FINAL REPORT ON:
ESF LESC Exploratory Workshop: PHENOLOGY AND AGROCLIMATOLOGY
(20-23 September, Volos, Greece)

1. EXECUTIVE SUMMARY

The fields of phenology and agroclimatology constitute old scientific subjects with significant contribution to research and agricultural and environmental practice. However, recent scientific findings in the fields of climate variability and impacts to agriculture need further investigation and intercomparison. Thus, the exchange of findings and information, as well as joint work on projects, is essential on this critical study area. In this workshop the relation between phenological and agroclimatic data is explored. This interrelation is also implemented by studies including spatiotemporal interpolation, GIS mapping, stochastic features and models and modeling results.

The European agricultural community asks for more evidence of climate change and variability. So the assessment of meteorological hazard impacts on agriculture represents a fundamental goal for European researchers that require objective evaluation of current and future climatic conditions by using, harmonising and integrating all the available data, methods and technologies. Risk assessment, definition of warning systems and addressing specific recommendations and evaluations for policy makers, extension services, farmers and other users are then crucial for Europe, considering the role of agriculture in the economy of the European Union

Particular attention is devoted to the quality of production, which represents the main goal of European agricultural policy, but also to the eco-environmental impacts. The results are made readily available in order to significantly enhance the awareness in the agricultural sector of the current hazard level and the future perspectives related to the next few decades. The sensitivity, adaptive capacity and vulnerability of European agriculture are evaluated to provide the users with all the information needed to adapt their strategies to current and future climatic conditions. This covers the fields of farmer activity, public and private extension services and especially policy-maker decisions on short and long term bases.

Thus, the main objectives of the Workshop are the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas and to establish a European reference data set of phenological observations that can be used for climatological purposes, especially climate monitoring, and detection of changes. Objectives can be summarized as follows:

- The collection and review of existing indices and models to assess hazard impacts on phenology and European agriculture.
- Developing recommendations for monitoring and collection procedures (methodologies, sampling density and frequency etc).
- Mapping techniques of phenological information and other

application methods.
- Increasing the knowledge concerning relations between climate and phenological phases.
- Use of common formats of archiving and distribution of phenological data.

The Workshop deals with a) ensuring comprehensive, dedicated and integrated collection of data and information to generate a quality controlled and transparent database, b) developing best practices for further harmonisation of the database and for its future enlargement and extension, and c) developing various applications, methods and techniques for further analyses to extract added-value information from sources and data. he following round tables were formed in order to asses the results and contribute to future research on the field:

1. Data recovery of past phenological data.
2. Remote Sensing – Agrometeorological – phenological applications on a larger scale.
3. Agrophenology Modelling (applications in irrigation models, crop yield modelling).
4. New ways in phenological monitoring: webcams, mobile phones with cameras.
5. Climate Change impacts: from Global to regional scale.

2. SCIENTIFIC CONTENT OF THE EVENT

The workshop focused on the above main subjects covering recent research activities in the fields of phenology and agroclimatology. Aim of the ESF workshop (only invited participants most of them coming from COST725) was to deliver input for new research initiatives, future developments, follow up research activities, collaborative actions on a European scale.

The workshop included presentations and posters in the fields of Phenology, Agroclimatology and Climate Impacts to Agriculture. Namely in the field of Phenology and Phenological data the following studies were presented:

1. Phenological and Agrometeorological Indices Related to Wheat Production for Central Greece.
2. Some relations in selected phenological phases and temperature sums in northern Carpathian.
3. The Spatial Gradient Law of Phenology .
4. The Finnish National Phenological Network.
5. Selected Phenological characteristics of the Czech Republic.
6. Phenological features of the agricultural species in Latvia.

While in the fields of Agrometeorology and climate impacts to agriculture:

1. Aridity Mapping with the Use of NDVI and Satellite Derived Degree Days.
2. Modeling climate change using Neural Networks.

