

## **CLIMAGRI – Climate Change and Agriculture Activities of the Second Year**

### **Development of a regional network on climate change and agriculture for the countries in the Mediterranean region**

**Michele Bernardi and René Gommès**

Food and Agriculture Organization of the United Nations (FAO)  
Environment and Natural Resources Service (SDRN)

#### **INTRODUCTION**

The three-year research **CLIMAGRI** project, financed by the Ministry of Agriculture and Forestry Policies (MiPAF) and coordinated by the Central Office of Crop Ecology (UCEA), has as its main objective a wide-ranging and in-depth technical and scientific overview of the various interconnections between agriculture and climatic variations in Italy. The technical-organizational entity implementing the project, which is located in Rome, has made it possible to initiate activities for the transfer of methodologies elaborated within CLIMAGRI to developing countries in the Mediterranean basin. For this reason, in February 2002, a partnership agreement was reached between UCEA and FAO, the Food and Agriculture Organization of the United Nations. The above-mentioned partnership is an integral part of CLIMAGRI and is listed as topic 4.3 under Sub-topic 4: Information and the dissemination of data. The coordination is the concern of the Agrometeorology group of the Environment and Natural Resources Service (SDRN), within the Research, Extension and Training Division of the Sustainable Development Department. SDRN, is FAO's focal point for all activities connected with International Environmental Conventions (Climate Change, Desertification, Biological Diversity) and because it provides infrastructures, regional information on the environment and training. Because of the geographical context, this topic was called **CLIMAGRI<sub>med</sub>**. Following is a brief description of the activities carried out during the project's first year and a more extensive one of the activities carried out in the second year.

During the first year two important activities were completed: the organization of an international meeting and the creation of the multi-lingual **CLIMAGRI<sub>med</sub>** website. The meeting made it possible for foreign researchers to establish contact with the various CLIMAGRI project theme coordinators who had adhered to FAO's proposal for cooperation in the Mediterranean region. About 50 experts on the impact of climate change on various agricultural sectors met in Rome at the FAO headquarters from 25 to 27 September 2002. The participants came from 8 Mediterranean countries (Algeria, Cyprus, Egypt, Lebanon, Libya, Morocco, Syria and Turkey) and from Italy. There were also representatives from UCEA and FAO. The Mediterranean area experts represented the National Meteorological Services and the National Agronomic Research Institutes. By the end of the work sessions, five proposals of collaboration had been determined:

1. Modelling of future scenarios in Mediterranean agricultural systems connected with climatic variability and change (Algeria, Egypt, Libya, Morocco, Turkey, University of Udine);
2. Techniques for the evaluation of suitable agricultural land at various levels (from local to national) in order to evaluate the risks involved in climatic variability (Algeria, Cyprus, Libya, Morocco, Turkey, CNR-IBIMET, ARPA-SMR, UCEA);

3. Sources of and pockets for accumulation of CO<sub>2</sub> in soil-cultivation systems in the Mediterranean environment (Algeria, Egypt, ISNP);
4. WEB-based exchange of current knowledge about the effects of desertification processes on agricultural production in the Mediterranean area (Algeria, Cyprus, Lebanon, Morocco, Syria, ISA, CNR-IBAF);
5. Quality and homogeneity of meteorological data (Egypt, Cyprus, University of Milan).

At the end of the meeting it was generally agreed that the synergy among the various researchers should be used to formulate a project for inter-regional exchange within the Mediterranean area to be submitted for funding.

The second activity regarded the creation of the CLIMAGRI website in English and French which is managed by FAO and located in the website of the Sustainable Development Department ([http://www.fao.org/sd/climagrimed/index\\_en.htm](http://www.fao.org/sd/climagrimed/index_en.htm)).

## GENERAL OBJECTIVES OF THE RESEARCH

On the basis of the collaboration projects discussed during the international meeting in Rome and the budget established by FAO, a Protocol for Technical Collaboration was drafted. It will have the duration of two years and its general objectives will be the creation of a network linking the Italian experts and the Mediterranean experts who participated in the CLIMAGRI initiative. The aim is to set up a common scientific team to study the impact of climate change on the agricultural sector. Besides Italy, participating countries are: Cyprus, Egypt, Morocco and Turkey. The final version of the Protocol for Technical Collaboration can be found at the CLIMAGRI<sup>med</sup> website.

