

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

### **Transfer of methodologies elaborated within the CLIMAGRI project to developing countries in the Mediterranean region**

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#### **INTRODUCTION**

The three-year CLIMAGRI project, financed by the Ministry for Agricultural and Forestry Policies (MiPAF) and coordinated by the Central Office of Crop Ecology (UCEA), got underway at the beginning of 2001. The project's aim is to develop a widespread and in-depth technical-scientific study of various interconnections between agriculture and climate change in Italy. The technical-organizational structure of the project and Italy's geographical position facilitate the transfer of methodologies developed within CLIMAGRI to developing countries in the Mediterranean area. Therefore, in February 2002, UCEA and FAO reached a partnership agreement to work together to achieve this aim. The above-mentioned agreement is an integral part of CLIMAGRI and is listed as topic 4.3 under Sub-project 4: Information and dissemination of data. Following is a description of the activities carried out so far within said agreement.

#### **CLIMATE CHANGE AND SUSTAINABLE AGRICULTURE**

The vulnerability of the Italian agricultural system, and more in general that of the Mediterranean area, depends on the interaction between two factors, uncertain climate-change forecasts and the increase of greenhouse gasses in the atmosphere, of which we are certain. The climate change factors could have very negative effects on agriculture. On the other hand, the increase in atmospheric CO<sub>2</sub> could have very positive effects. Agriculture and forestry are the two sectors most exposed to possible damage. In order to evaluate their vulnerability a method of evaluation needs to be worked out whereby the role of agriculture can be quantified and the type of land management measured on a national scale against global CO<sub>2</sub>. The final outcomes make it possible to determine the potential of agriculture as a means for reducing the concentration of CO<sub>2</sub> in the atmosphere, making agriculture sustainable, at the same time.

The Kyoto Protocol of 10 December 1997, signed by Italy on 29 April 1998 and ratified on 31 May 2002, confirmed the general aims of the UN Framework Convention on Climate Change, but introduced modifications in the framework regarding commitments and instruments for reducing greenhouse gasses. The Protocol points to sustainable agriculture as one of the policies and measures to be adopted in order to reduce emissions.

Considering that climate change is a global phenomenon, any reduction in greenhouse-gas emissions is effective no matter where in the world it takes place. Therefore the Protocol envisages the possibility of supplementing national measures for emission reduction with joint programmes of other countries, such as Joint Implementation and the Clean Development Mechanism (CDM), so

as to obtain the best results at the lowest cost. In particular, CDM makes it possible to transfer and implement in developing countries, cost-effective technologies and highly efficient energy-and-environment management systems capable of reducing emissions considerably.

What must also be considered is that the world population is expected to increase from the current 6 billion 200 million to 8 billion and 300 million in 2025, while the land available per capita for food production continues to diminish.

Approximately 11 per cent of the total surface of the earth is made up of land suitable for crops due to altitude, type of soil and climate. Consequently, most of the food products will be grown on land that has already been used, to a certain extent, for cropping. Expanding agriculture to land that is not so suitable means higher production costs, greater risk of a bad harvest and deterioration of the environment. All of these factors contribute to food insecurity.

## **UCEA - FAO PARTNERSHIP**

The geographical and morphological characteristics of Italy, together with its technical and scientific capabilities, enable it to play a key role in the transfer of methodologies to developing countries in the Mediterranean area. There is no doubt that the real solutions to the problems created by climate change come from the regionalization of the measures brought into effect.

The various research activities to be carried out within the CLIMAGRI project form an excellent setting from which to gain better knowledge of the physical phenomena connected with variability and climate change and which directly affect the quality and quantity of agricultural production and, thus, the emissions of greenhouse gasses. Once acquired, this knowledge has a fundamental role in making agriculture compatible with preservation of the environment and achieving sustainability.

The aims of CLIMAGRI are even more important in developing countries where it is very difficult to reach and maintain the right balance between the environment, population growth and agriculture. For this reason, an important activity has been included among the various CLIMAGRI topics, regarding the transfer of methodologies worked out within the project to developing countries in the Mediterranean area. The technical implementation of this activity is the concern of the Food and Agricultural Organization of the United Nations (FAO). FAO's technical and organizational competence, its experience in the field of sustainable development and its worldwide centre in Rome make it the ideal agency through which Italian methodologies can be transferred to developing countries in the Mediterranean area. This topic is listed at 4.3 under Sub-project 4: Information and dissemination of data.

## **THE STRUCTURE OF FAO**

FAO is the largest specialized agency in the United Nations system. Its purpose is to fight poverty and hunger in the world through rural development, nutritional improvement and food security. FAO collects, analyzes and disseminates information; it advises governments as to policies and planning; it serves as an international forum for debates on problems related to food and agriculture and approves international standards and agreements; it fosters development directly. It intervenes actively during a crisis, when the production and distribution of food are upset owing to disasters caused by Man or nature, such as wars, drought and invasions by harmful insects. FAO focuses on agriculture and sustainable rural development aiming to satisfy the needs of present and future

generations through programmes that do not damage the environment, that are technically valid, economically viable and socially acceptable.

