Agriculture, Climate Change and Food Security
Joint Research Centre Activities

Neil Hubbard, Head of MARS Unit
Jacques Delince, Head of AGRILIFE Unit

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Serving society
Stimulating innovation
Supporting legislation

The JRC inside the European Commission

President
José Manuel Barroso

27 Commission Members

Commissioner
Mairé Geoghegan-Quinn
Research, Innovation & Science

Director-General
Dominique Ristori
Joint Research Centre

DG Research & Innovation (RTD)

Who are we and what do we do?

JRC is the European Commission's in-house science service. It provides the science for policy decisions, with a view to ensuring that the EU achieves its Europe 2020 goals for a productive economy as well as a safe, secure and sustainable future.

⇒**JRC undertakess 'direct' research related to EU policies**

The JRC plays a key role in the European Research Area and reinforces its multi-disciplinarity by networking extensively with leading scientific organisations in the Member States, Associated Countries and worldwide.

⇒**JRC wants/needs 'indirect' research with partners to:**

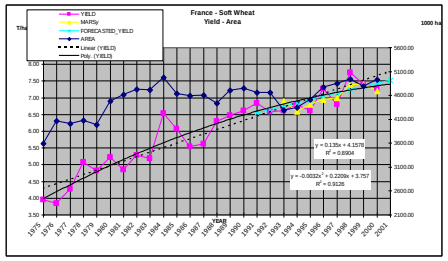
- ⇒ **Access/participate in scientific excellence**
- ⇒ **Involvement/stimulation for its scientists**

FACCE Core theme 1: Food Security, modelling

Crop yield forecasting

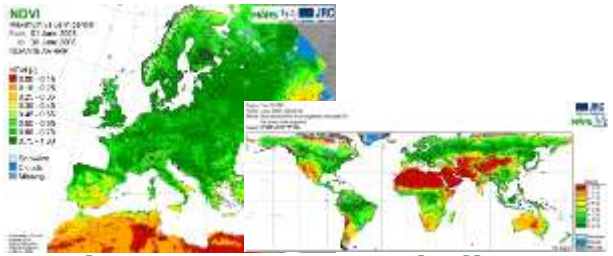
The systems are made by remote sensing, meteorological data, agro-meteorological modeling and statistical analysis tools.

Statistical infrastructure



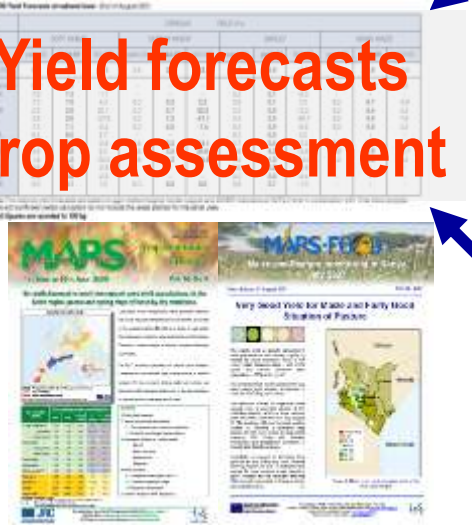
time series regression, similarity analyses

Remote Sensing infrastructure



Vegetation state & meteo indicator since 1981 Europe, 1998 worldwide

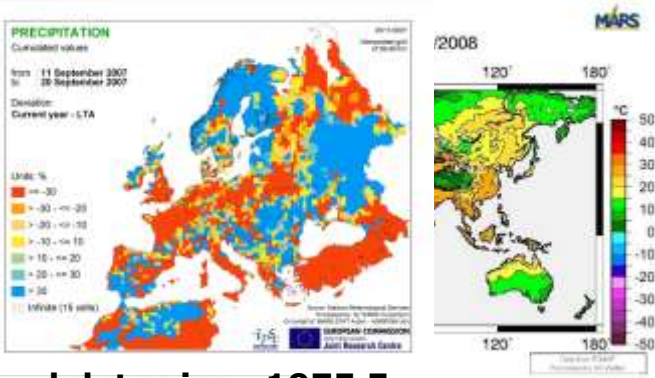
Yield forecasts Crop assessment



Crop Model infrastructure

Agrometeo indicators derived from crop growth model – WOFOST / LINGRA / WARM and GWSI

Meteorological infrastructure

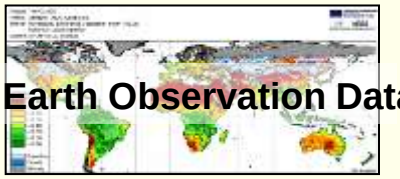


observed data since 1975 Europe under construction for Africa worldwide ECMWF data + archive

