

# Seasonal forecasts and agriculture

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# Seasonal forecasts and agriculture

- In western Europe agriculture is highly intensive but the weather is still the main source of uncertainty for crop yield assessment and for crop management.
- This means that seasonal weather forecasts have high potential interest for European agriculture.

# European agriculture

- The total value of European Union (EU) agriculture is around 200 billion Euro, while trade of agricultural products represents 7% of the total export of EU countries (as well as around 7% of its import)
- The EU production of wheat is around 100 million tons (second largest producer in the world after Asia and slightly ahead of North America).

# The current agricultural policy: Agenda2000

- Agenda2000 implies a potential trade liberalisation and therefore a need of better knowledge of both the internal EU agricultural production and the production of the main EU trade partners.
- Agenda2000 also sets the need to rise quality of agricultural products and to promote sustainability of production systems taking into account environmental concerns in farm management.

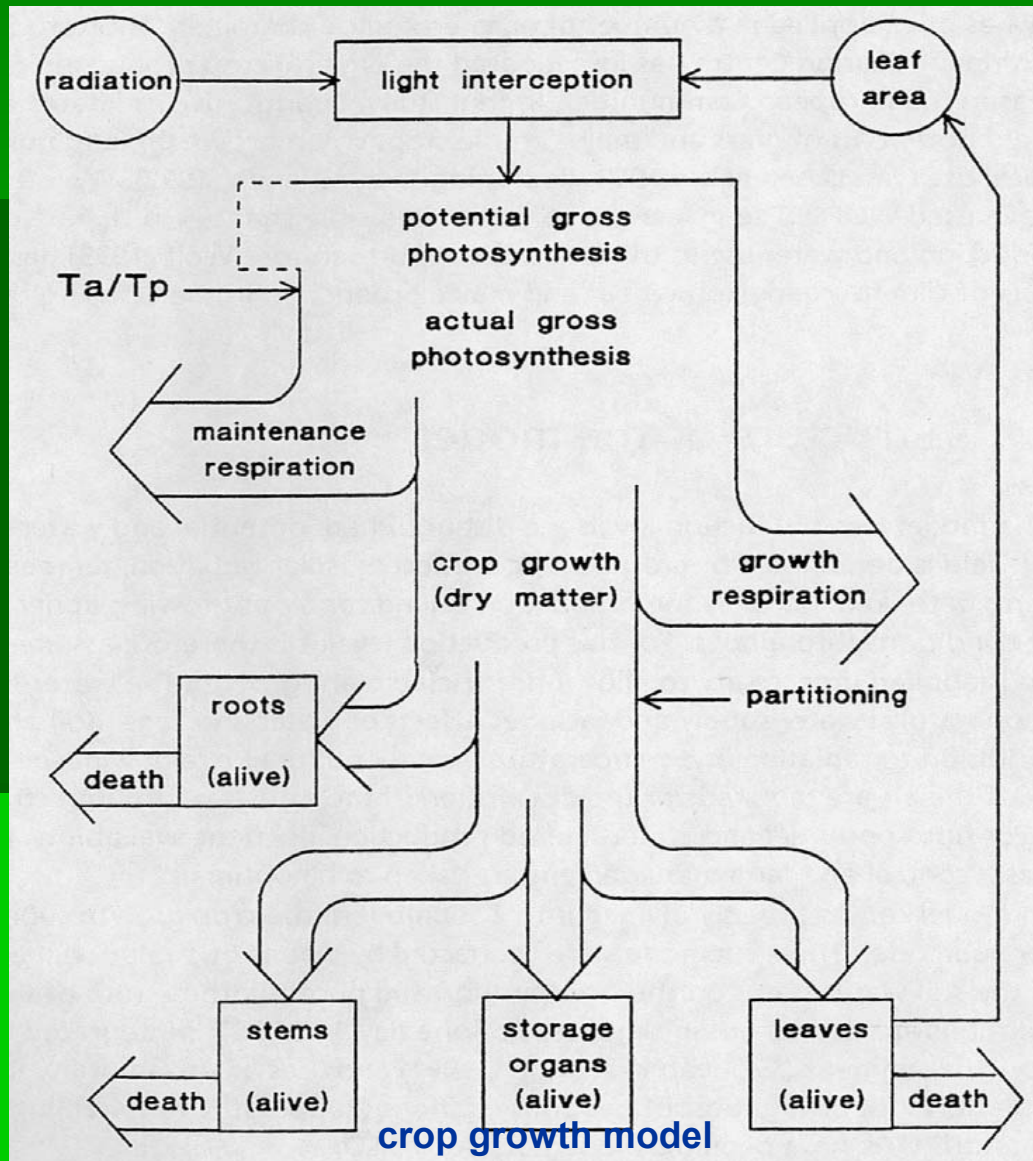
# Policy objectives implications at two levels

- European Commission (DG AGRI) needs better crop yield forecasts in order to manage appropriately the agricultural markets.
- Better crop yield forecasts are also needed at the regional level as quality of food products is required and sustainable farm management practices have to be implemented.

