Impacts of Climate Change and Variability on European Agriculture: CLIVAGRI – COST 734

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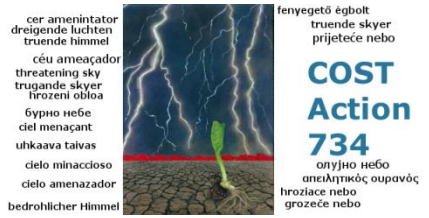

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OUTLINE

COST 734

SCIENTIFIC CONTEXT

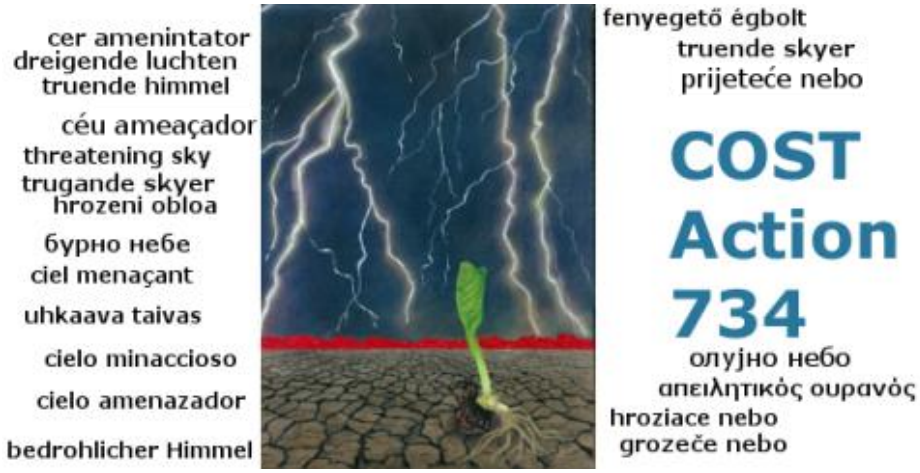
SCIENTIFIC ACTIVITY

DISSEMINATION OF RESULTS

COST 734

Impacts of Climate Change and Variability on European Agriculture
CLIVAGRI – COST 734

www.cost734.eu



Chair Simone Orlandini

Vice chair Pavol Nejedlik

Rapporteur Giampiero Maracchi

Science Officer Stefan Stückrad

Administrative Officer Sjamsudin Chandrasa

START 21 April 2006 **END 21 May 2011**

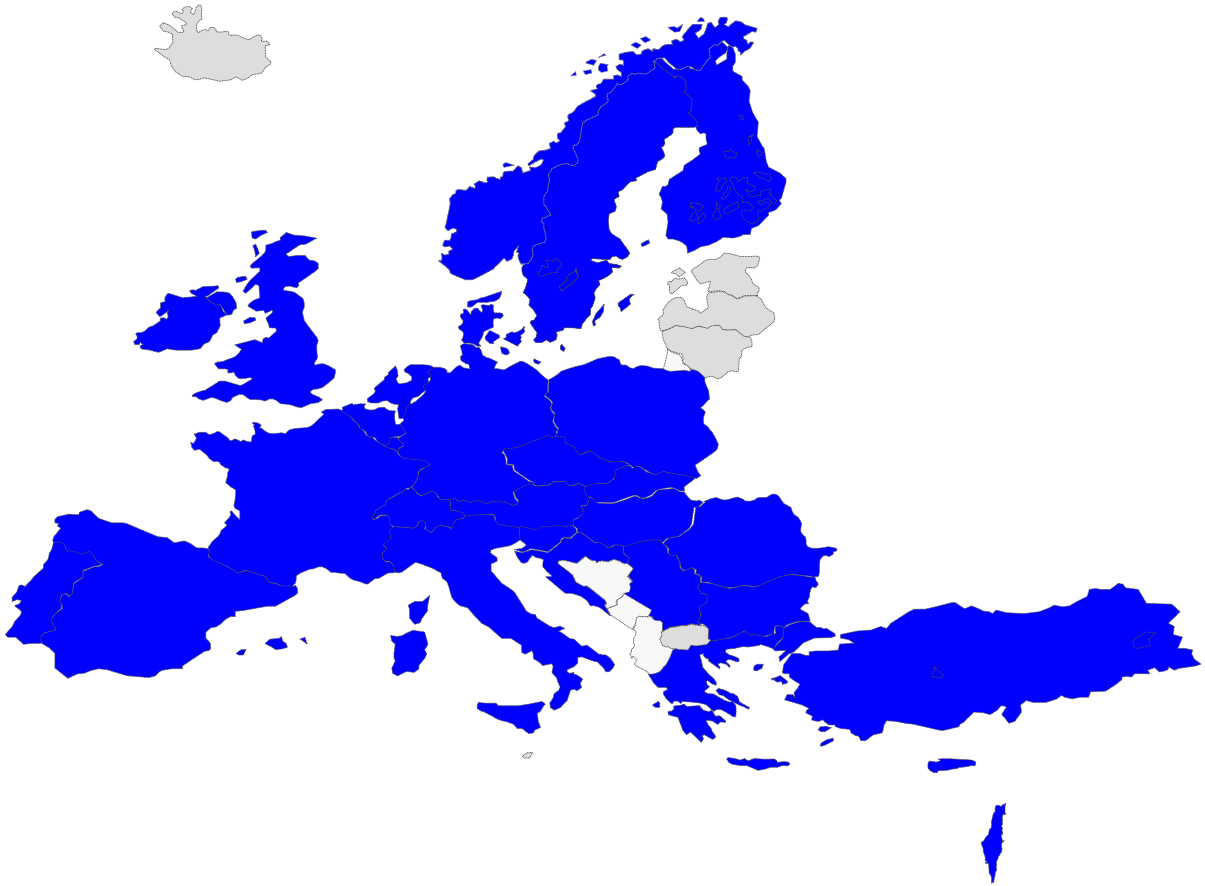
Geographical impact

COST Countries : 29

Chair : IT

List of COST country

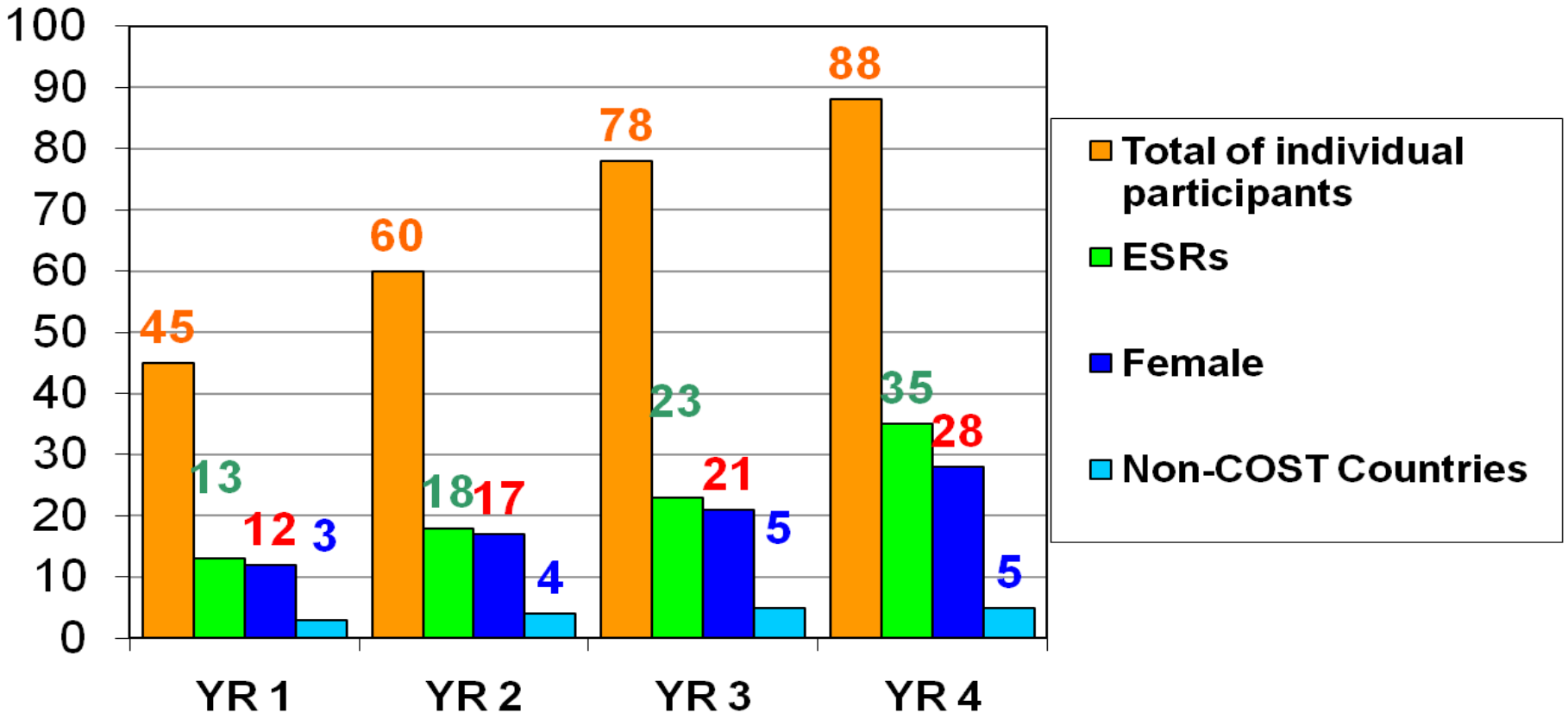
AT, BE, BG, HR, CY,
CZ, DK, FI, FR, DE, GR,
HU, IE, IL, LU, NL, NO,
PI, PT, RO, SR, SK, SI,
ES, SE, CH, TR, UK



Non-COST institutions:

National Drought Mitigation Centre, University of Nebraska–Lincoln USA
Lincoln University, Canterbury New Zealand
Joint Research Centre Ispra, Agriculture Unit (ex-Agrifish) Italy
WMO – Agricultural Meteorology Division

Action participants



In total 570 participations of NDs and experts to meetings

Total group included 51 ND, 5 external members (WMO, JRC Ispra, etc.), 5 WG members, 35 invited experts

Use of COST instruments

	YR 1	YR 2	YR 3	YR 4	Total
No. of MC / WG meetings	5/7	2/8	2/10	1/9	10/34
No. of STSMs	3	4	7	7	21
No. of workshops / conferences	0	2	1	1	4
No. of joint publications	1	1	1	3	6
No. of training schools	0	0	1	1	2
early stage researcher conference grant		1	1	1	3

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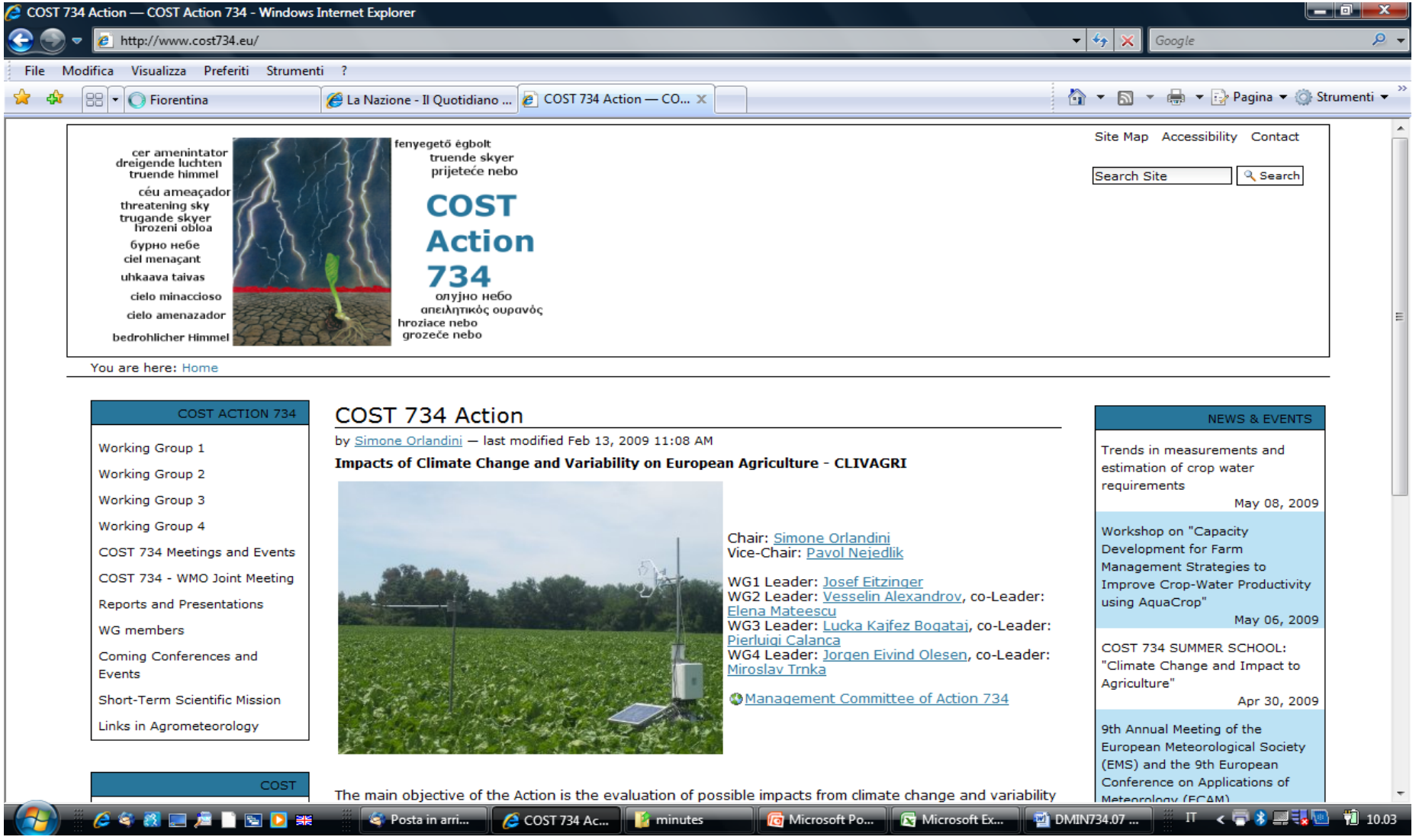


Training school (i)

Volos (Greece), beginning of July 2009.

