Crop yield forecasting

Crop yield forecasts and crop production estimates are necessary at EU and Member State level to provide the EU’s Common Agricultural Policy (CAP) decision makers with timely information for rapid decision-making during the growing season. Estimates of crop production are also useful in relation to trade, development policies and humanitarian assistance linked to food security.

The JRC’s crop forecasting activities support the CAP by providing scientifically relevant, independent and timely crop yield forecast products and data. The JRC also supports the EU Food Security Thematic Programme and food assistance policies by providing assessments and early warnings of agricultural production in food-insecure regions of the world. In addition, the JRC works on the assessment of climate change impacts on agriculture in support to the EU climate change policy agenda and the Europe 2020 flagship initiative for a resource-efficient Europe.

The JRC provides near real-time crop growth monitoring and yield forecasting information for the EU and its neighbourhood, and is extending these activities to the main producing regions of the world. It also assesses climate change impacts on agriculture through the simulation of impacts of climate change scenarios in crop models.

Moreover, it provides scientific advice and early warning on agricultural production in food-insecure regions of the world. All the information the JRC gathers helps to prepare food balance sheets that are used for market analyses and decisions related to the CAP management of stocks, imports and exports, market interventions and budget preparation.

For a detailed overview about our crop yield monitoring and forecasting activities please check out our videos:

/jrc/en/file/video/160108fyy6AiZ-vlQ

Video of fyy6AiZ-vlQ

Playlist of all crop yield monitoring and forecasting videos [1]

Crop yield forecasts in Europe

The JRC has developed and runs a crop yield forecasting system since 1992 which provides timely forecasts of crop production, including biofuel crops, for Europe and other strategic areas of the world.
The MARS Crop Yield Forecasting System (MCYFS) monitors crop vegetation growth (cereal, oil seed crops, protein crops, sugar beet, potatoes, pastures, rice), including the short-term effects of meteorological events on crop production. It also provides seasonal yield forecasts of key European crops, thereby contributing to the evaluation of global production estimates (wheat, maize, etc.) in support of CAP management decisions.

The MCYFS is an integrated analysis tool based on satellite observations of Earth, meteorological observations, meteorological forecasts, agro-meteorological and biophysical modelling, and statistical analyses. JRC scientists have developed specific applications to estimate rainfall, detect anomalies and produce early warning bulletins throughout crop season, anticipating food insecurity risks caused by events such as severe droughts.

The JRC has also developed several crop models and modelling systems for the simulation of crop growth under different conditions, for several crops, and with different objectives ranging from research and development to operational application.

Moreover, the JRC maintains a network of European Crop Growth Monitoring System (CGMS) users within competent national authorities and research institutions. The JRC also pursues scientific collaboration activities with other European research institutions in the field of agro-meteorology and crop modelling such as the French National Institute for Agricultural Research (INRA) and the Italian University of Milan.

The results of the yield monitoring activities are synthesised in the MARS Bulletin. This report, which is published regularly throughout the European growing season, contains analyses of the crop situation in different regions of Europe, maps of weather conditions, crop indicators and yield expectations.

These results are also used as input to the Agricultural Market Information System (AMIS) of the Food and Agriculture Organization (FAO) as a European contribution in response to the 2011 G-20 initiative on market transparency.

More information:

MARS crop models and modelling systems

Vulnerability analysis

The socio-economic impacts of food insecurity are explicitly linked to vulnerability. Vulnerability is defined by factors such as economic, civil or natural hazards, market prices, crop production, access to food, food consumption and livelihoods. The JRC is involved in the analysis of the reasons behind and consequences of vulnerability, and the identification of appropriate response measures.

The European Commission uses these analyses to evaluate the amount of food aid and other forms of assistance that could be required in emergencies and to support longer term multi-sectoral development in developing countries.

The JRC collaborates on existing programmes and practices related to vulnerability and need
assessments together with partners at national, regional and global levels, mainly in Sub-Saharan Africa.

The JRC carries out vulnerability and socio-economic analyses, monitors national vulnerability/food security indicators and participates in specific humanitarian initiatives in collaboration with international and local partners (e.g. the UN's Integrated Food Security Phase Classification – IPC [6]). It also organises training sessions and gives technical support, e.g. on food security assessment methods, food security indicators and vulnerability mapping techniques.

More information:

MARS bulletins for food security [7]

Vulnerability analysis [8]

**Crop production under climate change**

Agriculture has a dual role in terms of global change - it is a big emitter of greenhouse gases, while at the same time it is one of the main sectors to be impacted by climatic change, with local, regional and global implications for the stability of and access to food supply.

In view of providing support to the CAP and the climate change policy agenda, studies that assess the resilience of crop production systems under a number of climate change scenarios are being implemented by the JRC. Both current and forecasted climate conditions are analysed, focusing on short-term and medium-term time horizons (2020, 2050) in order to evaluate different adaptation measures to mitigate the impacts identified.

To simulate the impacts of climate change on agriculture and to evaluate adaptation strategies, the JRC uses its Biophysical Models Applications (BioMA) [9] framework. A suite of model components implemented in this modelling framework help carry out simulations of various crops in agricultural systems under present and future climate change scenarios. These JRC modelling activities are being integrated with other biophysical and economic models in order to develop an integrated approach to the evaluation of climate change scenarios.

**A social media campaign on flowering rapeseed!**

We are collecting data on the dates of rapeseed flowering.

This research aims to improve our understanding of rapeseed development, improve crop forecasts, and optimally benefit from high-resolution sentinel satellites observations.

We are seeking the support of 'citizen scientists' collecting pictures of rapeseed in bloom and use Twitter to share the image and the geo-location using the hashtag #YellowFlowersEU.

This information should ultimately lead to better production forecasts.

To take part in our scientific research, take a look at our social media campaign web page [10].

The campaign will run until 31 May 2018.