3. Cotton Yield Prediction Using Remotely Sensed Data and Neural Networks.
4. DEM based method for determination of potential frost-risk territories.
5. Clustering and Modelling Climate Zones in Greece.
6. Spatially Distributed Potential Evapotranspiration based on NOAA/AVHRR Satellite Data And GIS.
7. Determination of drought stress of wheat by thermal infrared measurements and modelling.
8. Spatio-temporal modelling of crops in agricultural landscape.
9. Drought Vulnerability, Changing of Vulnerability of Southern Transdanubium, Hungary.
10. Increased Spring Frost Risk for Fruit Growing Production in Slovenia.
11. Frequency Analysis of Precipitation Characteristics in Different Climate Zones For Greece.
12. Drought indices for the island of Cyprus.
13. Romanian Agro-Meteorological Network – Monitoring, Data Processing, and Real-Time Information to Decision Factors and End-Users.
14. Geographical analogies in climate change research.
15. Influence of climate warming on development regularities of plants in Lithuania during 1961–2000.

The discussion in the field of Phenology was focused mainly in finding a uniform way to collect and digitize phenological data from several sources (and countries) into a common European platform. In this way new technologies such as webcams and mobile phones can help in phenological monitoring. In the field of Agroclimatology and climate impacts on Agriculture the need to improve observations and the need for models in European scale was referred.

3. ASSESSMENT OF THE RESULTS - OUTCOME

After the introductory presentations which gave an overview on the ongoing research in the field of Phenology and Agroclimatology 5 working groups developed the following outputs/recommendations/research demands:

1. Data recovery of "ancient" phenological data.

Transdisciplinary approach: historians, phenologists, farmers, private interested people (e.g. beekeepers, ornithologists)

- Long-term data series is an important supplement to the shorter series from the IPG. Long-term natural variability also have an impact on trends.
- The exist phenological time series that are not digitized. Some of these series could easily be digitized. Preferable time period from the second half of the 18th century and the 19th century. Data policy might be problem.
- The group recommends that selected series should be digitized.

2. Remote Sensing – Agrometeorological – phenological applications on a larger scale.

i. Improve the detail of observations (resolution of images)- it is still a cost problem.
ii. Need to combine different satellite data.
iii. Need for good field calibration.
iv. Field data are still needed? For how long?
v. Combine field webcam observation with remote sensing techniques.

3. Agrophenology Modelling (applications in irrigation models, crop yield modelling)

i. Data availability:
   - Time series gaps,
   - Free available data via paid data,
   - Small to large scale usage of the data,
   - Multilayer approach 'Remote Sensing, Meteorological data, Phenological data etc.'.
ii. Models availability:
   - Models on European scale,
   - Proposals for common projects e.g. pollen dispersion, risk assessment for agriculture and forestry,
   - Run models on European platform.
iii. Products for end users 'user friendly way'.

4. New ways in phenological monitoring: webcams, mobile phones with cameras.

ii. Present use of web cameras in different countries.
iii. Technical guides for phenological observation using camera are necessary.
iv. How to use : individual plants or community.
v. Multispectral cameras.
vi. What kind of camera can be technically used.

The next steps:

ii. Contact to 725 members.
iii. Pilot study can be recommended to each country.
iv. Report in the next MCM meeting.

5. Climate Change impacts: from Global to regional

ii. Use of GCMs recommended by IPCC – pessimistic and optimistic.
iii. Need a technical guide for downscaling.
iv. Downscaled data for 50 or 25 Km raster.
v. Crop oriented analysis:
   - Definition of indices (needs in different phenophases),
   - Calculation from the scenarios,
   - Comparison with the present situation.
vi. Use of UV and IR radiation data (cooperating with COST 726).

4. FINAL PROGRAMME

EXPLORATORY WORKSHOP ON:

PHENOLOGY - AGROCLIMATOLOGY

21-23 September 2006, Volos, Greece
Xenia Hotel, Volos

PROGRAMME

Thursday, 21 September — Assembly Hall: Opening Ceremony

09:00-09:30	**Greetings**
	↓ **S. Tzortzios,** Chair of HAICTA2006 Organizing Committee ↓ **N. Dalezios,** Chair of HAICTA2006 Scientific Committee ↓ **B. Manos,** President of HAICTA-North Greece ↓ **Sideridis,** President of HAICTA-the Greek branch of EFITA ↓ **K. Bagiatis,** Rector of the University of Thessaly ↓ **Special Guests: Minister of Education, Minister of Agric. Development & Foods, Prefect of Magnesia, Mayor of the town of Volos**
09:30-11:00	**Invited Speakers**
	↓ **Prof. Dr. Gerhard Schiefer, "The challenge of integration in the agricultural and food sector: E-communities and e-networks"** University of Bonn, Germany. ↓ **Dr Elizabeth Koch,** Chairperson of COST 725 ↓ **Dr Bernard Avril,** ESF Representative ↓ **Bioagro** Representative