Every year the FAO budget accounts for investments in favour of agriculture and rural development amounting to approximately 300 million dollars, coming from donor organizations and governments. One of the main points in the FAO programme for the management and dissemination of information is WAICENT (World Agricultural Information Centre). Using Internet technologies, WAICENT offers millions of users worldwide, access to FAO data banks each month. WAICENT provides specialized information on global subjects such as desertification, sustainable development, food standards, animal genetic resources, post-harvest operations, biological diversity and food systems in urban centres. WAICENT includes access to the main FAO library which provides bibliographical support for research activities. The library allows on-line consultation of bibliographical information, of the principal scientific and economic journals and FAO's main data banks.

Knowledge is the fundamental instrument for development. Scientific and technological progress have brought changes in all fields, including agriculture and food production. The FAO programmes are based on two key factors: (i) the direct transfer of know-how and technology by means of in-the-field projects; (ii) worldwide management of own data banks on all the technological and scientific aspects regarding agriculture, forests and fisheries.

Coordination of topic 4.3 is within the FAO's Agrometeorology Group of the Environment and Natural Resources Service.

## **THE ENVIRONMENT AND NATURAL RESOURCES SERVICE**

The Environment and Natural Resources Service (SDRN), within the Research, Extension and Training Division which is part of the Sustainable Development Department, 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. It makes use of geo-referential (static and dynamic) data and information to describe the environment and the natural resources in order to support FAO's and the member states' operational and programmed activities. Its wide variety of programmes range from fast food-security warning, to agricultural production forecasts, to the management of natural resources, to the management of natural disasters, the evaluation of environmental impact, the monitoring of coastal areas, to energy.

SDRN consists of three important sections: agrometeorology, remote sensing and GIS. The Agrometeorology group is in charge of: (i) managing the world agroclimate data bank; (ii) developing computer programmes; (iii) providing technical support of fast food-security warning projects in developing countries. The centre for remote sensing collects, analyzes and archives images on a global scale, transmitted by weather and environmental satellites. Together with the data and agrometeorological models, the images form a system capable of monitoring agricultural production (particularly in Africa, Asia and Central and Latin America) in order to prevent food crises. The GIS unit supplies world-scale maps of the land, the extent of vegetation and land use.

SDRN is an active partner in the IGOS-TCI (Integrated Global Observing Systems-Terrestrial Carbon Initiative) project which aims to demonstrate the feasibility of continual temporal and spatial monitoring of the carbon cycle with a 1 km resolution on a global scale. FAO coordinates and takes part in various projects underway in several developing countries to prevent deterioration

of the land and increase the protection of carbon and biodiversity by means of soil usage and the sustainable management of land.

FAO employs the most updated information technologies to collect, record and file and disseminate information. The Rome centre is permanently linked with the outlying regional and national offices. Specialized personnel maintain and update the information system and the various data banks. Training courses are structured and organized using the most modern techniques. Two receiver stations collect the survey data coming from the weather and environmental satellites. Meteorological data are received and filed in real time so as to monitor the conditions of cereal crops in Africa, Asia, Central and Latin America.

### **MAIN OBJECTIVE OF TOPIC 4.3**

The main objective of this activity is to set up a programme for technical and scientific cooperation so as to achieve a perfect synergy between the potential of UCEA, the Italian research institutes and FAO in applying the methodologies worked out within the CLIMAGRI project so that they can be adapted to perform successfully in developing countries in the Mediterranean area. FAO will make its competence available to Italian researchers enabling them to adapt the methodologies to existing situations in the developing countries and to transfer the knowledge elaborated in the CLIMAGRI sub-projects to their national counterparts.

The website of CLIMAGRI<sup>med</sup> (the Mediterranean component of the CLIMAGRI project) will make this exchange of information easier. Italian and foreign researchers will be able to access the information and exchange the data necessary for the realization of the cooperation agreement.

Among the research themes, cooperation with the Mediterranean area countries has been limited to 11 sub-projects:

Sub-project 1 - Climate analysis and future scenarios:

- 1.1 - Acquisition, critical examination and analysis of Italian historical series to study climate change.
- 1.3 - Construction of future climatic scenarios at high resolution to study their effect on agriculture in Italy.

Sub-project 2 - Italian agriculture and climatic changes:

- 2.1 - Classifying the agricultural potential of the national territory on a climatic and pedological basis.
- 2.2 - Identification of agricultural areas and crops at high risk due to climate variations.
- 2.3 - The effect of climate modifications on the risks of freezing (winter, precocious, late) and on the cold requirements of cultivated species.
- 2.5 - The active role of agriculture in the mitigation processes of global climate change.
- 2.8 - Analysis and cataloguing of long-term agronomic experiments: productivity and the carbon cycle.

