CIHEAM

International Centre for Advanced Mediterranean Agronomic Studies
Mediterranean Agronomic Institute of Zaragoza

Telerieg

SUDOE Interreg IV B

UE/EU - FEDER/ERDF

Advanced Course

USE OF REMOTE SENSING FOR IRRIGATION MANAGEMENT

Zaragoza (Spain), 21-26 November 2011

1. Objective of the course

In agriculture and the environment, water is a scarce and indispensable resource for the development of production sectors and ecosystems.

The changes in land use have accelerated in recent years. The estimation of water for agricultural use needs to be updated frequently, which is very costly when based only on field studies. The variety and availability of new sensors for land observation and their combination with mathematical models are facilitating the development of new data processing techniques as well as their integration into the new precision irrigation systems. In comparison with other traditional methods, the use of satellite images and geographical information systems has various advantages, such as the synoptical vision of terrain, the obtention and use of multispectral information, the low cost of the images and periodical updates.

This course combines the new processing techniques for remote sensing images with methods based on field sensors, thus providing a vision of the present status and future possibilities for the improvement of irrigation system management.

Upon completion of the course, participants will be able to:

- Identify the main problems of present irrigation systems.
- Understand the basic concepts and principles of remote sensing techniques.
- Valuate the advantages and drawbacks of the different types of land observation data, their combination with field data and integration into models.
- Obtain an updated vision of remote sensing applied to water resource management.
- Acquire practical skills to estimate the spatial and temporal variability of water demands.
- Apply methodologies that lead to the improvement of irrigation efficiency on different work scales.
- Acquire experience in real cases and operational techniques.
- Integrate theoretical and practical knowledge for the efficient transfer of such technologies.

2. Organization

The course is organized by the **International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)**, through the **Mediterranean Agronomic Institute of Zaragoza (IAMZ)**, and the **Telerieg Project of the Territorial Cooperation Programme of the Southwest European Space (Interreg IV B SUDOE) of the European Union.**

The **Telerieg** project (Use of remote sensing for irrigation practice recommendation and monitoring in the SUDOE space) aims to improve natural resource management efficiency, adjusting economic activities to a more rational use of resources (thus improving competitivity) and enhancing the management capacity of economic and social agents as well as the administration regarding data collection and analysis and decision making.

The course will be held at the Mediterranean Agronomic Institute of Zaragoza and will be given by well-qualified lecturers from universities, research centres and private entities of different countries.

The course will be held over a period of 1 week, from 21 to 26 November 2011, in morning and afternoon sessions.

3. Admission

The course is designed for a maximum of 25 university graduates, and is addressed to professionals from public bodies or private entities, with responsibilities in the management of water resources in agriculture and the environment.

Given the diverse nationalities of the lecturers, knowledge of English and French will be valued in the selection of candidates, since together with Spanish, they will be the working languages of the course. However, if necessary, the Organization will provide simultaneous interpretation of the lectures.

4. Registration

Application forms may be obtained from:

Instituto Agronómico Mediterráneo de Zaragoza
Avenida de Montañana 1005, 50059 Zaragoza (Spain)
Tel.: +34 976 716000 - Fax: +34 976 716001
e-mail: iamz@iamz.ciheam.org
Web: www.iamz.ciheam.org

Candidates should send the completed application form to the above address, accompanied by a detailed *curriculum vitae*, stating degree, diplomas, experience, professional activities, language knowledge and reasons for applying to the course. Copies of certificates should be enclosed with the application.

The deadline for the submission of applications is **5 September 2011.**

Please display on a notice board if possible

100%

Instituto Agronómico Mediterráneo de Zaragoza
Avenida de Montañana 1005, 50059 Zaragoza, Spain
Tel.: +34 976 716000, Fax: +34 976 716001
E-mail: iamz@iamz.ciheam.org
CIHEAM

See updated information at

www.iamz.ciheam.org

INFORMATION CONTINUES OVERLEAF

Applications from those candidates who cannot present their complete records when applying, or those requiring authorization to attend the course, may be accepted provisionally.

Registration fees for the course amount to 450 euro. This sum covers tuition fees only.

5. Scholarships

Candidates from Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey may apply for scholarships covering registration fees and for scholarships covering the cost of travel and full board accommodation.

Candidates from other countries who require financial support should apply directly to other national or international institutions.

6. Insurance

It is compulsory for participants to have medical insurance valid for Spain. Proof of insurance cover must be given at the beginning of the course. Those who so wish may participate in a collective insurance policy taken out by the Organization, upon payment of the stipulated sum.