20 students, 5 days

“Climate Change and Variability Impact to Agriculture: data analysis, indices and models, preliminary evaluation of impacts and adaptations”

1) climate variability (data processing, reanalysis, time series, stochastic techniques, etc.)
2) climate change (GCM, scenarios, downscaling, climate forecasting)
3) agroclimatic indices, models, estimation of hazard, remote sensing techniques
4) introduction to agricultural impacts and adaptation measures

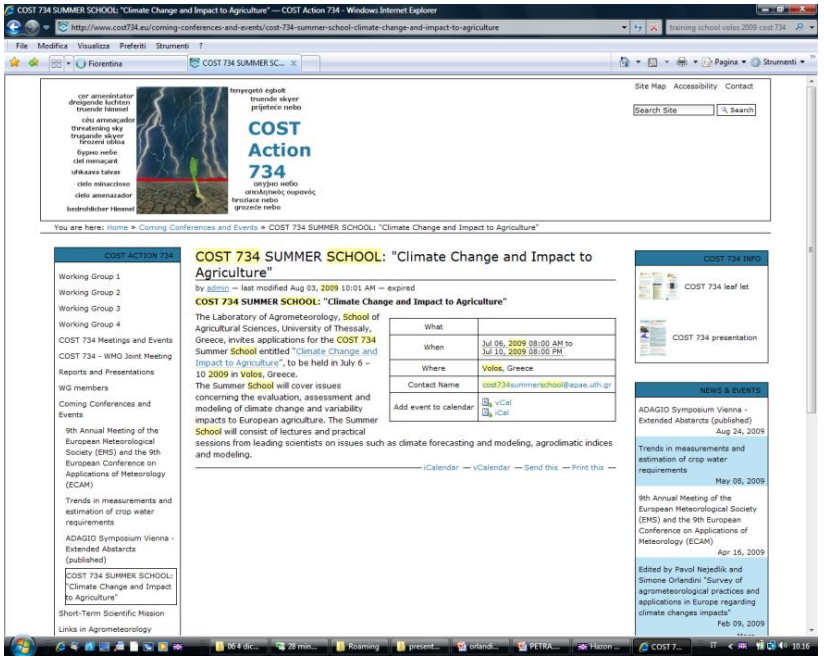
Keszthely (Hungary), July 2010.

20 students, 5 days

Training school (ii)

Climate Change and Variability Impact to Agriculture:

parameterisation of agromet models, the importance of field experiment and ground truth in remote sensing application, evaluation of impacts, risk assessment, adaptation measures, warning systems

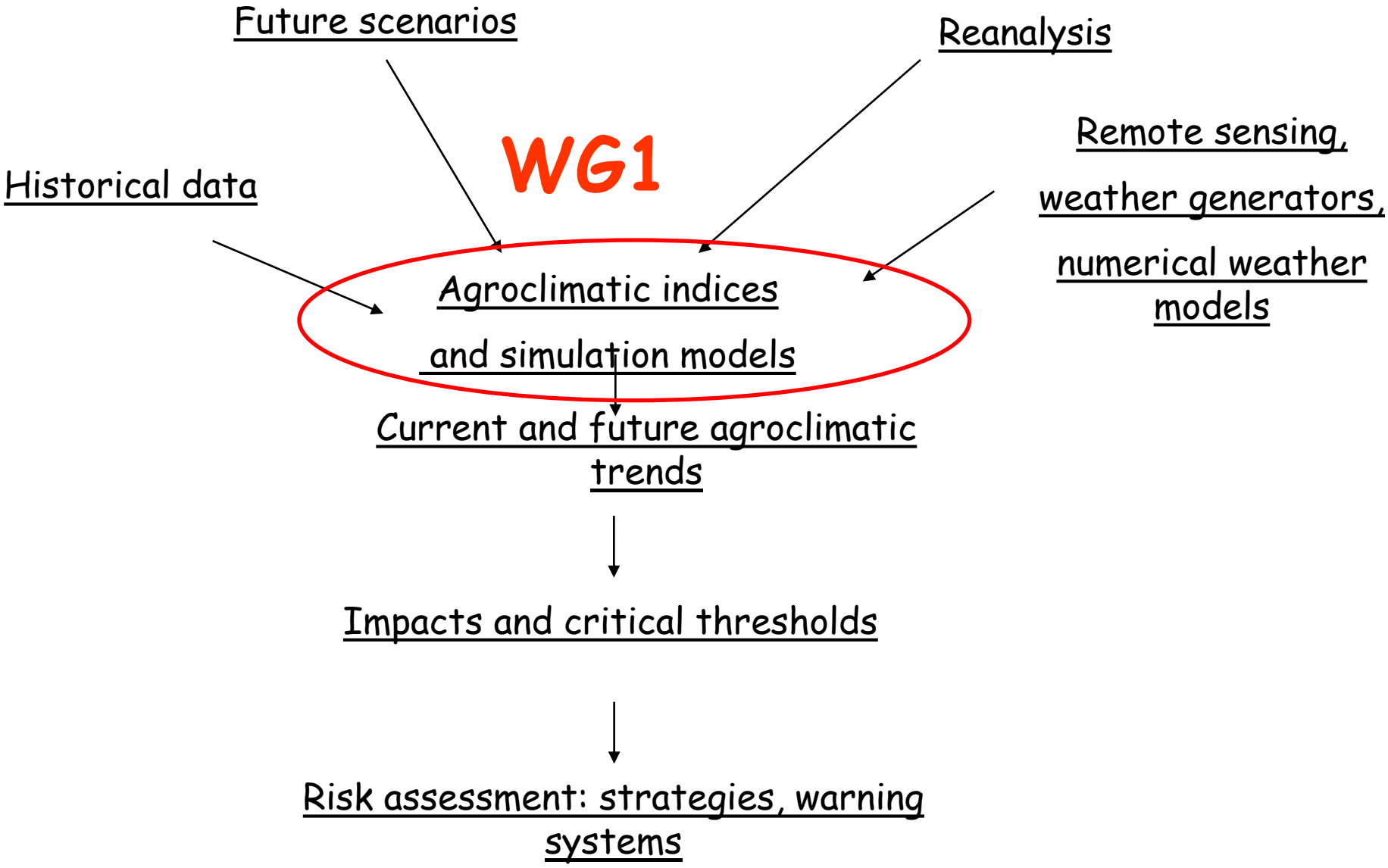


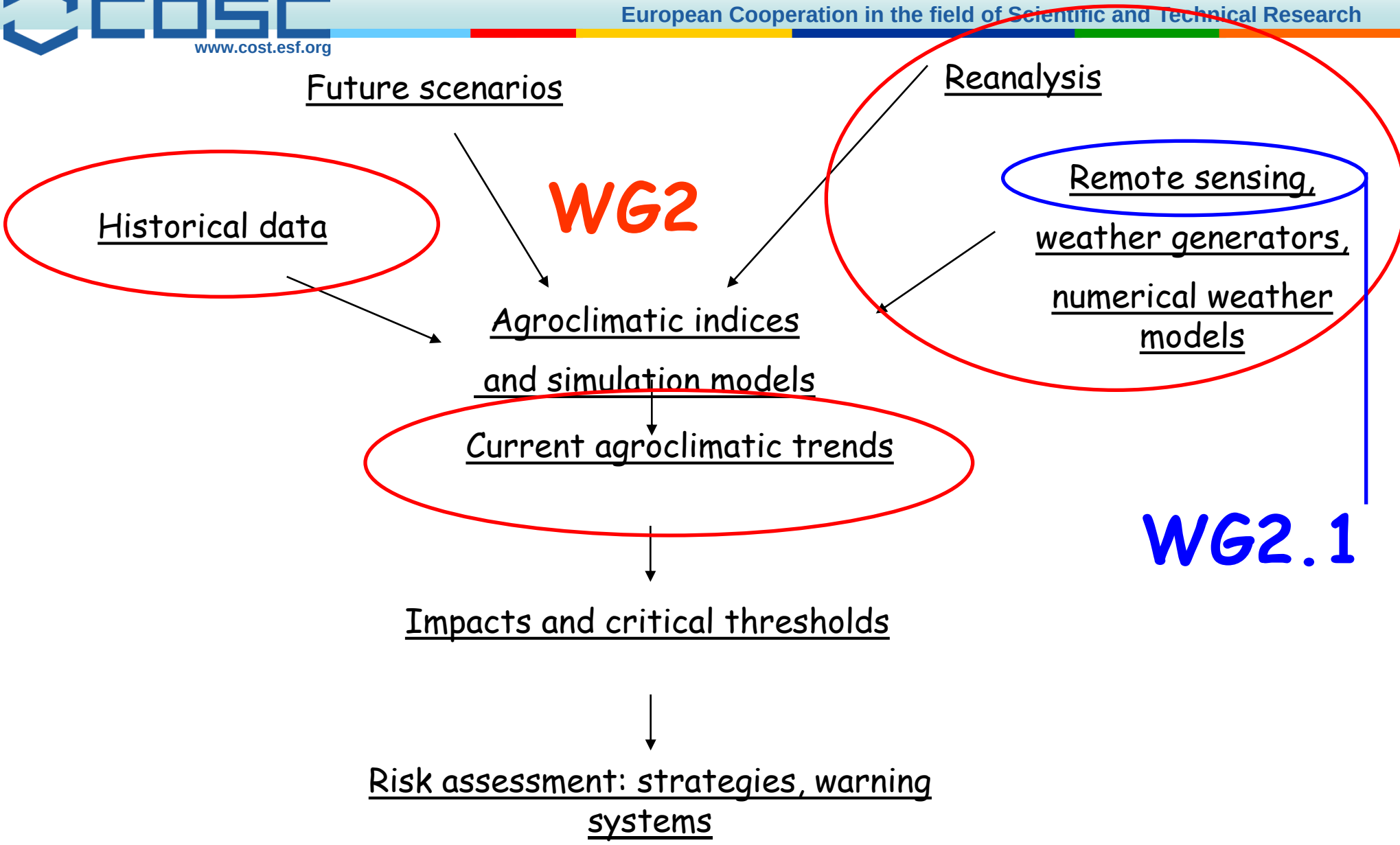
SCIENTIFIC CONTEXT

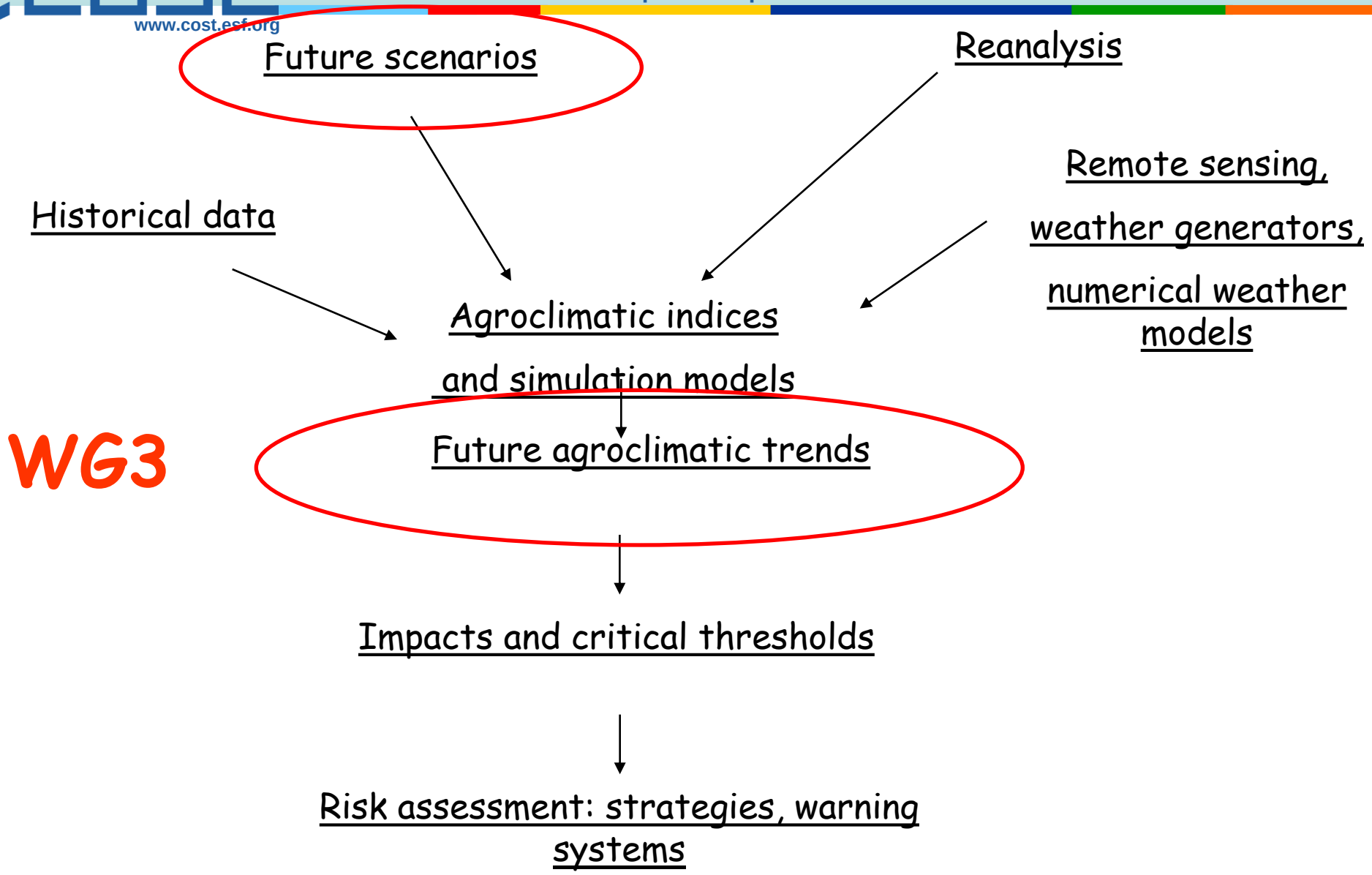
Scientific context and objectives
(defined during COST proposal in 2005)

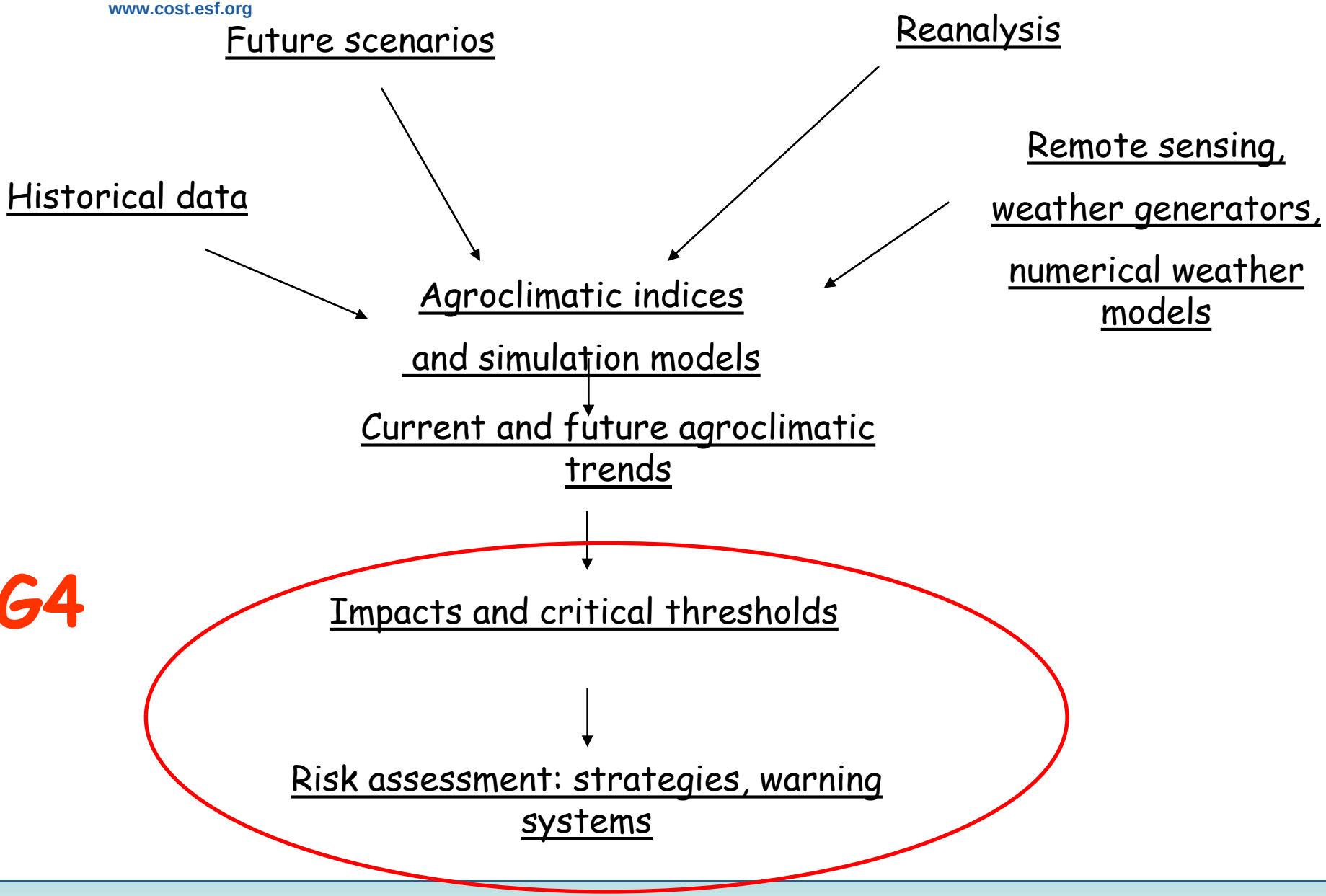
Background: The European agricultural community is requesting more evidence of climate change and variability. Consequently the assessment of meteorological impacts on agriculture represents a main goal for COST 734 with objective evaluation of current and future climatic conditions by using, harmonising and integrating all the available data, methods and technologies.

