

Serving society
Stimulating innovation
Supporting legislation

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 3. Kybele (Fotolia)

Joint Research Centre

The European Commission's in-house science service

JRC mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Facts & figures about the JRC

- Established in 1957
- Around 3 000 scientific and technical personnel
- 7 scientific institutes
- 1 433 publications in 2013

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Science for Agriculture

Some JRC examples

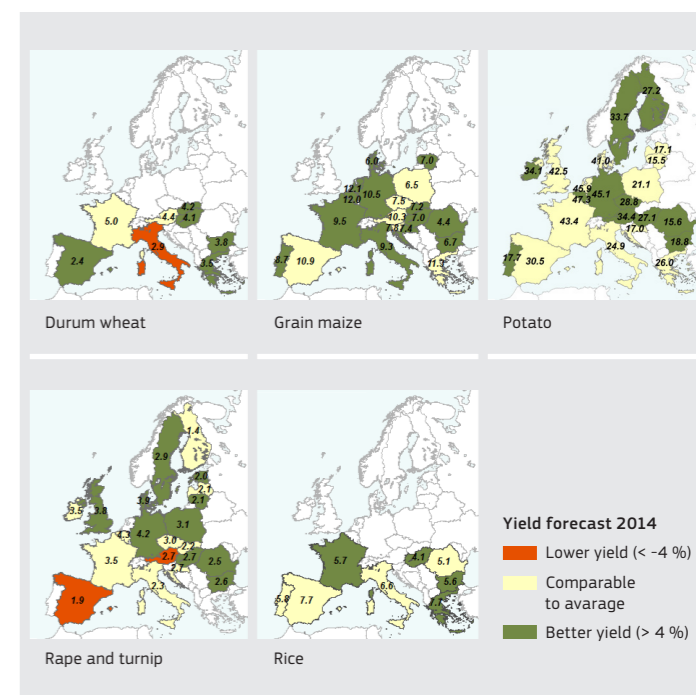
To meet the needs of the world's growing population whilst taking into account limitations in the availability of natural resources and the impacts of climate change, food production must be increased in an economically, environmentally and socially sustainable way.

The European Commission's in-house science service, the Joint Research Centre (JRC), provides scientific and technical support to the European Union's agriculture and food security policies through its monitoring, modelling and economic analysis of agricultural resources and farm systems.

Crop monitoring and forecasting

The JRC's crop forecasting activities support the EU's Common Agricultural Policy (CAP) by providing independent and timely crop yield forecast information for Europe and the main producing regions of the world. This allows for rapid decision-making during the growing season, as data and analysis delivered by the JRC help to prepare balance sheets for cereals, oilseeds, and rice that are used for market analyses and decisions related to the CAP management regarding trade measures and market intervention as well as budget preparation. The JRC produces a monthly bulletin containing quantitative forecasts of likely yields for the main grain and tuber crops grown in Europe. Additionally, the European forecasts are shared internationally by DG Agriculture and Rural Development as part of the Agricultural Market Information System (AMIS), which was set up by the G20 countries to enable greater transparency of agricultural supply and markets, thereby helping to limit damaging price fluctuations.

More info: <http://mars.jrc.ec.europa.eu/mars/About-us/AGRI4CAST/MARS-Bulletins-for-Europe>



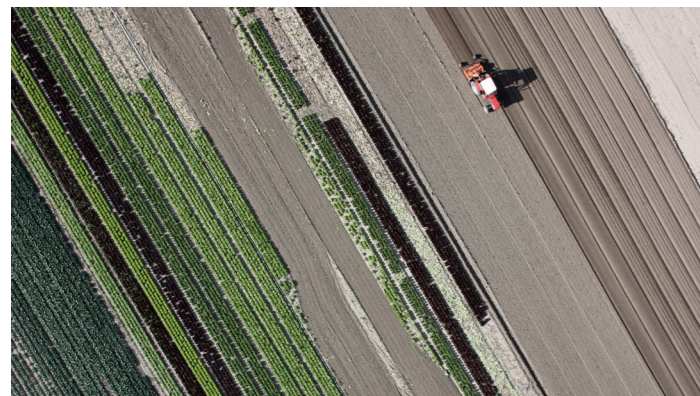
Different yields for 2014 across Europe as forecasted in July by the analysts of the JRC's Monitoring Agricultural Resources unit (MARS) using the MARS Crop Yield Forecasting System.

Agricultural monitoring

To support the implementation of the Common Agricultural Policy (CAP), the JRC provides guidance and tools to the EU Member States to check the validity of farmers' applications and help allocate CAP subsidy payments.