11:00-11:30 **Coffee Break**

(Chairperson: Elizabeth Koch, Austria-Viera Remišová, Slovak Republic)	
11:30-11:45	**Viera Remišová** **"Onset of the first May sprouts of Norway spruce (Picea abies (L.) Karst.) in Slovakia"** Slovak Hydrometeorological Institute, Bratislava, Slovak Republic
11:45-12:00	**D. Bampzelis,** C. Domenikiotis and N. R. Dalezios **Phenological and Agrometeorological Indices Related to Wheat Production for Central Greece.** University of Thessaly, Greece
12:00-12:15	**D. Bampzelis,** A. Chatzipli, O. Dadali, N.R. Dalezios **Frequency Analysis of Precipitation Characteristics in Different Climate Zones For Greece** University of Thessaly, Greece
12:15-12:30	Pavel Stastny**, Pavol Nejedlik** **"Some relations in selected phenological phases and temperature sums in northern Carpathian"** Slovak Hydrometeorological Institute, Bratislava, Slovakia
12:30-12:45	Helfried Scheifinger**, Elisabeth Koch** **"The Spatial Gradient Law of Phenology"** Zentralanstalt für Meteorologie und Geodynamik, Wien, Austria
12:45-13:00	**Marios Theofilou** **"Drought indices for the island of Cyprus"** University of Cyprus
13:00-13:15	**Eeva Kotilainen,** Mirva Leppälä, Jarmo Poikolainen, Ari Venäläinen and **Eero Kubin** **"The Finnish National Phenological Network"** Finnish Forest Research Institute, Muhos, Finland.
13:15-13:30	**Vasile Turcu, Elena Mateescu,** Oana Oprea **"Romanian Agro-Meteorological Network – Monitoring, Data Processing, and Real-Time Information to Decision Factors and End-Users"** National Meteorological Administration, Romania
13:30-14:00	**Discussion**

14:00-15:00 **Lunch**

(Chairperson: Elizabeth Koch, Austria – Jiri Nekovar, Czech Republic)	
15:00-15:15	Márta Gaál, **Levente Horváth** **Geographical analogies in climate change research.** Corvinus University of Budapest, Hungary

15:15-15:30	**Danuta Romanovskaya, Eugenija Baksiene** **"Influence of climate warming on development regularities of plants in Lithuania during 1961–2000"** Voke Branch of Lithuanian Institute of Agriculture, Lithuania
15:30-15:45	**Nekovar Jiri,** Hajkova Lenka, Striz Martin **"Selected Phenological characteristics of the Czech Republic"** Czech Hydrometeorological Institute
15:45-16:00	E. Tsiros**, C. Domenikiotis, N.R. Dalezios** **"Aridity Mapping with the Use of NDVI and Satellite Derived Degree Days"** University of Thessaly, Greece
16:00-16:15	Péter Salga, Marianna Medveczki, **Levente Horvath** **"Modeling climate change using Neural Networks"** Corvinus University, Hungary
16:15-17:00	**Discussion**

17:00-17:30 **Coffee Break**

Friday, 22 September

11:00-11:30 **Coffee Break**

(Chairperson: Pavol Nejedlik, COST Representative - Ákos Németh, Hungary)	
11:30-11:45	N. Gitsakis**, M. Spiliotopoulos, Ch. Domenikiotis,** G. Dimou and **N. Dalezios** **"Cotton Yield Prediction Using Remotely Sensed Data and Neural Networks"** University of Thessaly, Greece
11:45-12:00	**Ákos Németh** **"DEM based method for determination of potential frost-risk territories"** Hungarian Meteorological Service, Climatology Division, Budapest, Hungary
12:00-12:15	**K. Pappas, N. Gitsakis and N. Dalezios** **"Clustering and Modelling Climate Zones in Greece"** University of Thessaly, Greece
12:15-14:00	**CLOSING OF WORKSHOP** Discussion (All participants) Future developments Follow-up research activities Collaborative actions

14:00-15:00 **Lunch**

15:00-17:00 **Posters**
(Chairperson: Nicolas R. Dalezios, Greece - Pavol Nejedlik, COST Representative)