Brief reminder of MoU objectives: the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas.


Future scenarios
Reanalysis
WG1
Historical data
Remote sensing,
weather generators,
numerical weather models
Agroclimatic indices
and simulation models
Current and future agroclimatic trends
Impacts and critical thresholds
Risk assessment: strategies, warning systems


Future scenarios
Reanalysis
Historical data
WG2
Remote sensing,
weather generators,
numerical weather models
Agroclimatic indices
and simulation models
Current agroclimatic trends
WG2.1
Impacts and critical thresholds
Risk assessment: strategies, warning systems


Future scenarios
Reanalysis
Historical data
Remote sensing,
weather generators,
numerical weather models
Agroclimatic indices
and simulation models
WG3
Future agroclimatic trends
Impacts and critical thresholds
Risk assessment: strategies, warning systems


Future scenarios
Reanalysis
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Remote sensing,
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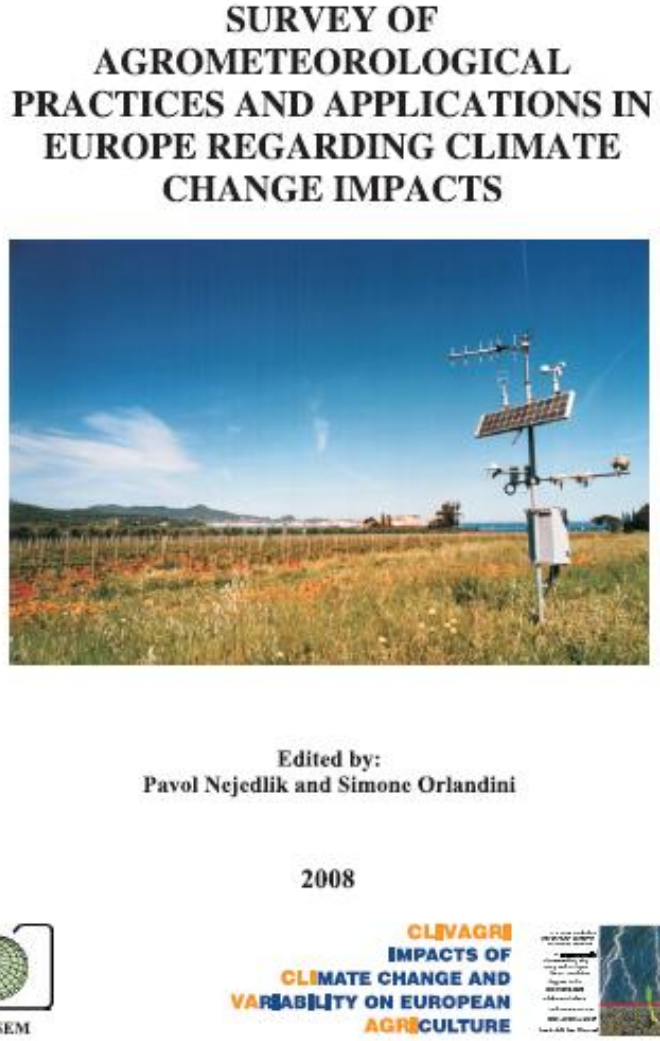
and simulation models
Current and future agroclimatic trends
Impacts and critical thresholds
Risk assessment: strategies, warning systems

WG4

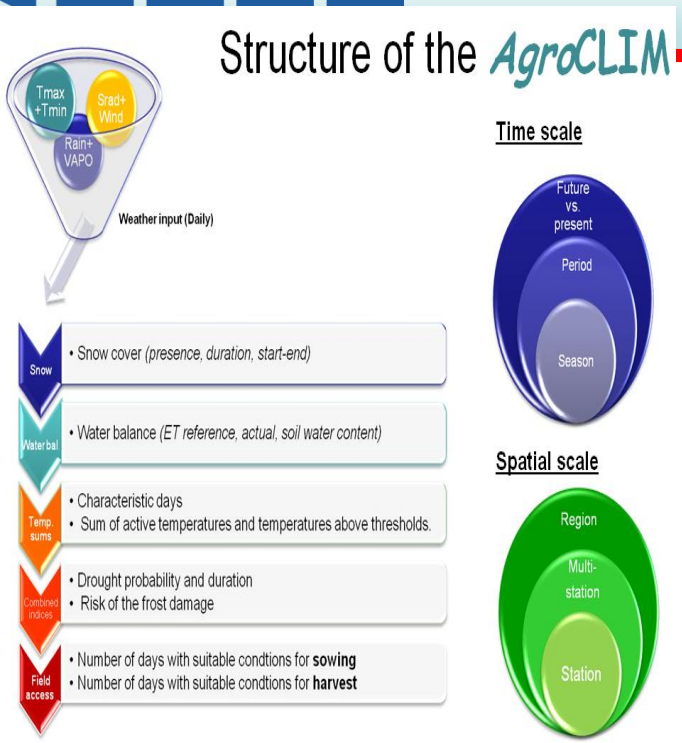
	SEASONAL SHIFT	FROST RISK	DROUGHT	ETC...
TIME SERIES ANALYSIS	Anticipation of budbreak	Delay of late frost and increasing of its temperature	Reduction of water storage in the soil at the end of Winter	
REMOTE SENSING	Modification of NDVI patterns		Determination of drought risk areas	
FUTURE CLIMATE SCENARIOS	Latitudinal and altitudinal plant shift	Increase of risk due to the simultaneous anticipation of budbreak and delay of frost event	Increasing of areas subjected to dry conditions during Spring and Summer	
ETC...				

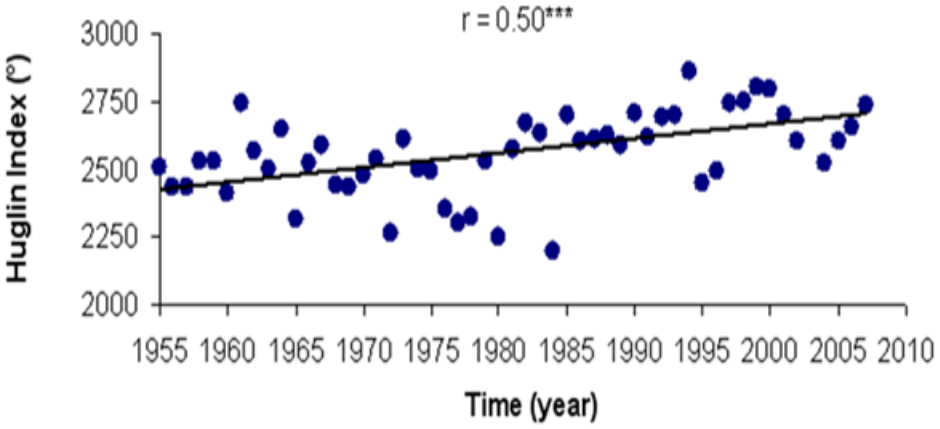
SCIENTIFIC ACTIVITY

Results vs. Objectives



As concerning the *phase A (first year)*, a book with the results of inventory phase was edited. It includes the analysis of answers to five questionnaires (titled: Agroclimatic Indices and Models; Trends in Agroclimatic Indices and Model Outputs; Satellite Data Records Survey; Climate Change Scenarios; Risk Assessment and Foreseen Impacts on Agriculture) disseminated among COST 734 countries





Results vs. Objectives

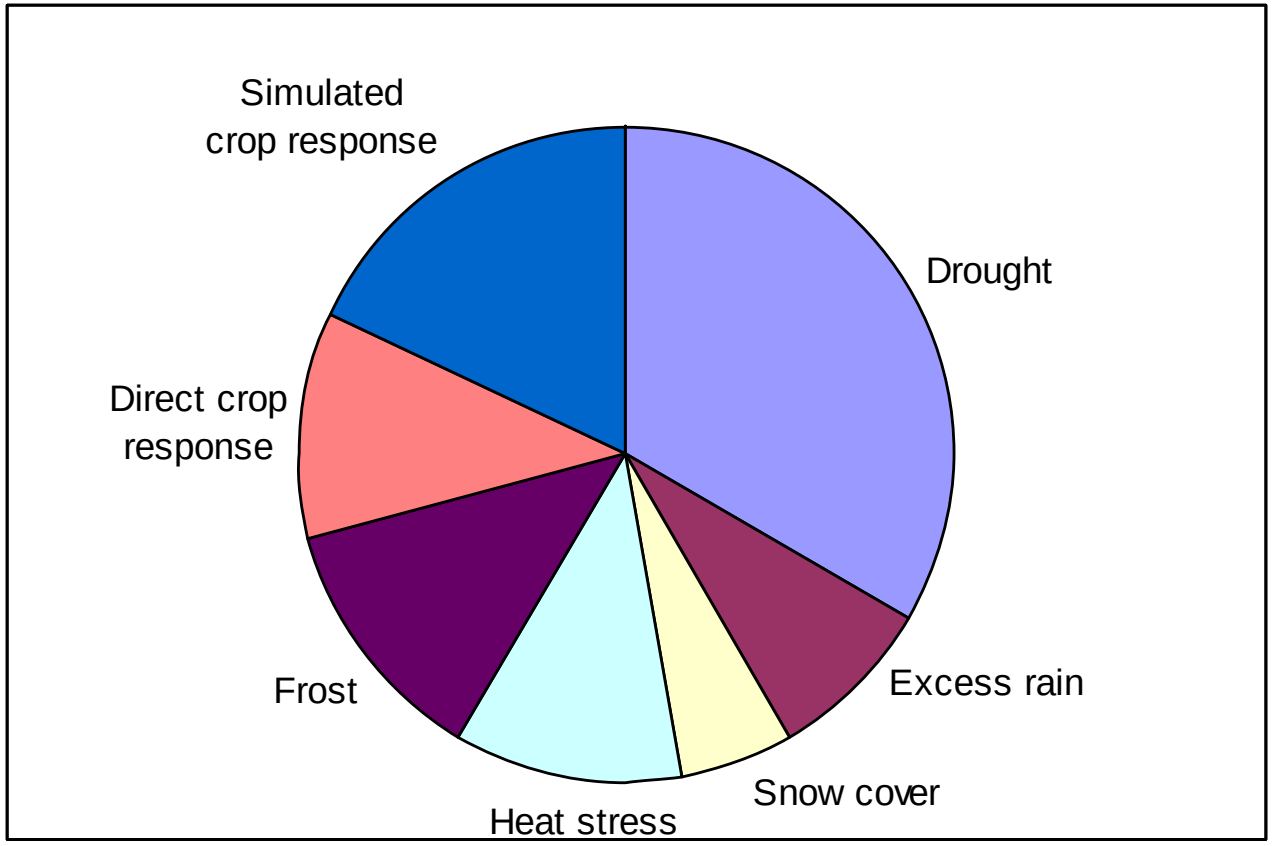
phase B (second and third years)

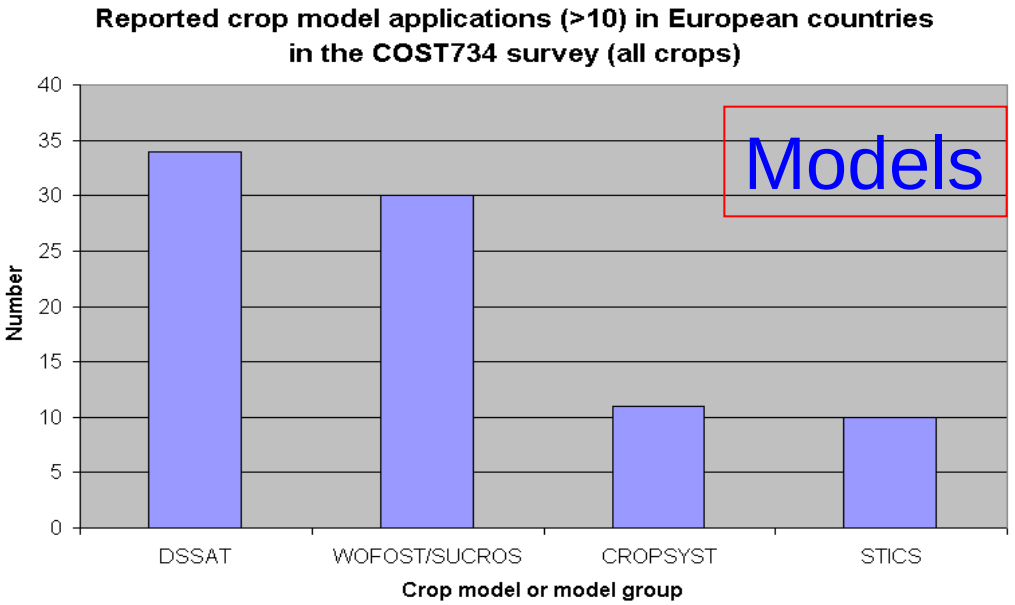
To address the main goals of the Action, specific case studies were identified and structured with the collaboration of Action members in order to involve the majority of the countries. The main aim is represented by a whole description of the impacts of climate change.