This includes technical assistance to help comply with requirements such as the Good Agricultural and Environmental Condition (GAEC) standards and the specific environmental farming practices of the CAP 2013 reform, known as ‘greening’ elements, which encompass crop diversification and the maintenance of permanent grassland. Over the years, JRC activities have led to several innovative developments such as the control with remote sensing (CwRS) technique, widely used by the Member States to check a sample of declarations made by farmers, and the Land Parcel Identification System (LPIS), which provides the reference database of land parcels for each Member State. The JRC is also developing a methodology to assess the regional impact of the ‘greening’ measures of the CAP, linking the market model of the CAP with a series of environmental indicators.

More info: <https://ec.europa.eu/jrc/en/research-topic/agricultural-monitoring>



The JRC is responsible for image acquisition in the context of CAP Controls with Remote Sensing (CwRS).

Modelling support for the Common Agricultural Policy (CAP)

The **Common Agricultural Policy (CAP)** represents the second largest share of the EU budget and is an evolving policy area that needs constant fine-tuning. Reforms responding to internal and external challenges are necessary, in particular in the context of the assessment of the multiannual financial framework 2014-2020, against the backdrop of an uncertain macro-economic environment. Different policy options imply different impacts on production and markets, which need to be assessed in due time.

The JRC develops economic modelling tools to provide ex-ante impact assessment of new CAP policy options, at aggregate level (impact of policy options on EU markets and income) and at farm level, both concerning the direct impact of policies on farms (income and subsidies distribution, production costs, agricultural structures) and on farmers’ behaviours (e.g. investment strategies).

The European Union counts circa 12 million farms with a wide variation in endowments, specialisation and land use. As a consequence of these differences and the diversity in entrepreneurship and personal or household aims, responses to a specific policy or innovation may significantly differ across the farming community. JRC scientists develop tools to evaluate the effectiveness and efficiency of policies, and to make impact assessments of agricultural and environmental policies at large-scale.

More info: <https://ec.europa.eu/jrc/en/research-topic/farming-eu>
<https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/farm-level-modelling-cap-methodological-review>

Support to food security

The European Union plays a major role in the international effort to improve global food security, through its contributions to food security assessment and planning, rural economic development and interventions during food crises. The JRC 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.

Based on over 20 years’ experience in crop monitoring and modelling, the JRC uses datasets of weather conditions, crop and vegetation growth and land management to monitor and forecast the performance of the agricultural season. Many measurements are taken using satellite observations which provide information that can be difficult to access on the ground. Reports are produced for other Commission services and the European External Action Service (EEAS). The reports, methods and tools developed are shared with local organisations and partners involved in the area, such as aid organisations.

The JRC also works closely with international organisations such as the Food and Agriculture Organization of the United Nations (FAO) and the United Nations World Food Programme (WFP), with which it identifies knowledge and data gaps, and coordinates research activities. Last but not least, the JRC contributes to technology transfer and capacity building of national and regional food security information systems.

More info: <http://mars.jrc.ec.europa.eu/mars/About-us/FOODSEC/MARS-Bulletins-for-Food-Security>
<http://spirits.jrc.ec.europa.eu/> • <http://www.aphlis.net/>



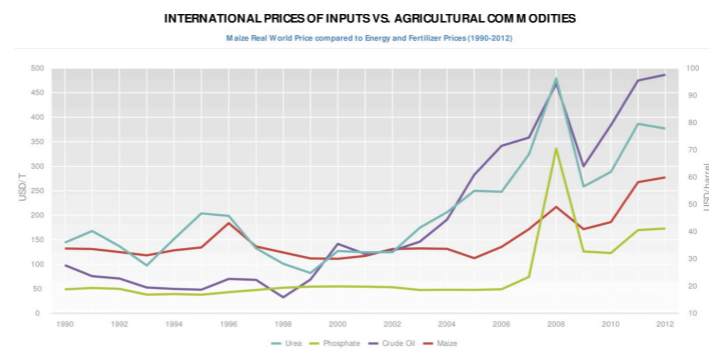
According to the Food and Agriculture Organization (FAO), demand for food is likely to grow by 70% by 2050 as a result of demographic growth and changes in diets and incomes.

Food markets and price volatility

Global agriculture markets have become increasingly volatile in recent years, directly impacting those involved in the production of food and making it extremely difficult for farmers and buyers to plan ahead. Agricultural markets must therefore be constantly monitored, and be subjected to prospective analyses.

Through economic modelling using its integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP), the JRC establishes annual reference projections for the major EU agricultural commodity markets and agricultural income for the coming ten years. These serve as a benchmark for assessing the medium-term impact of future market, trade agreements and policy issues and in estimating the likelihood of more volatile food prices.