Sub-project 3 - Drought, desertification and management of water resources:

- 3.1 - Permanent monitoring of drought in agriculture and highlighting of the desertification processes in the south of Italy.
- 3.2 - Irrigation planning and Water Management Analysis.
- 3.5 - The impact of climatic change on the agricultural systems: Research of Drought-Tolerance Indicators.

Sub-project 4 - Information and dissemination of data:

- 4.2 - The capacity of meteorological modelling to limited areas targeted to agrometeorological forecasting operating in the MiPAF environment.

## **FIRST YEAR OF ACTIVITIES**

During these first few months two important activities have been carried out: the organization of an international workshop in Rome and the creation of the CLIMAGRI*med* WEB site. The meeting was organized to enable foreign researchers to establish contact with the CLIMAGRI project theme coordinators who had accepted FAO's proposal for cooperation in the Mediterranean area.

### **CLIMAGRI*med* INTERNATIONAL WORKSHOP**

About 50 experts on the impact of climate change in various agricultural sectors attended the meeting held from 25 to 27 September 2002 at FAO headquarters in Rome. The participants came from eight Mediterranean countries (Algeria, Cyprus, Egypt, Lebanon, Libya, Morocco, Syria and Turkey), from Italy and there were also representatives of UCEA and FAO. In particular, the Mediterranean area experts represented the National Meteorological Services and the National Agronomic Research Institutes.

During the three-day workshop the following aspects were discussed: (i) description of the objectives of CLIMAGRI and CLIMAGRI*med*; (ii) presentation of the CLIMAGRI research themes by their coordinators; (iii) presentation of activities linked with the various themes researched within CLIMAGRI by the experts from the Mediterranean countries; (iv) bilateral discussions; (v) presentation of possible cooperation proposals.

At the end of the meeting, four cooperation proposals were put forth:

1. Modelling of future scenarios in the agricultural systems of the Mediterranean area in connection with climatic variability and change (Algeria, Egypt, Libya, Morocco, Turkey, University of Udine);
2. Techniques for the evaluation of suitable agricultural soil at various levels (from local to national) in order to evaluate the risks involved with climatic variability (Algeria, Cyprus, Libya, Morocco, Turkey, CNR\_IBIMET, ARPA-SMR, UCEA);
3. Sources of 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, Libya, Morocco, Syria, ISA, CNR-IBAF).

A fifth proposal ("Quality and Homogeneity of Meteorological Data") was put forth in the sidelines of the meeting (Cyprus, University of Milan).

Lastly, participants generally approved the idea of using the cooperation among the various Mediterranean-area researchers to prepare a proposal that could be put forth in a future Programme Framework of the European Union for community actions to be taken in research, technological development and trials.

The various proposals are now under study so as to be able to include most of the Mediterranean countries and, above all, meet the budget requirements established by the UCEA-FAO partnership agreement.

## **CLIMAGRI*med* WEBSITE**

The second activity was the creation of a website managed by FAO and concerned with cooperation within CLIMAGRI*med*. It will be an integral part of the new gateway on the climate located inside the Sustainable Development Department's site (SD Dimensions at the following address: <http://www.fao.org/sd/climagrimed/>).

The CLIMAGRI*med* website is divided into four sections: (i) activities, (ii) projects, (iii) research, (iv) cooperation. Furthermore, there is a protected area, limited to the CLIMAGRI*med* participants, to be used for the exchange of information and data. The documents are in English and French as are most of the CLIMAGRI documents which have already been translated. The final version of the CLIMAGRI*med* site has been presented during the workshop.

## **CONCLUSIONS**

The targeted project CLIMAGRI has enabled the creation, in Italy, of a unique research group to study the impact of climate change on agriculture. The data, the studies and methodologies developed will be used to obtain an analysis of the nationwide agroclimate, highlighting unusual factors and in-progress or hypothesized climate change, with particular emphasis on the impact they could have on agriculture in Italy.

Also, given Italy's geographical position and geo-morphological structure, the outcomes of the project can be successfully applied to other agricultural systems in the Mediterranean area. For this reason one of the research themes regards the transfer of methodologies worked out within CLIMAGRI to some developing countries in the Mediterranean area. FAO, coordinator of this activity, intends to build a strong and fruitful technical and scientific collaboration between Italian researchers and their counterparts in the other Mediterranean countries. This cooperation will be carried out essentially by means of specific exchange projects.

The first important step towards the above-mentioned collaboration between Italy and the other Mediterranean countries was taken during the international workshop on the CLIMAGRI project theme "Mediterranean", organized at the FAO centre in Rome. Moreover, the realization of a website to be managed by FAO will enable the real-time exchange via computer of data and information between Italian researchers and their counterparts in the other Mediterranean countries.