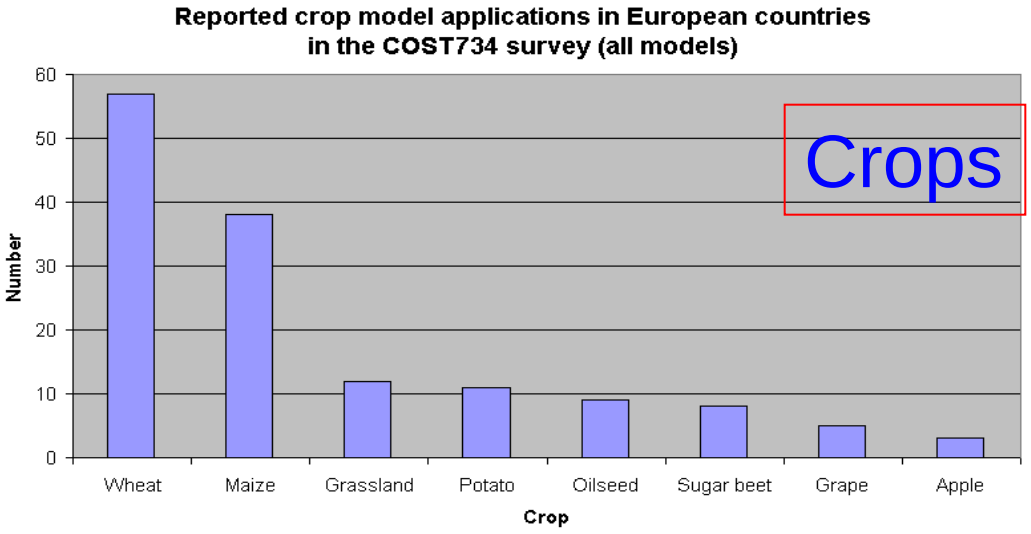
Indices and models - WG1

1) Investigate crop yield relations of different indices
2) How different crop models and indices can be combined for gathering better information on climate change impact assessments
3) Sensitivity analyses of climate change impact models to specific extremes
4) Information about available phenological models/indices

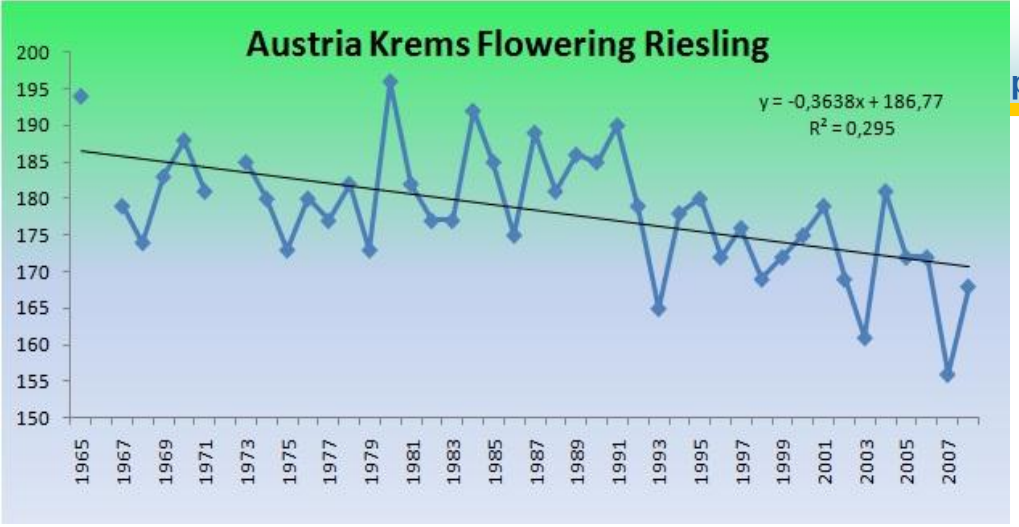
The distribution of the numbers of agrometeorological indices used in research according to their purpose

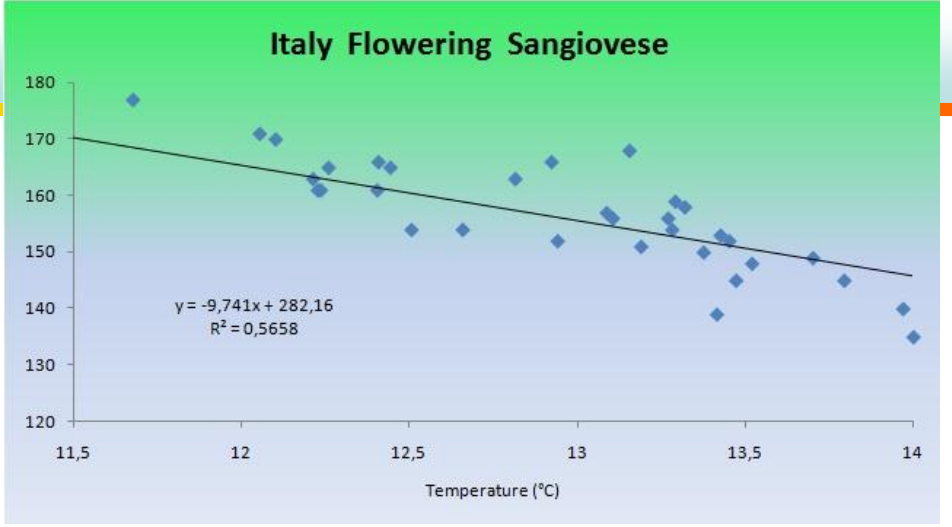






Use of process oriented models in European countries





Grapevine phenology - bloom

Country	Site	Variety	+/- Days x 10	p level
Italy	Montepulciano	Sangiovese	-4.4	**
Croatia	Hvar	Blatina	-2.9	***
		Plavac mali	-2.2	**
		Trbljan, Kuč	-2.6	**
	Daruvar	Chasselas dore	-2.9	***
		Riesling Italico	-2.8	***
Austria	Krems	Riesling	-3.6	***
Ukraina	Sevastopoli	Pinot gris180	-5.6	***
		Muskat white230	-0.3	N.S.
Slovakia	Dolne Plachtince	Burgundy white	-1.4	N.S.
		Blue Frenkei	-5.6	N.S.
		Muller - Thurgau	-4.7	N.S.
		Blue Portugal	-4.2	N.S.

COST is supported by
the EU RTD Framework Programme

ESF provides the
COST Office through an EC contract

Agroclimatic analysis- WG2

Evaluation of the Current Trends of Agroclimatic Indices and Simulation Model Outputs describing Agricultural Impacts and Hazard Levels,

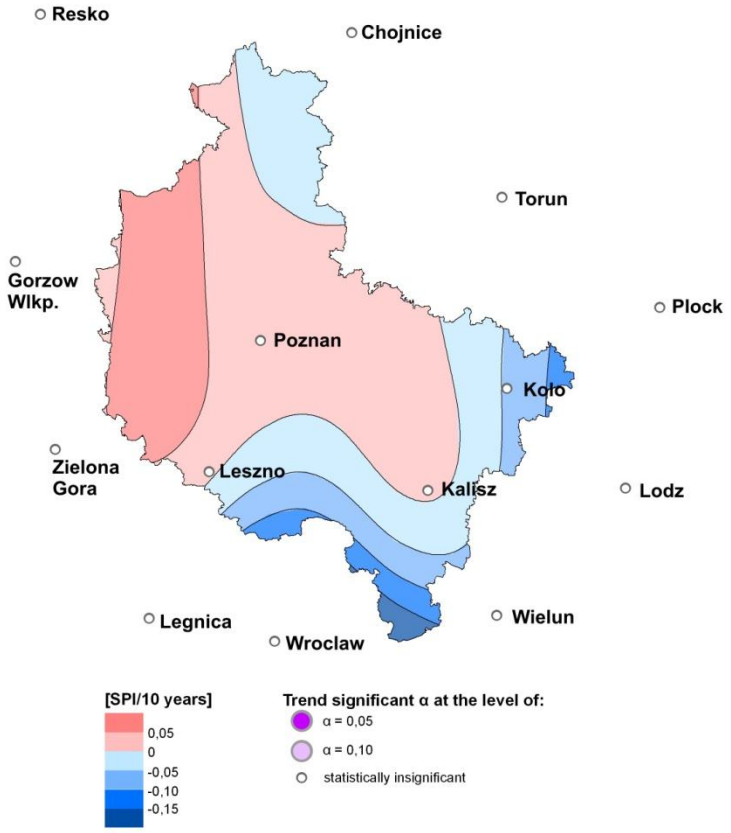
1960-2005 potential and actual ETP; proposal of new zoning of agroregions (north Carpathian region),

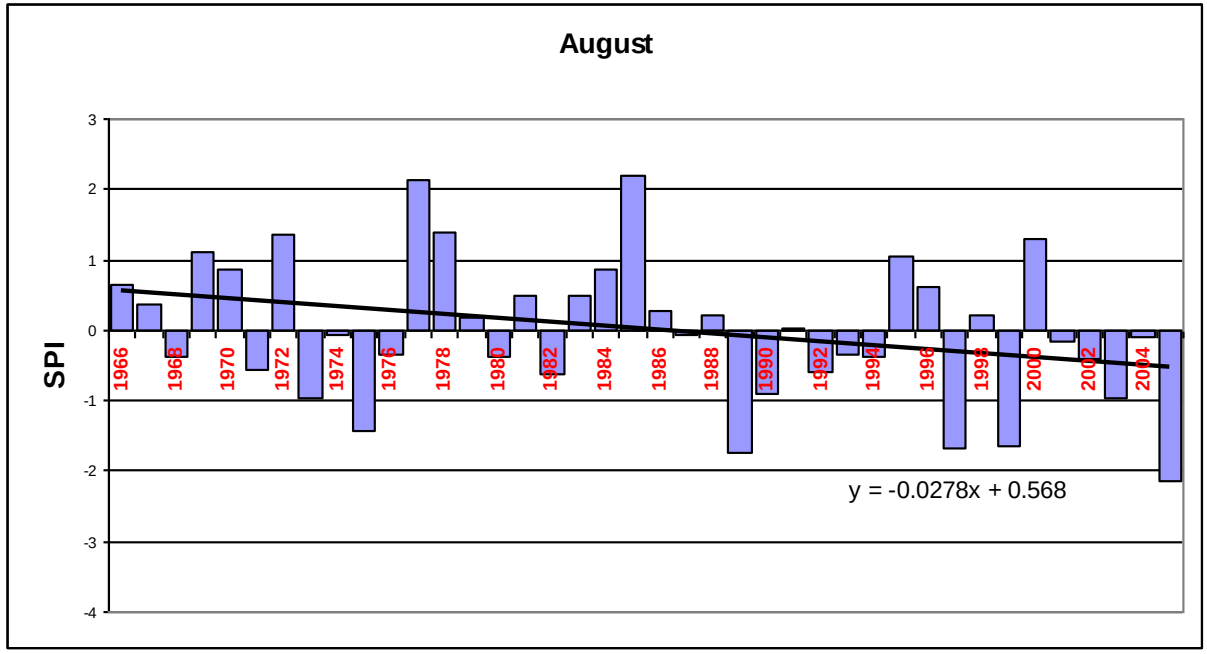
Diachronic Stochastic Futures of Drought Monitoring in Greece,

Secular Trend Analysis of Evapotranspiration in Croatia,

Trends of Agroclimatic Indices and Simulation Model Outputs

SPI values in Poland



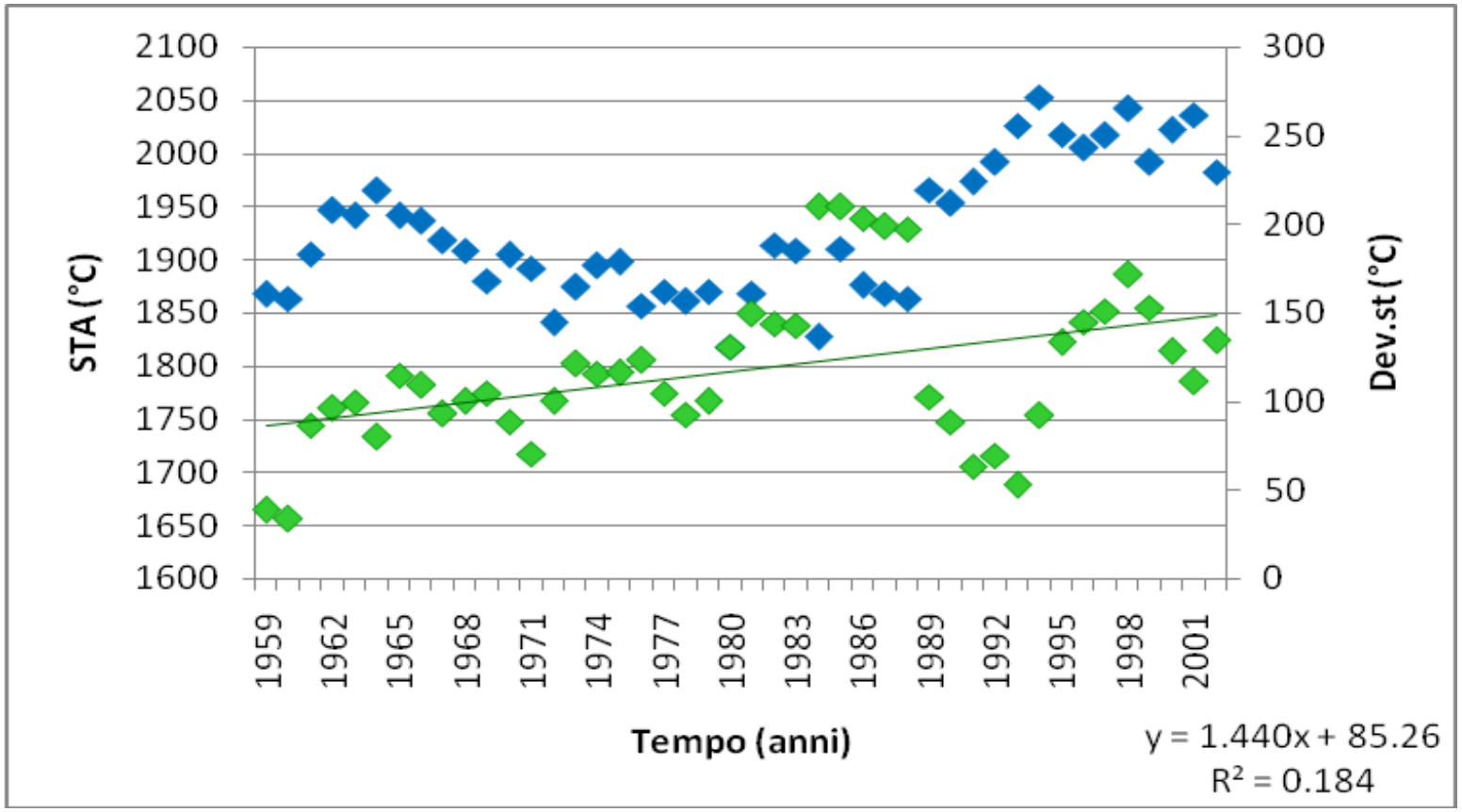


Trend of growing degree-days (°C/100 years) for different temperature threshold (T) during the year (Y), warm (W), and cold season (C)

(period 1901–2000 in Croatia). Significant trends are bolded

Trend	T = 5 °C			T = 10 °C			T= 15 °C			T = 20 °C		T = 25 °C	
	Y	W	C	Y	W	C	Y	W	C	Y	W	Y	W
Zagreb-Gric	**201.0**	**115.6**	**85.4**	**144.0**	105.4	**38.6**	76.7	71.3	**5.5**	35.0	35.0	7.6	7.6
Osijek	13.4	3.3	5.3	12.9	-2.4	12.0	-1.4	-9.6	-0.1	-12.7	-12.6	-3.3	-3.3
Gospic	-14.0	-25.1	33.4	-28.2	-35.5	**15.2**	-28.3	-33.5	0.7	-2.4	-2.4	-0.5	-0.5
Crikvenica	**220.9**	**143.9**	**73.6**	**177.7**	**140.1**	34.2	**142.2**	**127.9**	11.6	**94.0**	**93.8**	**21.1**	**21.1**
Hvar	**211.5**	**107.5**	**99.8**	**168.9**	**103.0**	**67.1**	**126.9**	**93.4**	**32.1**	**100.8**	**94.7**	**31.3**	**31.3**

Degree day accumulation – interannual variability



Moving mean and standard deviations of the STA index (Montepulciano station). The mean (1955-1959) is about 1959 °C. The **R^2** shows a significant trend ($p<0.01$).