## METHODOLOGY

The collaboration, as defined in the Technical Protocol, targets the effective realization of four objectives:

1. The institution of an inter-regional network for the exchange of information and mutual access to data and research outcomes through the CLIMAGRI<sup>med</sup> website.
2. Formulation of a project proposal which includes all of the Mediterranean countries, worked out on the basis of information acquired during the execution of technical activities.
3. Acquisition, analysis of the quality and homogeneity of the historical series of the meteorological data to construct future climatic scenarios. Coordinator: Dott. Maurizio MAUGERI (Institute of General Applied Physics, University of Milan). Participating countries: Cyprus (Dr. Stelio PASHIARDIS, Meteorological Service), Egypt (Dr. Emad ATTIA, Meteorological Service), Morocco (Dr. Abdelaziz EL OUALI, Meteorological Service).
4. Development of a *Land Evaluation* system useful to assess climatic risks in agriculture due to both variability and climate change in the Mediterranean area on a local and national scale. Coordinator: Dott. Pierpaolo DUCE (CNR-IBIMET, Institute of Biometeorology, Agroecosystem Monitoring Laboratory, Sassari), Dott. Franco ZINONI (ARPA-SMR Meteorological Service, Regional Agency for the Prevention and the Environment of the Emilia-Romagna Region). Participating countries: Morocco (Dr. Mohammed KARROU, National Agronomic Research Institute), Turkey (Dr. Ulfet OZSOY, Menemen/Izmir Soil and Water Research Institute of Rural Services, Dr. Yildirim KAYAM, Menemen/Izmir Agrohydrology Research and Training Center).

During the second year of activity, objectives 3 and 4 envisage a series of technical missions: one taking Italian researchers to the participating countries and one bringing the foreign researchers to Italy. The institution of the inter-regional network will be coordinated by FAO while, during the third year, the project proposal will be formulated by Italian researchers with the technical-logistics support of FAO. The CLIMAGRI*med* website enables viewing of detailed reports on the technical missions and, during the third year, the exchange of data and information will be possible.

## CONCLUSIONS AND THE FIRST RESULTS

Despite some logistical problems that delayed the work plan, the technical activities progressed as foreseen. It is important to note the professional performance of the Italian researchers in carrying out their missions. Following is a summary of the technical conclusions reached during the missions. As regards the CLIMAGRI*med* website, a proposal has been submitted to FAO requesting financial contribution for the translation of the entire contents into Arabic.

### 1. Acquisition, analysis of quality and homogeneity of the historical series of meteorological data to construct future climatic scenarios.

- Mission of Dott. Maurizio MAUGERI to **EGYPT** at the National Meteorological Service from 21 to 23 December 2003. People met: Rabie SAYED FOULI (Director General of Scientific Research), Mohamed Abd El-Rham ALY DAWOD (Researcher – Agrometeorology), Emad ATTIA (Researcher - Agrometeorology), Ahmed ADEL FARIS (Responsible for Stations and Instruments), Maheb H. DOOS (Director General of International Affairs).

The aim of the mission was to evaluate the existing meteorological situation as regards availability of data, methods of analysis, logistical infrastructures and identification of potential counterpart for the transfer of methodologies. The Meteorological Service was found to qualify because it has computer archives containing about 40 years of information (quality to be evaluated) and hard copy archives for a longer period. The personnel and logistics have an excellent technical level judging from studies made on the climate in Egypt with the publication of a Climate Atlas. As regards studies on climatic variability and change, research is still in the preliminary phase.

A work plan for future activities was set out: (i) collection of data and meta-data (first 6 months); (ii) monitoring of quality and homogeneity (3-9 months); (iii) analysis of data (9-15 months). The first mission of the Egyptian researcher in Italy can take place once the collection of data and meta-data has been completed. An application for participation in the CLIMAGRI*med* activities has been sent to the General Director of the Meteorological Service by FAO, making the collaboration official. The conditions for the dissemination of data to CLIMAGRI*med* participants will be established at a later stage.