7. Teaching organization

The course requires personal work and interaction among participants and with lecturers. The international characteristics of the course favour the exchange of experiences and points of view.

The programme has an eminently applied focus that combines specialized lectures, computer practicals and real case studies in different geographical areas to show the wide range of applications of remote sensing available for the management of water resources. The programme is completed with a technical visit to a farm which successfully integrates and applies the methodologies presented.

8. Programme

1. **Introduction to irrigation management (3 hours lectures + 2 hours practicals)**
   - 1.1. Irrigation systems: principles and current status. Precision irrigation
   - 1.2. Issues and needs in irrigation management of different hydroclimatic regions
   - 1.3. The Telerieg project
   - 1.4. Geographic information systems: data versus information
   - 1.5. Introduction to remote sensing
     - 1.5.1. Remote sensing as a decision support tool
     - 1.5.2. Physical principles and spectral response
     - 1.5.3. Platforms and sensors
     - 1.5.4. Resolutions: spectral, temporal, spatial and radiometric
     - 1.5.5. Economic analysis
   - 1.6. Practical work
     - 1.6.1. Integration of field data on soil moisture and meteorology with images
     - 1.6.2. Introduction to GIS tools: ILWIS
2. **Image processing techniques in remote sensing (3 hours lectures + 2 hours practicals)**
   - 2.1. Image corrections and enhancement
   - 2.2. Extraction of information from optic sensors
     - 2.2.1. Vegetation and soil brightness indices
     - 2.2.2. Multispectral classification
   - 2.3. Extraction of information from thermal sensors
     - 2.3.1. Estimation of surface temperature
     - 2.3.2. Estimation of real evapotranspiration
   - 2.4. Practical work
     - 2.4.1. Access to satellite image data bases. Analysis of resolutions
     - 2.4.2. Generation and interpretation of images
     - 2.4.3. Extraction of information from thermal sensors
3. **Applications and case studies (9 hours lectures + 9 hours practicals)**
   - 3.1. Mapping and quantifying irrigated surface areas
     - 3.1.1. Estimation of irrigated crop surface areas: scenario building for agricultural water demand
     - 3.1.2. Determining agronomic parameters for improving irrigation efficiency in fruit crop plots
     - 3.1.3. Practical work: quantification of water demand per plot
   - 3.2. Calculation of irrigation requirements on different scales. Irrigation efficiency
     - 3.2.1. Temporal dynamics of water demand based on medium-resolution images
     - 3.2.2. Estimation of spatial variability of soil water distribution using thermal images
     - 3.2.3. Estimation and prevision of water balance through remote sensing and plant-climate-soil sensors
     - 3.2.4. Practical work
       - 3.2.4.1. Estimation of crop coefficients (Kc) through remote sensing
       - 3.2.4.2. Identification of water stress
       - 3.2.4.3. Forecasting irrigation requirements
   - 3.3. Evaluation of drought and salinity conditions: determining water stress
     - 3.3.1. Monitoring of vegetation and evapotranspiration indicators on a catchment scale
     - 3.3.2. Contribution of remote sensing to the study of water stress on a plot scale
     - 3.3.3. Practical work: estimation of actual evapotranspiration on a catchment scale
   - 3.4. New agrohydrological models and other future applications
4. **Technical visit to a farm in Barbastro (Huesca)**

GUEST LECTURERS

R. ALVÁREZ, VerdTech Nuevo Campo S.A., Lepe (Spain)
A. BAILLE, Univ. Politécnica de Cartagena (Spain)
W. BASTIAANSSEN, WaterWatch, Wageningen (the Netherlands)
M. BEA, GEOSYS S.L., Madrid (Spain)
J.F. BERTHOUMIEU, ACMG, Le Passage (France)
A. CALERA, Univ. Castilla-La Mancha, Albacete (Spain)
M. ERENA, IMIDA, La Alberca (Spain)
S. GARCÍA, Univ. Politécnica de Cartagena (Spain)
J. GIRONA, IRTA, Lleida (Spain)
D. INTRIGLIOLO, IVIA, Valencia (Spain)
S. LABBÉ, CEMAGREF, Montpellier (France)
J. MAIA, COTR, Beja (Portugal)
S. MONTESINOS, GEOSYS S.L., Madrid (Spain)
L.A. RUIZ, Univ. Politécnica de Valencia (Spain)
P. ZARCO, CSIC-IAS, Córdoba (Spain)

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