Remote sensing - WG2.1

Objective

"How the study of climate change and variability impact on agriculture can benefit from space".

"Analysis of the role of satellite data in the suitable models and indices for assessing the impact of climate change and variability on European agriculture"

Deliverable

"Evaluation and assessment of the use of satellite data for agro-climate research and in particular their integration into high-quality, globally-integrated climate products"

Status of satellite data for warning purposes for agriculture, in Europe

Among European countries there is a great difference concerning climate and biophysical data received from satellite sensors or collected as satellite-derived ready products

Main variables collected are **Land Surface Temperature** and **NDVI**

In a second series of the climate variables are: cloud products, snow cover, radiation, land cover, precipitation, evapotranspiration and albedo. Variables collected only in specific cases: Air-stability, Storm detection, Ozone content, VCI, TCI, Soil moisture, MSAVI, LAI, Degree days, sea ice and sea wind

SEVIRI/METEOSAT and AVHRR/NOAA are the most popular sensors

MODIS and ASTER onboard TERRA or AQUA platforms are preferred due to easy accessibility via internet and because their improved spatial, temporal and spectral characteristics

Among the limitations to use satellite data are:

- the need to manage extremely large volumes of data
- restrictions of spatial sampling, resolution and temporal sampling
- accounting for orbit drift and sensor degradation over time
- difficulty of calibrating after launch (e.g., vicarious or onboard calibration)
- the need for significant computational resources for reprocessing

Potential for assimilation of satellite data into models

A large variety of information is freely available for the users who would like to study vegetation temporal and spatial changes over the last 10-30 years.

Remotely sensed data have been shown to be a useful tool in the assessment of stress caused by adverse climatic conditions and in crop yield modelling.

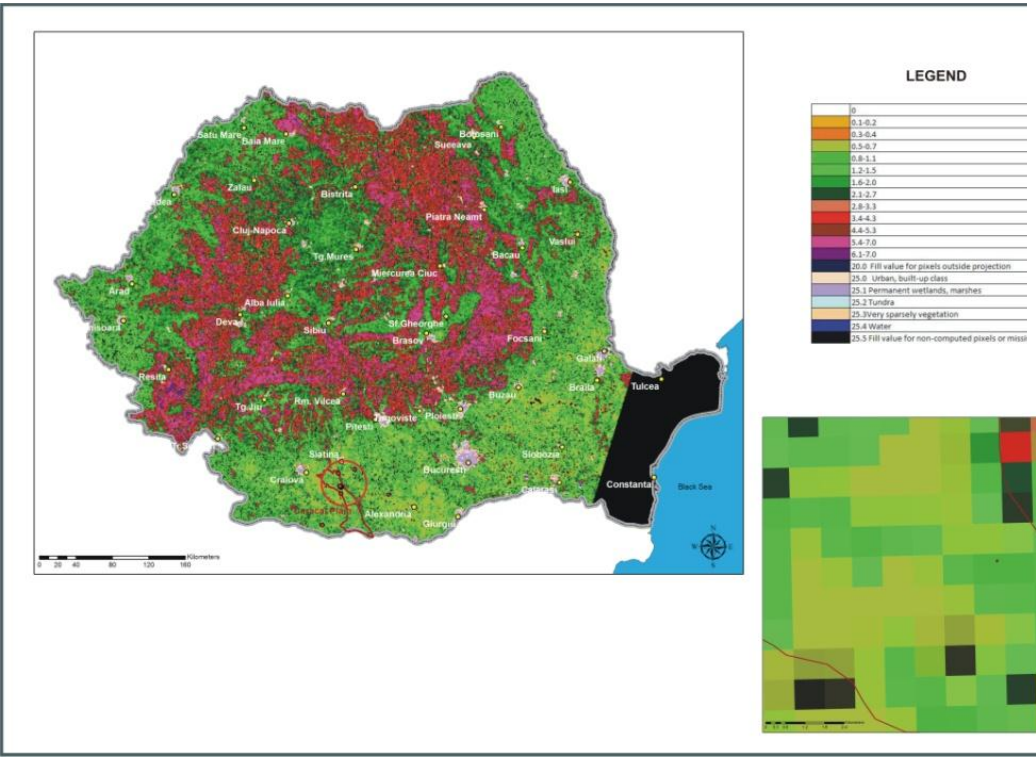
For the operational assimilation of satellite image data in crop models there are some new approaches for data collection and analysis. The most promising solution seems to be the constellation of identical satellites in the same orbit.

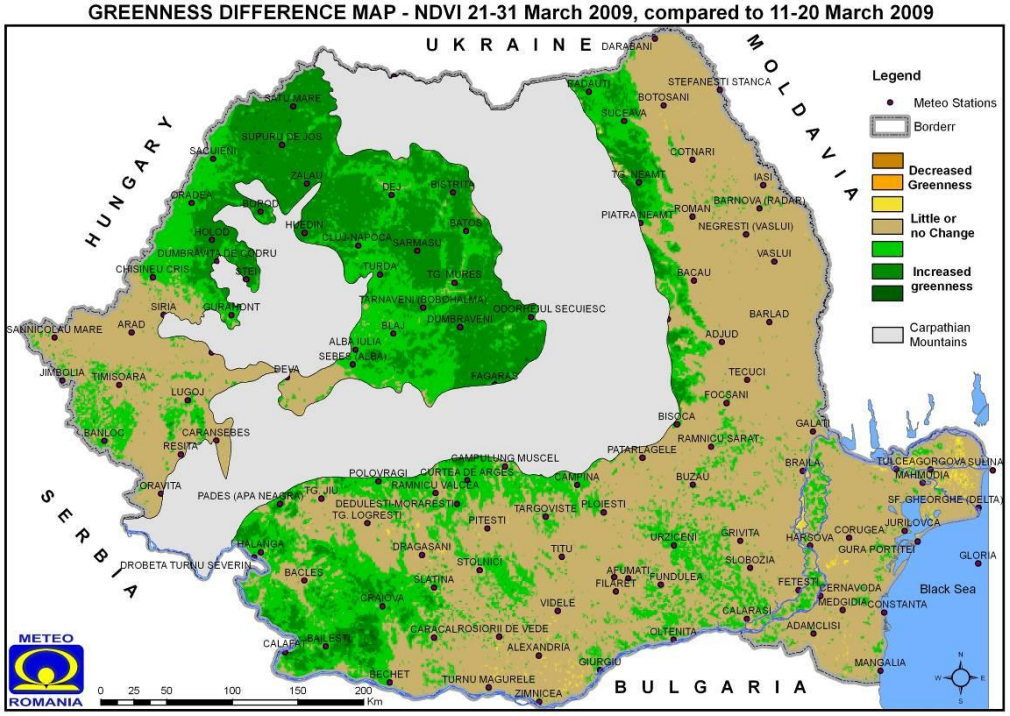
High level remote sensing products are easier to assimilate. Nevertheless, working with more ‘core’ satellite observations such as low level products can provide better results, since assumptions made in the satellite product calculation are avoided.

The assimilation of ‘raw’ remote sensing data, although it can provide better results, is often an unrealistic approach due to the computing power required.

There are probably enough platforms in space to collect daily 30m spatial resolution data for the whole of Europe. The effects of cloud cover need to be quantified and some areas of Europe may be too cloudy to allow weekly observations.

LAI and Greenness difference map for Romania





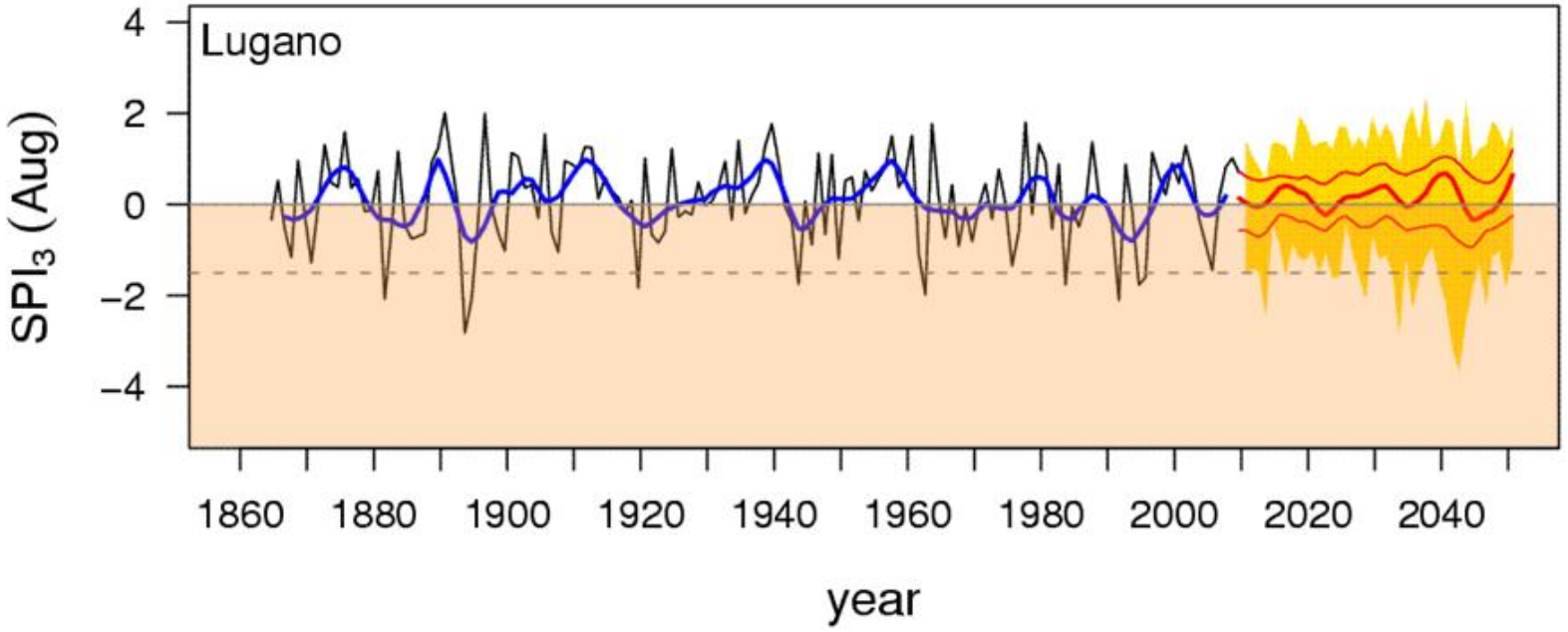
WG3 – Future Regional and Local Scenarios

- **D1: Collection of climate scenarios for European Regions**
  Review of available scenarios for Europe (IPCC-AR4, PRUDENCE, CECILIA, ENSEMBLES)

- **D2: Future trends in agroclimatic conditions**
  Evaluation of agroclimatic indices from LARS-WG scenarios and comparison with indices obtained from AgriClim and CECILIA

- **D3: Assessment of scenarios uncertainties**
  Evaluation of uncertainties in IPCC-AR4 using MAGICC/SCENGEN , discussion of uncertainties in relation to dynamical and statistical downscaling

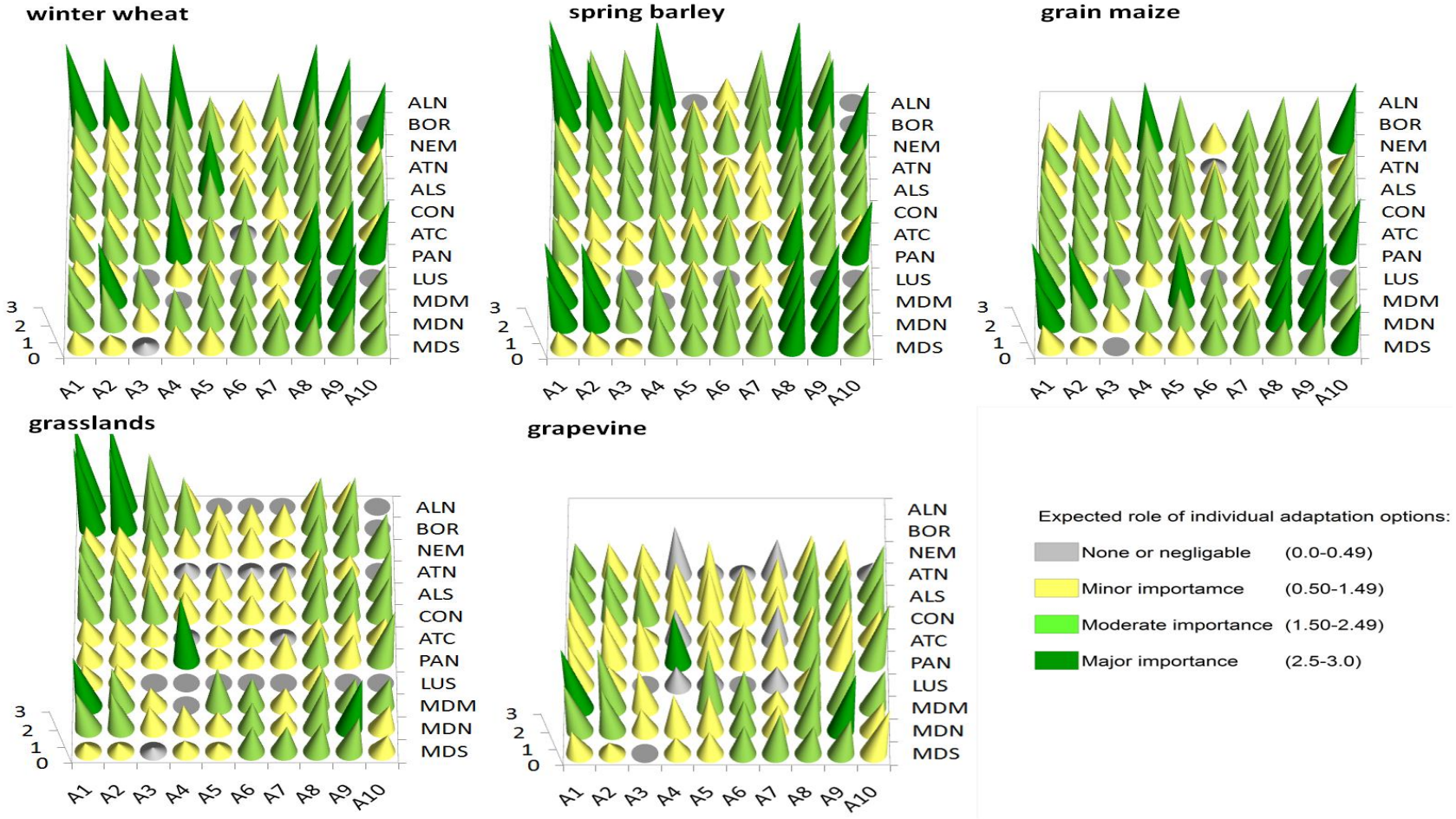
Historical time series (thin black line and thick blue line of the SPI_3 for August at Lugano, southern Switzerland, along with the range of projections (orange domain and red curves corresponding to the median and lower and upper quartiles) given by 15 transient simulations from the ENSEMBLES archive.