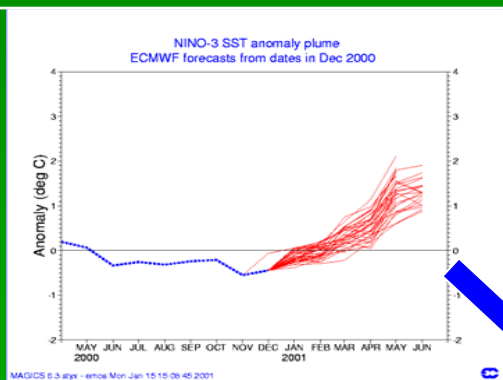
# Crop-weather models

- These models provide base-line information for determining crop yield production
- They can be used also for computing the effects of different management practices (irrigation, sowing time or nitrogen fertilisation) and to assess the impacts of these practices on the environment (nitrate leaching, crop water requirement, etc ...).
- They can also be applied for the assessment of climatic risk in agriculture in the frame of global change.

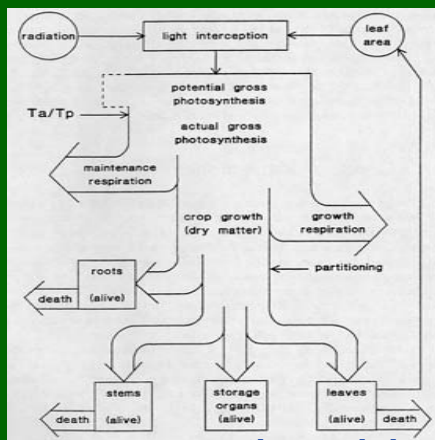
# The crop growth Wofost model



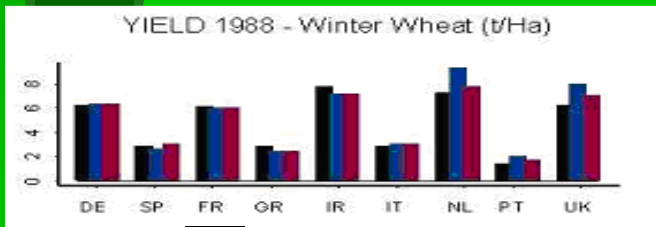
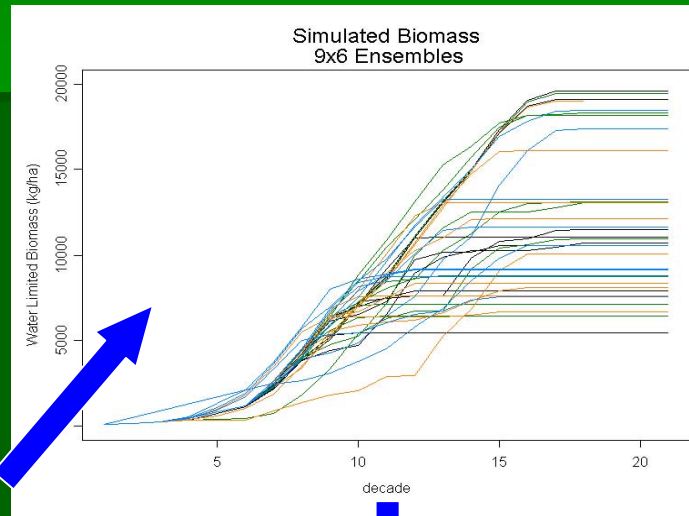
# Potential of seasonal forecast for crop yield estimates