More info: <http://www.datamweb.com/datam/>
<https://ec.europa.eu/jrc/en/scientific-tool/imap-%E2%80%93-integrated-modelling-platform-agro-economic-commodity-and-policy-analysis>
<http://emm.newsbrief.eu/NewsBrief/alertedition/en/IPTS-Foodsec-PriceVollnf.htm>



International prices of inputs vs agricultural commodities.
Source: DataM web, Joint Research Centre. Elaboration based on original data coming from WORLD BANK – Prices.

Agricultural biodiversity and ecosystem services

Agricultural land covers almost half of Europe’s territory. Technological development, mechanisation and agro-chemicals have led to structural modifications in farming practices and put pressure on the environment, leading to soil depletion, water shortages, pollution, habitat degradation and biodiversity loss. The Common Agricultural Policy (CAP) aims to address these issues, promoting the sustainable management of natural resources and balanced territorial development while maintaining a viable food production capacity.

Through geospatial and modelled assessments, the JRC studies the links between agriculture and biodiversity (pressures and benefits). Its research particularly focuses on mapping ecosystem services delivered by agriculture, assessing available natural resources, monitoring the changes in agricultural landscapes, and studying the impact of agricultural practices on water quality and climate change. For this, JRC scientists have developed robust modelling approaches that evaluate ecosystem dynamics and make future scenario simulations.

More info: <https://ec.europa.eu/jrc/en/research-topic/ecosystems-and-biodiversity>

Natural resources

The JRC carries out studies and assessments of the state of natural resources such as water, soil and land, following the European Commission’s Roadmap to a Resource-Efficient Europe. For instance, the JRC provides indicators on soil quality and soil erosion and is working on a standardised methodology to evaluate the economic impacts of land degradation.

To encourage the sustainable management of water resources, the JRC investigates potential solutions to the increasing competition for scarce freshwater by analysing the water footprint of consumption for different diets in the EU.

The JRC also developed a Land-Use based Integrated Sustainability Assessment (LUISA) modelling platform to analyse the impacts on land use of policies and proposals in the context of environmental and socio-economic changes in Europe. It combines models on themes such as hydrology, agriculture, economy and forestry. The platform is used to access European policies and related initiatives dealing

with integrated coastal zone management, the Common Agricultural Policy, resource efficiency and shale gas extraction.

Resources: <https://ec.europa.eu/jrc/en/research-topic/soil>
<https://ec.europa.eu/jrc/en/research-topic/water>
<https://ec.europa.eu/jrc/en/news/water-footprint-eu-different-diets-9674>
<http://moland.jrc.ec.europa.eu/lump/lump.htm>
http://sa.jrc.ec.europa.eu/?page_id=763lump/lump.htm

Impacts of climate change on agriculture

Agriculture has a dual role in terms of global change, being at the same time a major emitter of greenhouse gases and 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. The JRC studies the resilience of crop production systems under a number of climate change scenarios, using crop models such as the Biophysical Models Application (BioMA) framework. Both current and forecasted climate conditions are analysed, focusing on short-term and medium-term time horizons (2030, 2050) in order to evaluate different adaptation measures to mitigate the identified impacts.

More info: <http://bioma.jrc.ec.europa.eu/>

Agricultural technological foresight

New technologies, such as bio-technologies, and their adoption by EU farmers are key drivers in maintaining European agricultural competitiveness on the global market. However, such technologies must be regulated to ensure that they are safely and ethically used.

Through its European Union Reference Laboratory for Genetically Modified Food and Feed (EURL-GMFF), the JRC validates the EU Member States’ methods to detect and quantify GMOs in food, feed, seeds and end products.

The JRC is also involved in anticipation and technological foresight studies of new agricultural technologies, notably in the area of crop improvement. It also carries out socio-economic research evaluations of the crops derived using biotechnology for the EU farming and related economic sectors. Together with Member States, the JRC-managed European GMO Socio-Economics Bureau (ESEB) defines indicators and methodologies for socio-economic assessments. Also hosted by the JRC, the European Coexistence Bureau (ECob) produces EU farming guidelines on technical segregation measures to achieve coexistence between GM, conventional and organic agriculture.

More info: <https://ec.europa.eu/jrc/en/research-topic/gmos>
<https://ec.europa.eu/jrc/en/eseb>
<https://ec.europa.eu/jrc/en/network-bureau/european-coexistence-bureau-ecob>



Sustainable intensification of agricultural production through technological development is high on the agenda of governments and international bodies.