WG4 - Risk assessment and foreseen impacts

- A questionnaire survey was used to gather and analyse standardised information on vulnerabilities, impacts and adaptation to climate change for selected crops for European environmental zones (Olesen et al., 2011)
- Analysis of site and regional crop data responses to climatic varibility (Peltonen-Sainio et al., 2011)
- A study of agroclimatic conditions under present and projected climate change conditions over most of the EU and neighboring countries with special focus on variability and events with lower probability using a set of eleven agroclimatic indices (Trnka et al., 2011)
- A comparison of a range of winter wheat crop simulation models against datasets from North to South in Europe to evaluate the ability of crop models to simulate crop yield responses across a wide range of climatic conditions (Palosuo et al., 2011)

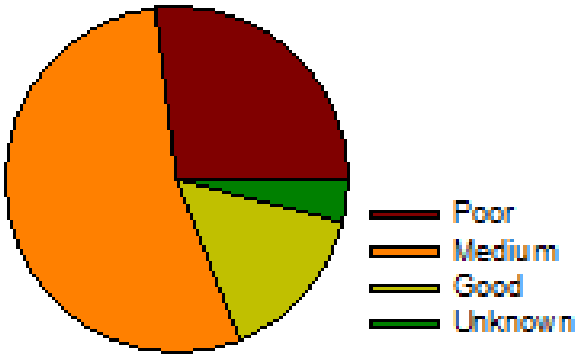
Expected importance of adaptation measures under the expected climate conditions for individual crops



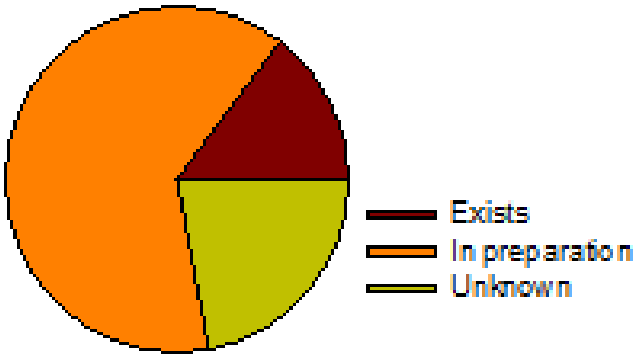
A1 Cultivation timing; **A2** New tillage practices; **A3** Modification to the fertilisation practices; **A4** Modification of crop protection; **A5** Introduction of new ”climate-proof” cultivars; **A6** Soil water conservation practices; **A7** Focus on protection from soil erosion; **A8** Operational monitoring of pests and diseases; **A9** Seasonal agrometeorological forecast; **A10** Crop insurance

Reported level of climate change awareness among farmers, agriculture advisors and government officials in 26 countries and the status of agriculture adaptation strategy and education programs for farmers.

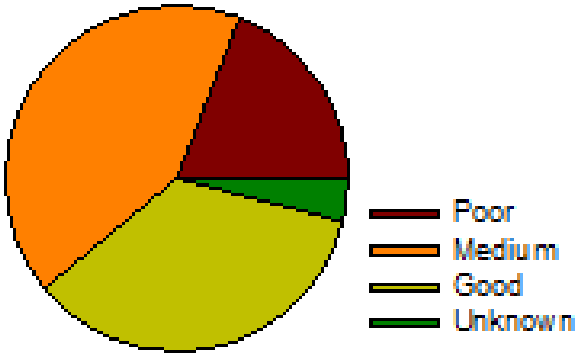
Awareness among farmers



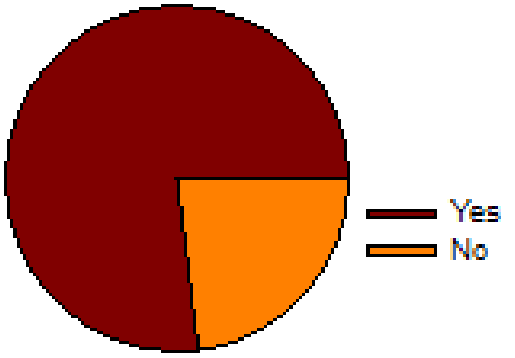
Status of agricultural adaptation strategy



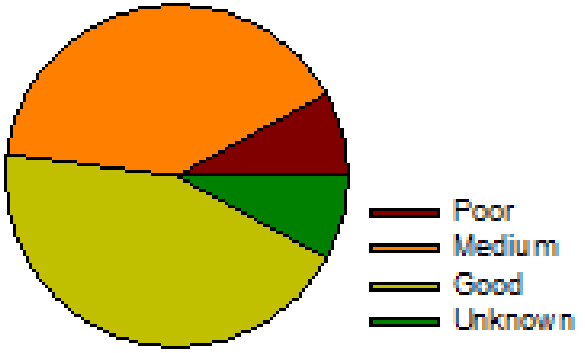
Awareness among advisors



Activities to increase farmer awareness



Awareness at government level



Models

APES, CropSyst, Daisy, DSSAT, FASSET, HERMES, WOFOST

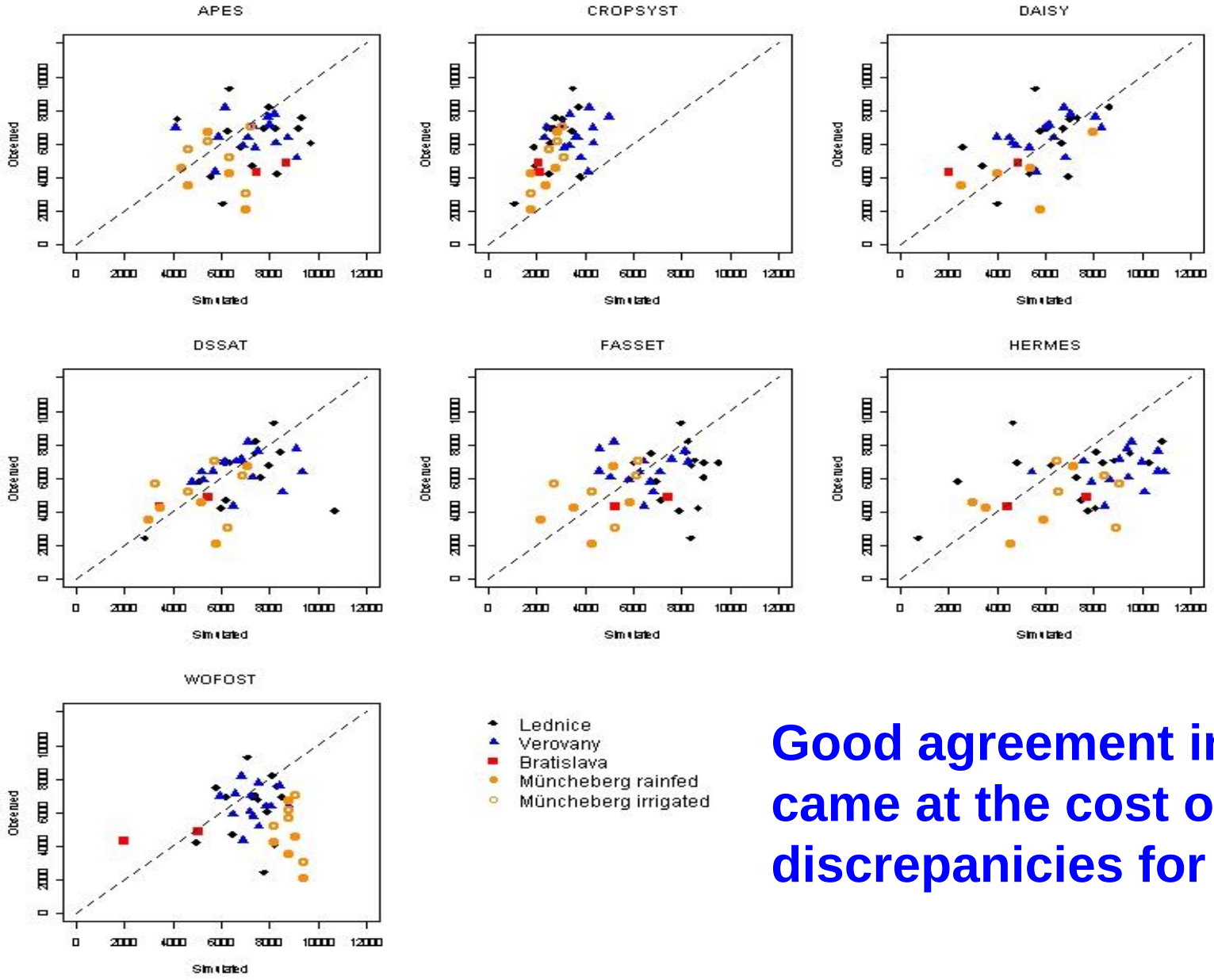
Crop variables

Grain yield , above-ground biomass, above-ground N-uptake, rooting depth, soil moisture content at field capacity, phenology

Crop model intercomparisons

OVERALL OBJECTIVE: To compare crop growth simulation models for predicting yield and yield variability in response to climatic factors and possible adaptation options (shift in sowing, irrigation, nitrogen management, cultivar changes)

Model-calculated vs. measured yields



Good agreement in yield often came at the cost of large discrepanicies for other outputs

DISSEMINATION OF RESULTS

phase C (fourth – last - year)

LINKS WITH CURRENT PROJECTS

PRUDENCE, STARDEX, MICE, ACCELERATES, CLAVIER, ENSEMBLES, CECILIA, ACCRETe , CECILIA, KLIMA2, IPCC, ENSEMBLES, CLAVIER, ADAGIO

COST 725 Establishing a European Phenological Data Platform for Climatological Applications

COST 726 Long term changes and climatology of UV radiation over Europe

COST FP0903 Climate Change and Forest Mitigation and Adaptation in a Polluted Environment

COST ES0601 Advances in homogenisation methods of climate series: an integrated approach

COST ES0603 Assessment of production, release, distribution and health impact of allergenic pollen in Europe (EUPOL)

PROJECTS PROPOSALS (EU and National level)

Multiscaling Procedure for Adaptation Measures to Climate Change in Agroecosystems for Assessing Impacts to Key Sectors in Europe (PROADAPT) - FP7 - (January 2009).

INTERREG IV C-Project on Water Scarcity and Drought, WaterCoRE - Water Scarcity and Droughts Coordinated Activities in European Regions proposal in 12 January 2009 (Romania)

From Sweden - The following Report written for Eu-Informal Agriculture Ministry Meeting: Jennische P., Eckersten H., Fahlbeck, E., Magnusson U., Rabinowicz, E., 2009. Discussion document for informal meeting of agriculture ministers. Report to Ministry of Agriculture. Dnr SLU ua 12-851/09. 19 pp

From Bulgaria - Impact of the Climate change on the Agro climatic resources for sustainable Agriculture development in Bulgaria and Poland

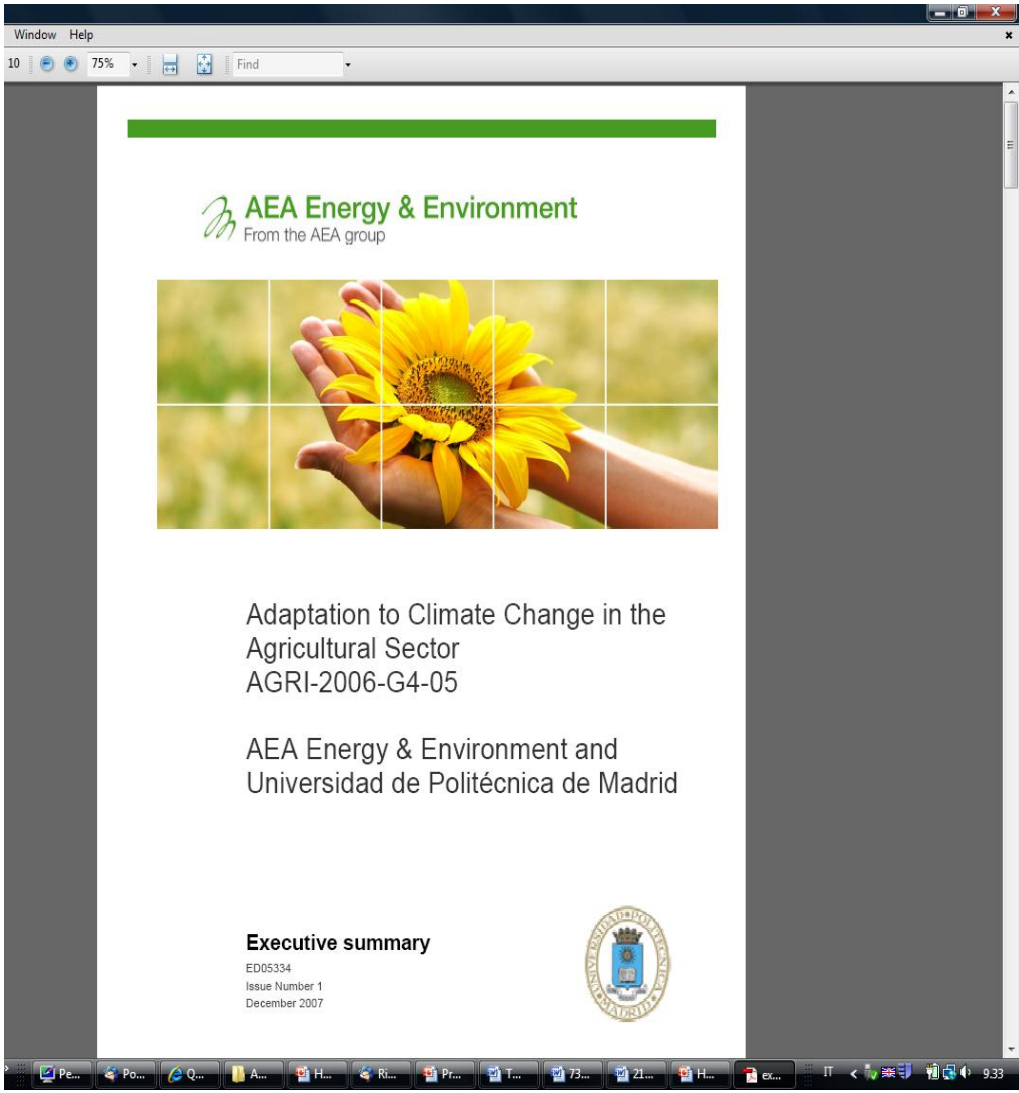
From Slovakia - Project of the Operative Programme supported by the EC from structural funds was proposed: Impacts of Climate change on various sectors in Slovakia and possible adaptations.