E. Kanellou, **Chr. Domenikioths and N.R. Dalezios**
"Spatially Distributed Potential Evapotranspiration based on NOAA/AVHRR Satellite Data And GIS"
University of Thessaly, Greece
M. Spiliotopoulos, A. Marinaki, H. Michalopoulou
"Drought Estimation for Crete Island, Greece"
University of Thessaly, Greece
Weihs P.**, Rischbeck P.**, Berger L., Besnard, T., Eitzinger, S., Haumann J.,Huber, K., Kaiser, G., Linke R., Postl, W., Schneider, W.**,**
"Determination of drought stress of wheat by thermal infrared measurements and modelling"
University of Vienna, Austria
Agrita Briede and Gunta Grišule
"Phenological features of the agricultural species in Latvia"
University of Latvia, Faculty of Geography and Earth Sciences
M.S. Castellazzi, K. Conrad, J. Matthews, J.N. Perry
"Spatio-temporal modelling of crops in agricultural landscape"
Rothamsted Research,Harpenden, UK
Christos Domenikiotis, Anna Blanta**, N. R. Dalezios**
"Transferability of the DEMETER Methodology"
University of Thessaly, Greece
Szabolcs Bella, Sándor Szalai
"Drought Vulnerability, Changing of Vulnerability of Southern Transdanubium, Hungary"
Hungarian Meteorological Service, H-1024 Budapest, Hungary
Ana Žust, Andreja Sušnik
"Increased Spring Frost Risk for Fruit Growing Production in Slovenia"
Environmental Agency of the Republic of Slovenia

17:00-17:30 **Coffee Break**

19:30-20:30	**General Assembly – Closing Conference**
	Panel: **S. Tzortzios,** (Chair of HAICTA2006 Organizing Committee) **N. Dalezios,** (Chair of HAICTA2006 Scientific Committee) **E. Koch,** (Chair of COST 725) **M. Vlachopoulou,** (Vice-President of HAICTA-North Greece) **A. Sideridis** (Representative Bioagro-President of HAICTA)
21:30	**Gala Dinner**

Saturday, 23 September (Optional)

10:00	**Excursion to the famous mountain PELION by the small train "Mountzouris" - Lunch in the wonderful village "Milies".**

5. PARTICIPANTS

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6. STATISTICS

a) Country of Origin
Participants came from 16 countries.

1. Austria (2)
2. Belgium
3. Bulgaria
4. Cyprus (2)
5. Czech Rep.
6. Finland (2)
7. France
8. Germany
9. Greece (5)
10. Hungary
11. Latvia (2)
12. Lithuania (2)
13. Romania
14. Slovak Rep.
15. Slovenia (3)
16. United Kingdom

b) Gender
Male 16
Female 14

c) Scientific Background
Meteorology, Climatology, Hydrology, Environmental Sciences, Agriculture, Soil Chemistry, Ecology.

APPENDIX

Working Groups of Exploratory Workshop - COST 725
Future developments follow up research activities, collaborative actions

1. Data recovery of "ancient" phenological data

Isabelle Chuine (FR)
Gaston Demaree (B)
Nicole Estrella (D)
Danuta Romanovskaya (LT)
Agrita Briede (Latvia)
Katarzyna Jatczak (PL)
Viera Remisova (SK)
Eugenija Baksiene (LT)
Elizabeth Koch (A)
Wolfgang Lipa (A)

2. Remote Sensing – Agrometeorological – phenological applications on a larger scale

Marie Castellazzi (UK)
Blaz Kurnik (SL)
Vasile Turcu (RO)
Christos Domenikiotis (GR)
Dimitrios Bampzelis (GR)
Marios Spiliotolpoulos (GR)

3. Agrophenology Modelling (applications in irrigation models, crop yield modelling)

Marios Theodosiu (CY)
Ashgo Dahl (SW)
Akos Nemeth (HU)
Gunta Grisule (Latvia)
Nicolas Dalezios (GR)

4. New ways in phenological monitoring: webcams, mobile phones with cameras

Eero Kubin (FI)
Eeva Kotilainen (FI)
Elena Mateescu (RO)
Pavol Nejedlik (B)
Jiri Nekiovar (HU)
Bernard Avril (FR)

5. Climate Change impacts: from Global to regional

Marta Gaal ((HU)
Andreas Poyiadjis (CY)
Marios Theofilou (CY)
Pavel Stastry (Slovak Rep)
Szabolos Bella (HU)
Nicolas Papageorgiou (GR)