- Mission of Dott. Maurizio MAUGERI to **CYPRUS** at the National Meteorological Service from 14 to 16 January 2004. People met: Theophilou KYRIAKOS (Director of the Meteorological Service), Stelios PASHIARDIS (Meteorologist), Loizos HADJIOANNOU (Head Climatologist), Sofia LOUKA (Meteorologist).

The objective of the mission was to evaluate the existing meteorological situation as regards availability of data, methods of analysis, logistical infrastructures and identification of potential counterpart for the transfer of methodologies. The Meteorological Service was found to qualify because it has computer archives containing 80/90 years of pluviometric data and hard copy archives for a longer period. For the daily temperature data, the archives go back 40/50 years. The

personnel and logistics have an excellent technical level judging from the studies made of the climate in Cyprus, some of which on climatic variability and change.

A work plan for future activities was set out: (i) collection of data and meta-data (first 6 months); separation of observed data from estimated data, filing away of pluviometric data prior to 1916, checking of missing data, identification of stations to be used for the monitoring of homogeneity; (ii) monitoring of quality and homogeneity (3-9 months); (iii) analysis of data (9-15 months). The first mission of a Cypriot researcher in Italy can take place once collection of data and meta-data has been completed. The conditions for the dissemination of data to CLIMAGRI<sup>med</sup> participants will be established at a later stage.

## 2. **Development of a *Land Evaluation* system useful to assess climatic risks in agriculture due to both variability and climate change in the Mediterranean area on a local and national scale.**

- Mission of Dott. Pierpaolo DUCE (CNR-IBIMET), Dott. Andrea MOTRONI (SAR-Sardinia), Dott. Lucio BOTTARELLI (ARPA-SMR) to **TURKEY** from 14 to 21 November 2003 at the Agrohydrology Research and Training Center (ARTC) and the Soil and Water Research Institute of Rural Services (MRI) in Menemen/Izmir. People met: Orhan ODEN (Director of ARTC. Expert on Soil Fertility), Halit KARAMERCAN (Deputy Director of ARTC), Melek GURBUZ (ARTC, expert in Soil Science), Dilek KAHRAMAN (ARTC, Agrarian Engineer), Yildirim KAYAM (MRI, Irrigation specialist), Ulfet OZSOY (MRI, expert on Soil Fertility), Gulay YOLCU (MRI, expert on Land Conservation).

The objective of the mission was to evaluate the situation of the meteorological and agronomic sectors in terms of availability of data, methods of analysis, infrastructures and identification of the most suitable partners for an efficacious transfer of methodologies. Both ARTC and MRI appeared to be able to make use of the transfer of CLIMAGRI methodologies efficaciously. Between 1999 and 2003 work groups of the two institutes conducted studies on the Impact of the Climate and the Agro-technological and Socio-economic factors on wheat and cotton crops and they recently started a new research project regarding the Impact of Climatic Variability and Change on Agricultural Production in western Turkey. Moreover, the institutes confirmed the ready availability or possibility of collecting most of the data (climatic, morphological, pedological, soil usage, Agricultural Land Capability, etc.) needed to evaluate the climatic risk in agriculture in the crop areas identified by the ARTC-MRI work group for the transfer of *Land Evaluation* methodologies. The two Institutes have set up an interdisciplinary research group for the realization of CLIMAGRI<sup>med</sup> activities and they guarantee they are well equipped with services and infrastructures for analysis of the data and execution of the activities foreseen.

A work plan for future activities was set out: (i) selection of the agricultural areas for application of *Land Evaluation* analysis of climatic risks in agriculture (Aegean coastal area of about 30,000<sup>2</sup> km characterized by a Mediterranean-type climate) and description of the region selected in terms of meteorological, climatological, pedological and agronomic characteristics; (ii) inventory of available data and selection of climatologic historical series (temperature, rainy precipitations, at least 20-30 years of daily data); (iii) discussion in detail of the methods to be used for calculation of bioclimatic indexes (using a 30-year historical series provided by ARTC and MRI researchers, calculations of the bioclimatic indexes were made, mainly based on degrees per day and on simplified models of hydrological balance, and on analysis of climatic variability by means of the procedure elaborated within CLIMAGRI).