EXTERNAL CONTACTS: AEA ENERGY & ENVIRONMENT

AEA is currently worked on the European Commission project 'Adaptation to Climate Change in the Agricultural Sector', gathering information on national agricultural adaptive strategies.

AEA invited COST 734 to participate in this via the use of an online questionnaire .

This questionnaire is intended to confirm and expand on the picture of national adaptation that has emerged to date.

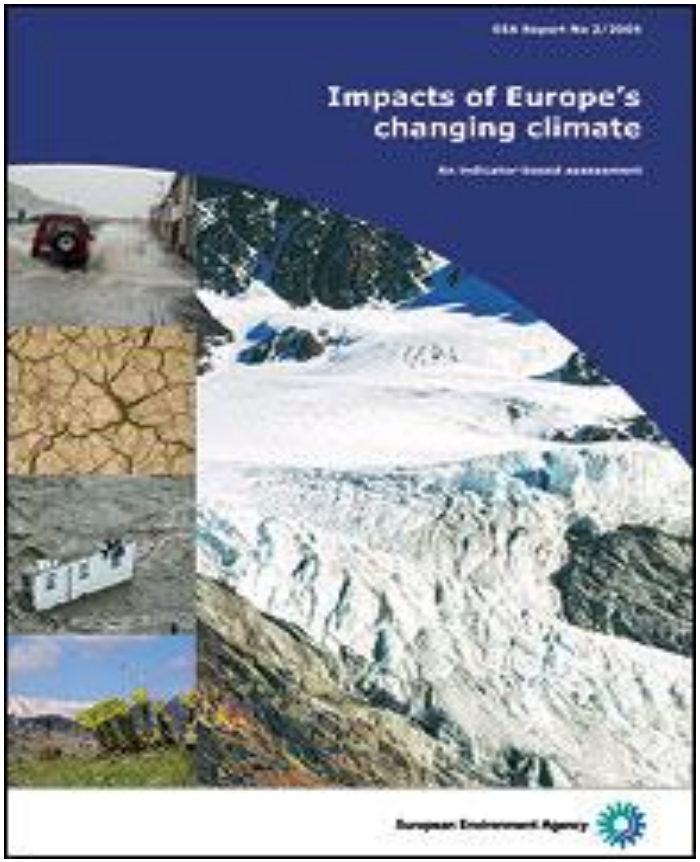


EXTERNAL CONTACTS: EUROPEAN ENVIRONMENTAL AGENCY

A collaboration with Climate Change and Energy Group of European Environmental Agency was also defined

EEA intends to include various indicators on changes in plant species and growing season, e.g. in natural ecosystems and agriculture.

EEA prepared an update/extension of our previous climate change indicator report that was published in 2004



CONSULTATION ON THE EUROPEAN COMMISSION'S GREEN PAPER COM(2007)354 ON "ADAPTING TO CLIMATE CHANGE IN EUROPE - OPTIONS FOR EU ACTION“

COST 734 Position paper

COST 734 welcomes the EU initiative expressed by Green Paper. Four pillars concept addresses all general issues regarding the climate change impacts and the activities towards the adaptation strategies.

Respecting the projected redistribution in agricultural sources in Europe with possible shift of highly productive areas in the mode south – north COST734 sees a need for a European coordinated activity in building adaptive strategies.

COST734 feels following issues concerning future adaptive strategies in agriculture should be more specifically addressed in the Green Paper:

-high need for urgent appropriate and reliable studies on possible impacts of climate change/variability on the agriculture production, food safety and food trade in Europe mainly at regional and local levels /pillar 3/

-to define the most vulnerable areas in Europe with the regard to agriculture production

-to define differences within EU27 both existing and projected

-to stress the local dimension and relatively short time line of needed adaptive strategies in agriculture in Europe

-to address the soil degradation and other issues in soil properties change

-to discuss “what if” option if the increase of global temperature goes exceeds the desired/projected limit of 2 °C

Bernard Seguin is research director at the Agroclim Unit at INRA's research centre in Avignon

Gennady V. Menzhulin
Director of Research

Bernard Siska

Slovak Agricultural University

NOBEL PEACE PRIZE 2007

The Nobel Peace Prize 2007

"for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change"

IPCC
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO UNEP

Photo: Ken Opprann

Intergovernmental Panel on Climate Change (IPCC)

1/2 of the prize

Geneva, Switzerland

Founded in 1988

Albert Arnold (Al) Gore Jr.

1/2 of the prize

USA

b. 1948

Lučka KAJFEŽ-BOGATAJ

Biotechnical Faculty, University of Ljubljana

Special Issue of the Annals of the New York Academy of Sciences entitled "Trends and Directions in Climate Research“

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Impacts of Climate Change and Variability on European Agriculture

Results of Inventory Analysis in COST 734 Countries

Simone Orlandini,[a] Pavol Nejedlik,[b] Josef Eitzinger,[c] Vesselin Alexandrov,[d] Leonidas Toulios,[e] Pierluigi Calanca,[f] Miroslav Trnka,[g] and Jørgen E. Olesen[h]

[a]Department of Agronomy and Land Management, University of Florence, Florence, Italy

[b]Slovak Hydrometeorological Institute, Bratislava, Slovak Republic

[c]Institute of Meteorology (BOKU-Met), Working Group Agrometeorology, University of Natural Resources and Applied Life Sciences (BOKU), Vienna, Austria

[d]National Institute of Meteorology and Hydrology, Sofia, Bulgaria

[e]National Agricultural Research Foundation (NAGREF), Larissa, Greece

[f]Agroscope Reckenhol-Taenikon, Research Station ART, Zurich, Switzerland

[g]Institute of Agriculture Systems and Bioclimatology, Mendel University of Agriculture and Forestry in Brno, Brno, Czech Republic

[h]Department of Agroecology and Environment, University of Aarhus, Tjele, Denmark

Climate plays a fundamental role in agriculture because of to its influence on production. All processes are regulated by specific climatic requirements. Furthermore, European agriculture, based on highly developed farming techniques, is mainly oriented to high quality food production that is more susceptible to meteorological hazards. These hazards can modify environment–genotype interactions, which can affect the quality of production. The COST 734 Action (Impacts of Climate Change and Variability on European Agriculture), launched in 2006, is composed of 28 signature countries and is funded by the European Commission. The main objective of the Action is the evaluation of possible impacts arising from climate change and variability on agriculture and the assessment of critical thresholds for various European areas. The Action will concentrate on four different tasks: agroclimatic indices and simulation models, including review and assessment of tools used to relate climate and agricultural processes; evalu-

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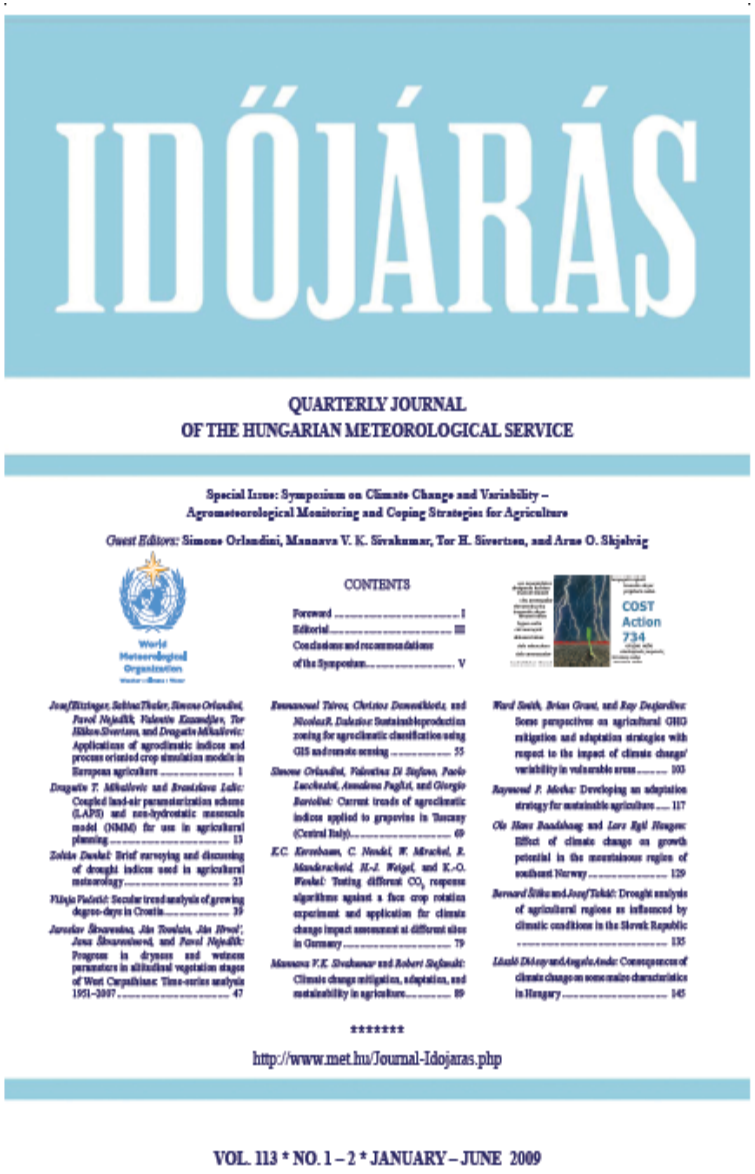


Joint Symposium with WMO – Agricultural Meteorology Division

ET on impact of climate risks in vulnerable areas: agrometeorological monitoring and coping strategies.

IMPACT: Publication and dissemination

Special Issue of Idojaras disseminated by WMO worldwide (more then 250 copies).

World Meteorological Organization

cost

Symposium on Climate Change and Variability- Agro Meteorological Monitoring and Coping Strategies for Agriculture

Oscarsborg, Norway

June 3-6 2008

Organizers:

European Cooperation in the field of Scientific and Technical Research -COST
Management Committee of COST ACTION 734
'Impact of Climate Change and Variability on European Agriculture'

COST Action 734

World Meteorological Organization (WMO)
Commission for Agricultural Meteorology (CAgM)

Local organizers:
Bioforsk, Norwegian Institute for Agricultural and Environmental Research
Plant Health and Plant Protection Division

UMB, The Norwegian University of Life Sciences
Department of Plant and Environmental Sciences

EUROPEAN SCIENCE FOUNDATION

ESF provides the COST Office through an EC contract

www.bioforsk.no

FOKUS

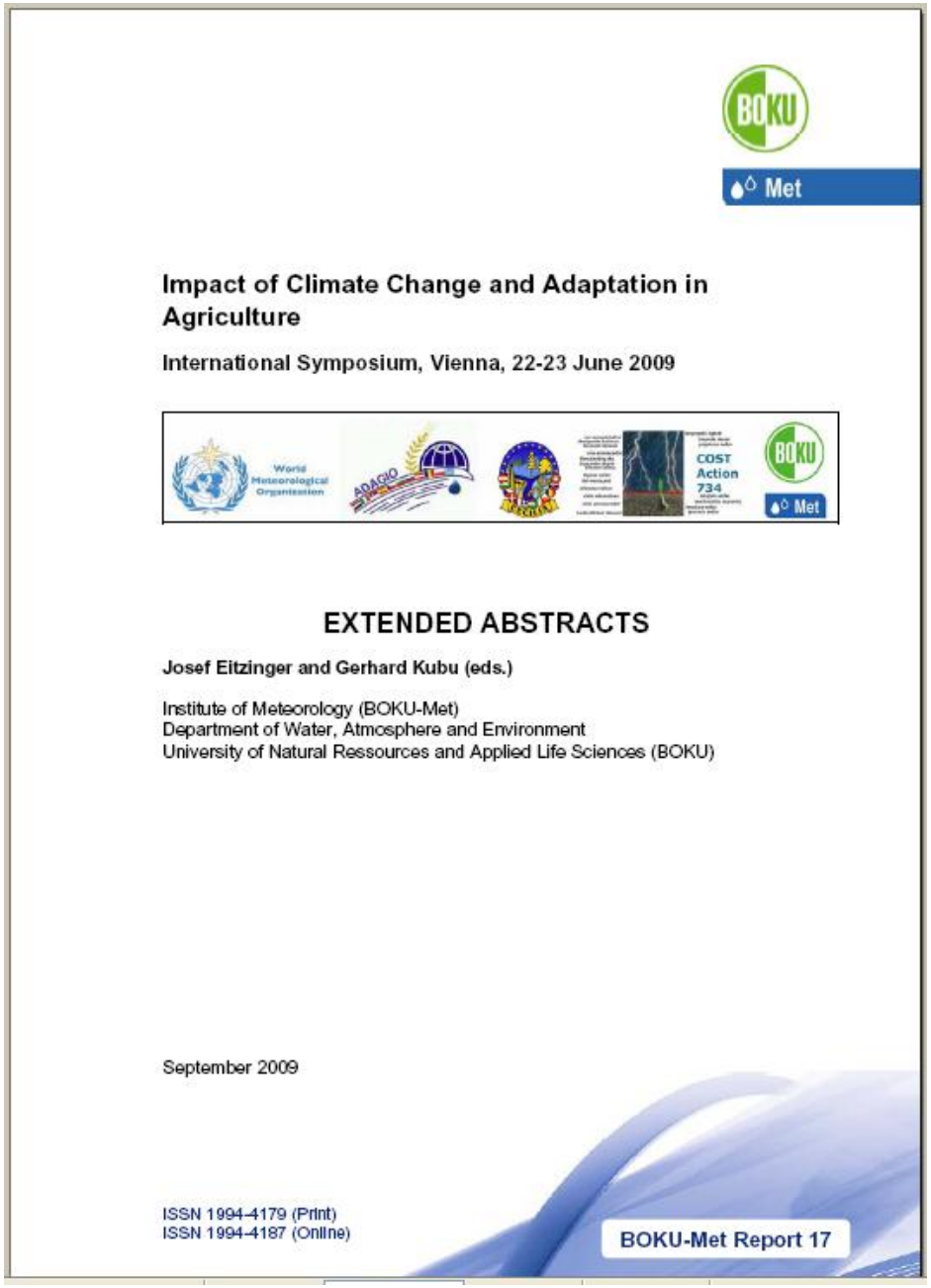
Bioforsk I Vol. 3 I Nr. 8 I 2008

Symposium on Climate Change and Variability - Agro Meteorological Monitoring and Coping Strategies for Agriculture

Oscarsborg, Norway, June 3-6 2008

Book of abstracts

Bioforsk



Joint ADAGIO-CECILIA-WMO-COST734

Symposium

June 22-23 2009, Vienna

Extended abstracts available at:
www.adagio-eu.org

Proceeding will be published in the special issue of Journal of Agricultural Science (IF 1.471)

SATELLITE DATA AVAILABILITY, METHODS AND CHALLENGES FOR THE ASSESSMENT OF CLIMATE CHANGE AND VARIABILITY IMPACTS ON AGRICULTURE