Seasonal ensemble predictions ECMWF

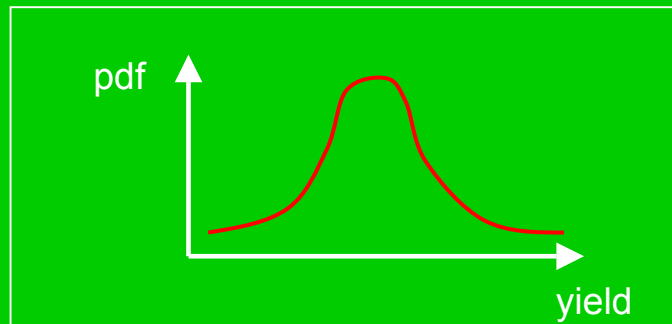


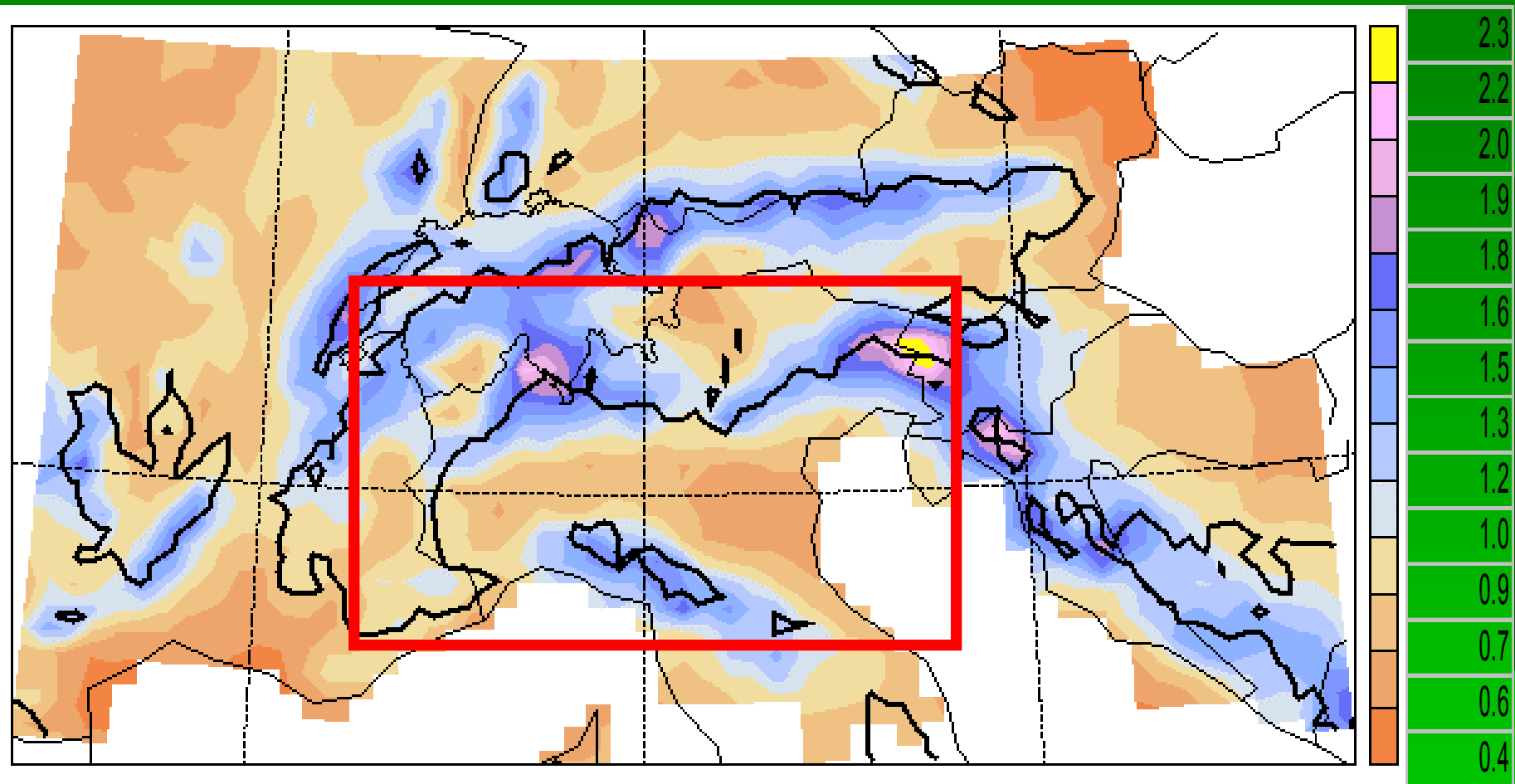
crop growth model



Eurostat official yield  
 Current model yield  
 Seasonal forecast yield

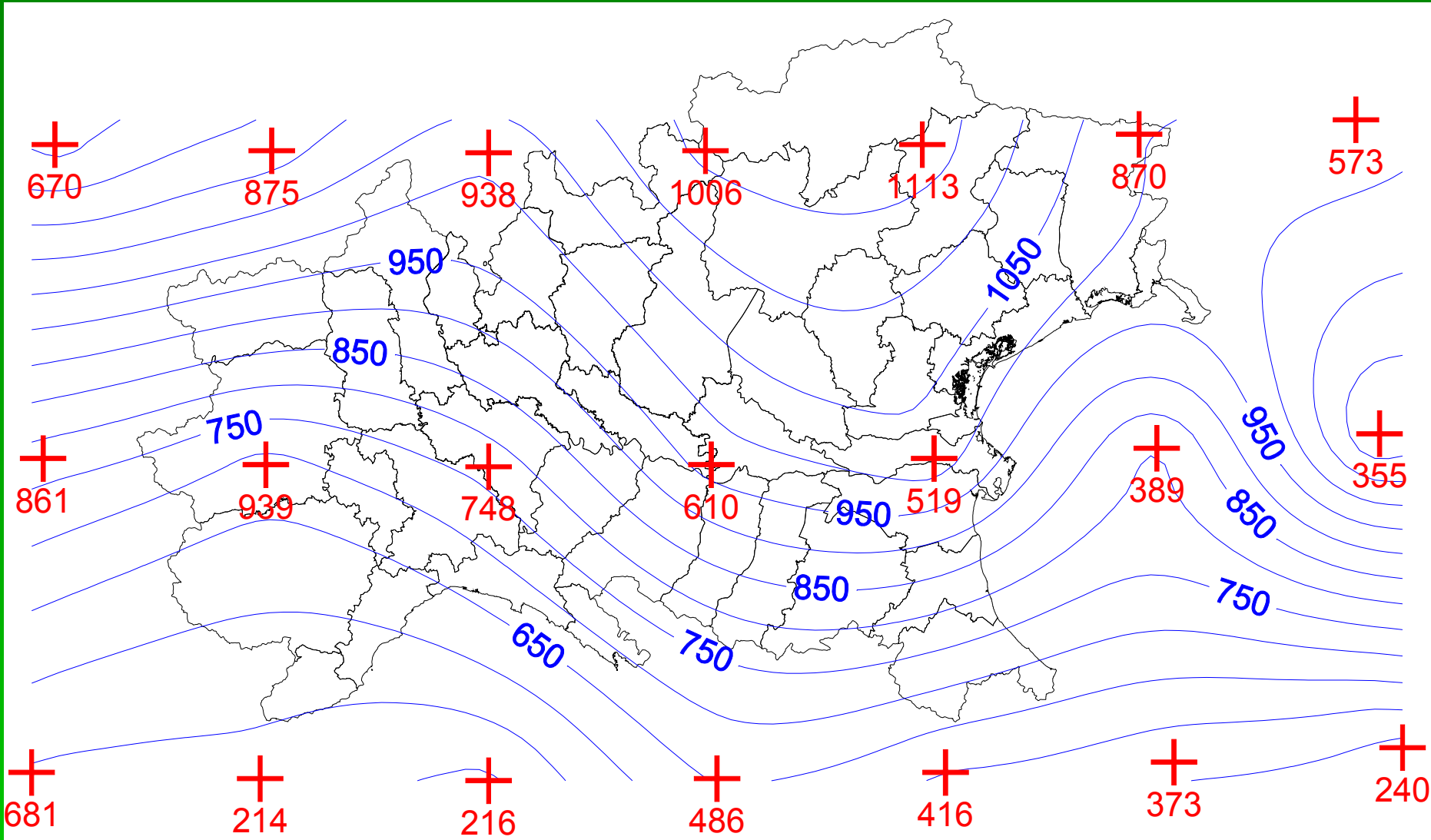
Improvement of crop yield forecast





Mean precipitation 1971-1990 [m/year]  
(from the MAP project site, [www.map.ethz.ch](http://www.map.ethz.ch))

# ERA15 mean annual precipitation 1979-1993



Precipitation (blue, mm) and model orography (red, m)

# The need for “downscaling”

- Multi-model ensemble seasonal forecasting is performed at global scale, that is at low spatial resolution.
- At the scale used in the Demeter project orography of Europe and esp. of northern Italy is represented very coarsely so that even correctly predicted large scale weather systems are not yielding a reliable representation of local weather conditions.
- This leads to the necessity to “downscale” the outputs from the forecasting system, that is to represent more accurately the weather at the local scale.
- The downscaling groups working in Demeter are using several techniques which all tend to improve forecasts at local scale injecting in the system information on local climate taken from climatic data time series (provided by end-users).

# A few general remarks (1)

- I tried to show the importance of end-user models in order to exploit the potentialities of seasonal forecasts
- There is a clear need to adapt such models to be used with seasonal to decadal forecasts as inputs
- There is also a clear need for downscaling, esp. on complex terrain

# A few general remarks (2)

- Downscaling can be performed only in the presence of large and quality controlled observational datasets (e.g. Mars and Map)
- Long term forecast projects need the continual interaction between modelers, downscalers and end-users to be fruitful



**Seasonal forecasting and  
agriculture:  
carefully managed seedlings can  
grow in big trees!**

**Thank you for your attention**