The first mission of Turkish researchers to Italy can take place once the collection of data and meta-data has been completed. During the meeting in Italy, the partners will discuss the models of interpolation that can be used for the spacing of data regarding temperature and rainy precipitations, as well as the standard procedures to follow for the realization of climatological maps. The conditions for the dissemination of data to CLIMAGRI<sup>med</sup> participants will be established at a later stage.

- Mission of Dott. Andrea MOTRONI (SAR-Sardinia), Dott. Simona CANU (SAR-Sardinia), Dott. Gabriele ANTOLINI (ARPA-SMR) to **MOROCCO** from 10 to 15 December 2003. People met: Mohammed KARROU (Direction National Institute of Agronomic Research - INRA), Mohammed EL GHAROUS (Direction Aridoculture Center - INRA), Rachid DAHAN (Agronomist and Physiologist - INRA), El MJEHED (expert on Environment and Resources Management - INRA), Hassan BENAOUA (Agrometeorologist - INRA), Riad BALAGHI (Agrometeorologist - INRA).

The objective of the mission was to evaluate the situation in the meteorological and agronomic sectors in terms of availability of data, methods of analysis, infrastructures and identification of the most suitable partners for an efficacious transfer of methodologies. The INRA Centers in Rabat, Settat and Meknés appeared to be able to make efficacious use of the transfer of the CLIMAGRI methodologies. During the last five years the INRA work groups have conducted studies on the impact of the climate and agro-technological and socio-economic factors on the production of wheat, barley and on pastures. The area of greatest experience is the modelling of crop cultivation and various models have been developed and used to estimate potential crop production, also in relation to climatic variability. Moreover, early warning systems of drought have been developed. The Centers confirmed the ready availability or possible collection of most of the data (climatic, morphological, pedological, soil usage, Agricultural Land Capability, etc.) needed to evaluate climatic risk in agriculture in the agricultural areas identified by the INRA work groups for the transfer of the *Land Evaluation* methodologies. The INRA researchers involved in the project have set up an interdisciplinary research team for the realization of CLIMAGRI<sup>med</sup> activities. They guarantee a good level of competence in using Geographical Information Systems (GIS) and that they are well equipped with services and infrastructures for analysis of the data and execution of the activities foreseen.

A work plan for future activities was established: (i) selection of the agricultural areas for application of *Land Evaluation* analysis of climatic risk in agriculture (the region of Settat, about 6,000<sup>2</sup> Km., 150 km south-east of Rabat, as it is the most important area for the cultivation of wheat and barley in Morocco; the region of Meknés, approximately 3,600<sup>2</sup> Km., 150 km. east of Rabat, characterized by a more humid climate than Settat); description of the region selected in terms of meteorological, climatological, pedological and agronomic characteristics; (ii) inventory of available data; selection of the climatologic historical series (temperature, rainy precipitations, at least 20-30 years of daily data) to be used in the calculation of the bioclimatic indexes; identification of the historical series and data to be collected; (iii) analysis of data and methods to be used for the calculation of the bioclimatic indexes (using a 30-year historical series provided by the INRA researchers, calculations were made of the bioclimatic indexes, mainly on the basis of degrees per day and on a simplified model of hydrological balance, and climatic variability was analyzed by means of a procedure elaborated within CLIMAGRI.

The first mission on the part of Moroccan researchers to Italy can take place once the collection of data and meta-data has been completed. During the meetings in Italy, the partners will discuss the details of the models of interpolation that can be used for spacing of data regarding temperature and rainy precipitations, as well as the standard procedures to follow for the realization of

climatological maps. The conditions for the dissemination of data to CLIMAGRI<sup>med</sup> participants will be established at a later stage.