Edited by:
Leonidas Toulios and Gheorghe Stanciu

2010

ESSEM

CLIVAGRI
IMPACTS OF
CLIMATE CHANGE AND
VARIABILITY ON EUROPEAN
AGRICULTURE

COST is supported by
the EU RTD Framework Programme

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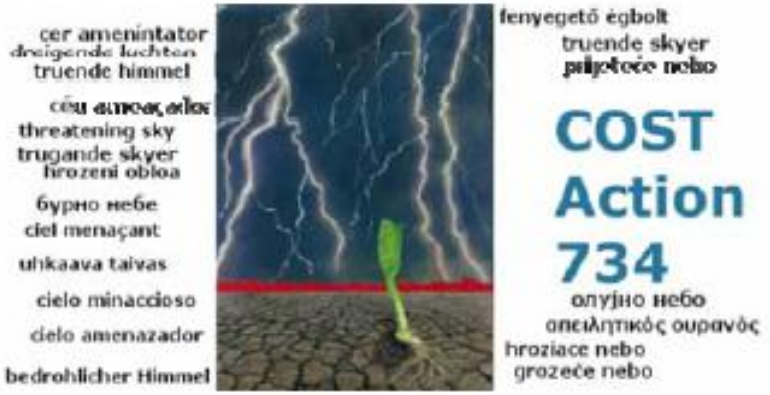
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

COST ACTION 734: Impacts of Climate Change and Variability on European Agriculture - CLIVAGRI



CLIMATE VARIABILITY AND CHANGE AND RELATED IMPACTS ON AGROECOSYSTEMS IN SOUTHEAST AND CENTRAL EUROPE AS WELL AS IN SOUTHEAST USA

Vesselin Alexandrov
Josef Eitzinger
Gerrit Hoogenboom

2011

Title: AGROCLIMATIC CONDITIONS IN EUROPE UNDER CLIMATE CHANGE

Running title: Agroclimatic conditions in Europe under CC

Authors: *M. Trnka[1,2], J.E. Olesen[3], K.C Kersebaum[4], A.O. Skjelvåg[5], J. Eitzinger[6], B. Seguin[7], P. Peltonen-Sainio[8], R. Rötter[8], Ana Iglesias[9], S. Orlandini[10], M. Dubrovský[1,11], P. Hlavinka[1], J. Balek[1], H. Eckersten[12], E. Cloppet[13], P. Calanca[14], , A. Gobin[15], V. Vučetić[16], P. Nejedlik[17], S. Kumar[18], B. Lalic[19], A. Mestre[20], F. Rossi[21], J. Kozyra[22], V. Alexandrov[23], D. Semerádová[1], Z. Žalud[1]*

Global Change Biology; doi: 10.1111/j.1365-2486.2011.02396.x

Coincidence of variation in yield and climate in Europe

Pirjo Peltonen-Sainio[a,*], Lauri Jauhiainen[a], Miroslav Trnka[b], Jörgen E. Olesen[c], Pierluigi Calanca[d], Henrik Eckersten[e], Josef Eitzinger[f], Anne Gobin[g], Kurt Christian Kersebaum[h], Jerzy Kozyra[i], Suresh Kumar[j], Anna Dalla Marta[k], Fabio Micale[l], Ben Schaap[m], Bernard Seguin[n], Arne O. Skjelvåg[o], Simone Orlandini[k]

Agriculture, Ecosystems and Environment 139 (2010) 483–489

Ref.: Ms. No. EURAGR2217R1 Simulation of winter wheat yield and its variability in different climates of Europe. A comparison of eight crop growth models

European Journal of Agronomy

Current perceptions on climate change impacts and adaptation for arable crops in Europe

J.E. Olesen, M. Trnka

This study was made possible through the joint effort of the COST 734 member countries and their national delegates. The team of co-authors included in particular:
J. Eitzinger , V. Kazandjiev, V. Vušetič, A. Ingver, P. Peltonen-Sainio, B. Seguin, K.C. Kersebaum, L. Toulios, D. Zoltan, A. Donnelly, F. Rossi, A. Jermuss, S. Lazauskas, R. Rötter, A.O. Skjelvåg, J. Kozyra, E. Mateescu, M. Rivington, B. Lalic, P. Nejedlík, A. Utset, A. Iglesias, H. Eckersteen, P. Calanca.
The team of authors was supported by number of collaborators who are acknowledged in the COST 734 publication p. 328

Agriculture: Crop challenge : Nature Climate Change : Nature Publishing Group#/re... Pagina 1 di 1

NATURE CLIMATE CHANGE | RESEARCH HIGHLIGHTS

Agriculture: Crop challenge

Sid Perkins

Nature Climate Change (2011) doi:10.1038/nclimate1042
Published 08 February 2011

Crop yields in western France and across much of southeastern Europe will see a significant drop by 2050, unless adaptation measures are adopted.

Climate change expected by 2050 will trim precipitation in many parts of Europe, forcing farmers to mitigate the loss of rainfall or risk crop failures.

©iStockphoto.com/Flavio Vallenari

To estimate future crop yields, Jørgen Olesen, an agronomist at Aarhus University, Denmark and his colleagues combined 11 agroclimatic indices — such as the length of the growing season and the date of the last frost — gathered from 86 sites across Europe between 1971 and 2000, with climate projections from three commonly used global models[1]. Overall, the results were consistent for all climate models across most portions of Europe. The multi-model average suggests that by 2050 the growing seasons in western France and across large swathes of southeastern Europe will become considerably hotter and drier, substantially reducing crop yields unless farmers boost soil moisture via irrigation, or plant drought-resistant crops, options that may not always be available.

Although most regions are expected to receive enough precipitation to produce crops without irrigation in most years by the middle of the century, rainfall will probably exhibit more year-to-year variability in the future, presenting farmers with a major crop-management challenge, the researchers contend.

References

1. Trnka, M. *et al.* Agroclimatic conditions in Europe under climate change. *Global Change Biol.* doi:10.1111/j.1365-2486.2011.02396.x (2011).

Download references

Nature Climate Change ISSN 1758-678X EISSN 1758-6798

International Congress of Biometeorology (Tokyo, September 2008)

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Agri-P05 ICB2008, *Agriculture*, *Poster*

COST Action 734: Impacts of Climate Change and Variability on European Agriculture (CLIVAGRI)

Orlandini Simone[1], Di Stefano Valentina
Department of Agronomy and Land Management, University of Florence, Florence, Italy

1. INTRODUCTION

Climate plays a fundamental role in agriculture due to its direct and indirect influence on production. Physical, chemical and biological processes are regulated by specific climatic requirements, and any deviation from these patterns may exert a negative influence. Furthermore, European agriculture, based on highly developed farming techniques, is mainly oriented to high quality food productions, that are more susceptible to meteorological hazard impacts.

There is considerable evidence that regional variations in climate, particularly the rise of temperature, have already affected plant systems, increasing the hazard impacts. Examples of observed changes include lengthening of the growing season, latitudinal and altitudinal shifts of plant range, earlier flowering, outbreak of plant diseases, acceleration in breakdown of organic matter in soils, and insects development (Olesen and Bindi, 2002). With respect to the latter for instance, during the period 1964-2004 in England, a 1°C increase in temperatures can be associated with a 16-day earlier shift in the first appearance of peach-potato aphid (*Myzus persicae)* and peak flight time of the orange tip butterfly (*Anthocharis cardamines L.*) 6 days earlier (Cannell et al., 1999). More frequent precipitation and more humid conditions favour the spread of diseases. The highest intensity of rainfall reduces the infiltration of water in the soil, decreasing the net available soil water content, contributing to an increase of drought conditions.

At times climate variability can exceed a defined threshold, determining an extreme event. The perceived severity of said event depends on the vulnerability of the natural environment and human society. These events always cause very extensive or local hazards with high intensity: drought, frost, windstorms, heat waves, cold injury, fire, heavy precipitation, floods, snow, wind and hail. The importance of extreme events derives from their capacity to cause serious damage in very short time frames. For example, in the late 1990s, a drought that affected the central and the southern parts of

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World Climate Conference 3

September 2009 Geneva

Abstract to WCC 3 poster session

COST Action 734

Impacts of Climate change and Variability on European Agriculture

Simone Orlandini[1], Pavol Nejedlik[2], Jozef Pecho[2]
University of Florence, Florence, Italy[1], Slovak Hydrometeorological Institute Bratislava, Slovakia[2]

Within the COST (Cooperation in Science and technology) framework there is a whole European activity regarding the Climate Change and its impact on Agriculture. This Action deals with a multidisciplinary issue being performed in National and Regional Meteorological and Hydrological Services (NMHS), Research Centres and Universities in Europe.
Further to 29 European countries it involves the representatives from the USA, New Zeland and cooperates also with JRC of the EC and WMO.
The main objective of the Action is the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas.
Main activity of the Action concentrates on four different tasks: agroclimatic indices and simulation models review and assessment of tools used to relate climate and agricultural processes; evaluation of the current trends of agroclimatic indices and simulation model outputs describing agricultural impacts and hazard levels; developing and assessing future regional and local scenarios of agroclimatic conditions; risk assessment and foreseen impacts on agriculture.
The Action has completed the first phase which comprises the survey of the existing methods of the evaluation of agroclimatic conditions used for different purposes. The focus concentrated on the agroclimatic indices and simulation models. Further evaluation includes testing of the indices and models and their use for regional assessment.
Key deliverables of the Action are as follows:
- standardisation and harmonisation of criteria to evaluate the impact of climate change and variability on agricultural activity;
- determination of the current and future impacts on various European agricultural areas;
- determination of critical thresholds;
- formulation of specific recommendations and assessments for policy makers, extension services, farmers and other end-users;
-definition of warning systems
First results show different impacts of climate change on the agricultural production through the regions. The Action entered the second phase of its duration and it will finish in late 2009.

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EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-247, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
Applications of Meteorology
High resolution meteorology
- applications and services

COST 734-CLIVAGRI: Impacts of Climate change and Variability on European Agriculture

S. Orlandini (1), P. Nejedlik (2), J. Eitzinger (3), V. Alexandrov (4), L. Toulios (5), L. Kajfez Bogataj (6), P. Calanca (7), M. Trnka (8), and J.E. Olesen (9)

(1) University of Firenze, Agronomy and Land Management, Firenze, Italy (simone.orlandini@unifi.it), (2) Slovak Hydrometeorological Institute. Bratislava, Slovak Republic, (3) Institute of Meteorology (BOKU-Met), Working group Agrometeorology. University of Natural Resources and Applied Life Sciences (BOKU), Vienna, Austria, (4) National Institute of Meteorology and Hydrology. Sofia, Bulgaria, (5) National Agricultural Research Foundation (NAGREF). Larissa, Greece, (6) Biotehnical Faculty, Centre for agrometeorology, University of Ljubljana, Ljubljana, Slovenia, (7) Agroscope Reckenhol-Taenikon, Research Station ART, Zurich, Switzerland, (8) Inst. of Agriculture Systems and Bioclimatology, Mendel University of Agriculture and Forestry in Brno, Czech Republic, (9) Dept. of Agroecology and Environment, University of Aarhus, Denmark

COST is an intergovernmental framework for European Cooperation in Science and Technology, funded by its member countries through the EU Framework Programme. The objective of COST is to coordinate, integrate and synthesise results from ongoing national research within and between COST member countries to add value to research investment. COST Actions aim to deliver scientific syntheses and analyses of best available practice to aid problem identification, risk assessment, public utilities and policy development.
During 2006, COST Action 734 (CLIVAGRI-Impacts of Climate Change and Variability on European Agriculture) was launched thanks to the coordinated activity of 15 EU countries. The main objective of the Action is the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas (COST 734 MoU. www.cost.esf.org). Secondary objectives are: the collection and review of existing agroclimatic indices and simulation models, to assess hazard impacts on various European agricultural areas relating hazards to climatic conditions; building climate scenarios for the next few decades; the definition of harmonised criteria to evaluate the impacts of climate change and variability on agriculture; the definition of warning systems guidelines. Four working groups, with the integration of remote sensing sub working group 2.1 were created to address these aims:
WG1 - Agroclimatic indices and simulation models
WG2 – Evaluation of the current trends of agroclimatic indices and simulation model outputs describing agricultural impacts and hazard levels
WG3 – Development and assessment of future regional and local scenarios of agroclimatic conditions
WG4 – Risk assessment and foreseen impacts on agriculture

The activity of WGs has been structured like a matrix, presenting on the rows the methods of analysis and on the columns the phenomena and the hazards. Each intersection point describes the evaluation of past, present and future trends of climate and thus the impacts on agriculture. Based on these results, possible actions (specific

Agmet

25 years supporting Agricultural Meteorology in Ireland

The Coach House, Dublin Castle,

Monday 7th December 2009

PROGRAMME

09:30 Registration (Tea and coffee)

10:00 Welcome

25 Years of Agricultural Meteorology in Ireland
Tom Keane, Met Éireann (retired) and founding member of AGMET

International Invited Speaker

10:30 Impacts of Climate Change and Variability on European Agriculture - COST Action 734
Simone Orlandini, University of Florence

11.30 Coffee break and poster session

Invited Speakers

12:00 Meteorology and Agricultural Research
Séamus Walsh, Climatologist, Met Éireann

12:30 Global and regional climate predictions: Certainties and uncertainties
Tido Semmler, Climate Modeller, Met Éireann

13:00 Lunch and poster session

14:00 Austin Burke Bronze Medal presentation

Research presentations

14:10 Using a dynamic system simulation model to assess the influence of climate, soil and climate change on grass-based dairy production
Joanne Fitzgerald, Teagasc (Austin Burke Bronze Medal 2009 Recipient)

14:30 Comparing the greenhouse gas balance of managed ecosystems: implications for mitigation options
Bruce Osborne, UCD

15.00 Modeling the effects of climate change on the incidence of pests and diseases: a spatial analysis of the potential impacts on Irish agricultural productivity
Catriona Duffy, NUI Maynooth

15.30 The Frontal waves: how agro-meteorological science is shaping agricultural and environmental policies
Rogier Schulte, Teagasc

16:00 Close

SUNDAY, 14 NOVEMBER 2010

Participants arrive in Geneva

MONDAY, 15 NOVEMBER 2010

SESSION 1: OPENING OF THE MEETING

09:00 hrs **Welcome**
A. Tyagi
World Meteorological Organization (WMO), Switzerland

09:10 hrs **Welcome**
A. Grobicki
Global Water Partnership (GWP), Sweden

09:20 hrs **Opening of the Meeting**
J. Lengoasa, Deputy Secretary General
World Meteorological Organization (WMO), Switzerland

09:35 hrs Group Photo and Tea/Coffee Break

SESSION 2: INTRODUCTION

10:00 hrs **Drought Management: Current Status and Future Challenges**
Don Wilhite
University of Nebraska, USA

10:30 hrs **Presentation on the Proposal on the Integrated Drought Management Programme**
Ania Grobicki and Avinash Tyagi
GWP and WMO

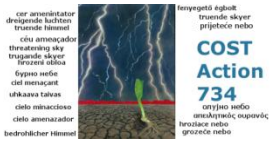
Acknowledgments!!

- MC members
- WG leaders and core group members
- WG and invited experts
- National collaborators
- Non COST countries and institutions (WMO)
- All COST Office staff: Science (about 5) and Administrative Officers (about 5)

Thank you for your kind attention

Impacts of Climate Change and Variability on European Agriculture: CLIVAGRI – COST 734

www.cost734.eu



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