated to specific locations. All are supplied with information for interpretation.

Phase II is currently on-going: Modification of simulation experiments is being carried out in partnership with ITAP (Instituto Técnico Agrario Provincial, Albacete) which is responsible for extension services and farm advice in the Region of Castilla-La Mancha. This collaboration has allowed for:

- Access to their data base of regional field experiments on traditional and new cultivars of main crops in the region, to update calibrations and impact simulations.
- Formalising the “Open experiments” concept of AGROCLIMA, participation in current and future simulation experiments of the extension services and decision makers, with further results included in the tool. The prioritisation on crop types and cultivars, parameterisation of a wide range of current and possible crop managements, revision of definitions of extreme events, improvement of the range of adaptations for simulation (e.g.: economically feasible) are established through round-table discussions, simulations, in an iterative way. This has led to a re-financing of a research project by the Government of Castilla-La Mancha 100000 € for 3 years).



**Fig.1. AGROCLIMA explorer showing crops included and analyses for maize**



**Fig.2. AGROCLIMA viewer showing an uncertainty analysis for rainfed spring wheat**

AGROCLIMA-SSP is the first tool constructed to synthesize projections of climate change impact by discriminating by crop/management options at regional level, including uncertainty evaluation. Users - extension services or decision makers - can explore results and adaptive possibilities, and also participate in design of new experiments or the co-construction of questions.

## References

- Mínguez MI, Ruiz-Ramos M, Díaz-Ambrona CH, Quemada M and Sau F, 2007. First order impacts on winter and summer crops assessed with various high-resolution climate models in the Iberian Peninsula. *Climate Change* 8, suppl.1, 343-355.
- Ruiz-Ramos M, Gallardo-Andrés C, Sánchez E and Mínguez MI, 2009. Impacts on cropping systems of present and future extreme events assessed with various regional climate models in the Iberian Peninsula. *EGU 2009 Vol.11-8555*