Joint Research Centre

Crop assessment and yield forecasting process

Data collection & retrieval



Earth Observation Data

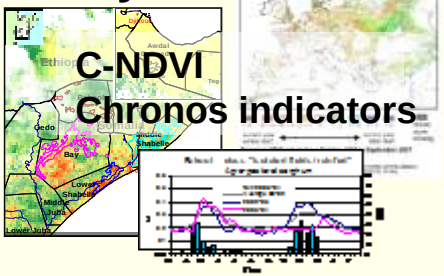
Meteorological Data

Agronomic Database

WEB Information
Media Monitor
Magazines

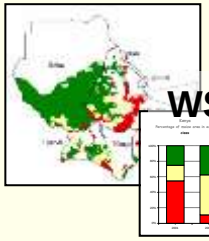
Agro-phenological network

Processing & Analysis



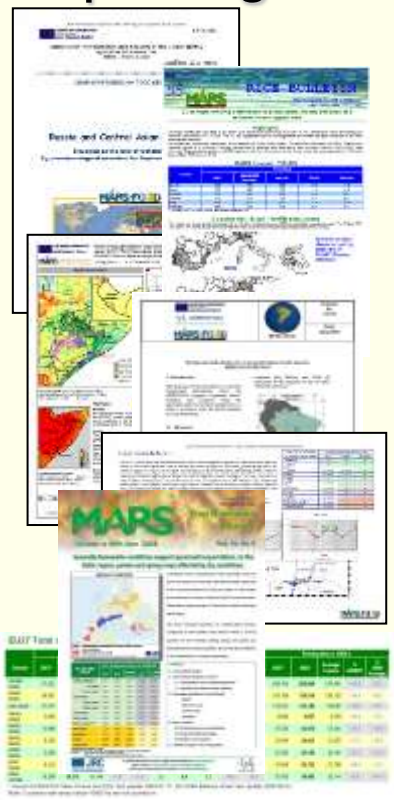
C-NDVI
Chronos indicators

CGMS

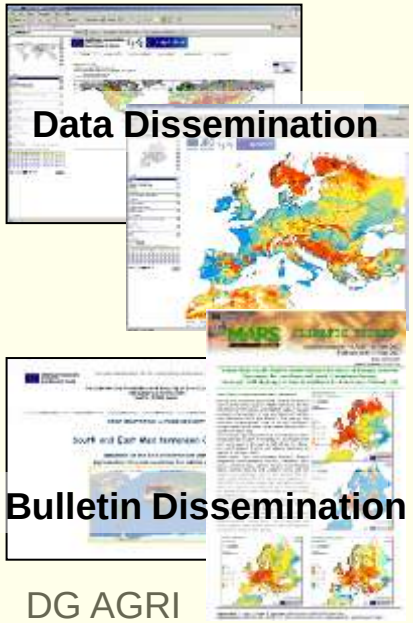


WS Index

Reporting



Dissemination



Data Dissemination
Bulletin Dissemination

DG AGRI
DG RELEX family
DG EUROSTAT
EU Delegations
Member States
National Agencies
Int. Institutions (FAO, …)

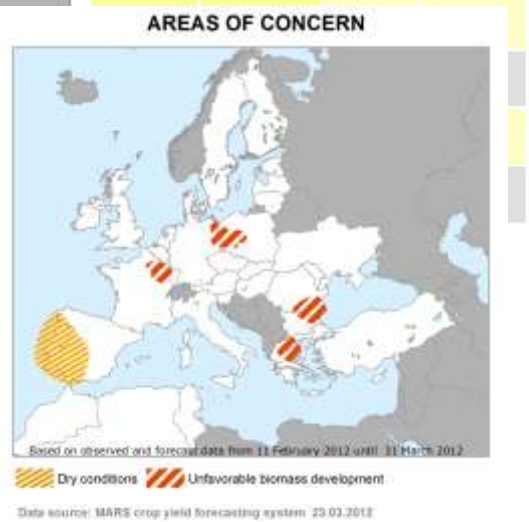
Final users just need some figures and very simple sketches displaying areas of concern

European Commission

EU27 Total cereals yield forecasts – 22nd July 2008

Cereals	Area x 1000 ha					Yield t/ha					Production x 1000 t.				
	2007*	2008*	Average 5 years	% 2008/07	% 2008/ Average	2007*	MARS 2008 forecasts	Average 5 years	% 2008/07	% 2008/ Average	2007*	2008	Average 5 years	% 2008/07	% 2008/ Average
cereals (total)	57,023	**59,833**	58,470	+4.9	+2.3	4.5	**5.0**	4.7	+10.4	+6.0	258,102	**298,940**	275,491	+15.8	+8.5
wheat (total)	24,837	**26,372**	25,450	+6.2	+3.6	4.8	**5.3**	5.0	+9.6	+5.4	120,190	**139,916**	128,123	+16.4	+9.2
soft wheat	21,974	**23,227**	22,017	+5.7	+5.5	5.1	**5.6**	5.4	+9.9	+4.0	112,051	**130,186**	118,685	+16.2	+9.7
durum wheat	2,848	**3,128**	3,404	+9.8	-8.1	2.8	**3.1**	2.7	+8.8	+12.6	8,084	**9,657**	9,336	+19.4	+3.4
barley (total)	13,668	**14,415**	13,740	+5.5	+4.9	4.2						**63,670**	57,454	+10.7	+10.8
spring barley	8,358	**8,870**	8,436	+6.1	+5.1	3.8									
winter barley	5,296	**5,528**	5,276	+4.4	+4.8	4.8									
grain maize	8,310	**8,732**	9,134	+5.1	-4.4	5.8									
other cereals	10,208	**10,313**	10,146	+1.0	+1.6	3.2									

* Source EUROSTAT New Cronos and EES: last update 2008-07-17,
Note: Countries with areas below 10000 ha are not counted in



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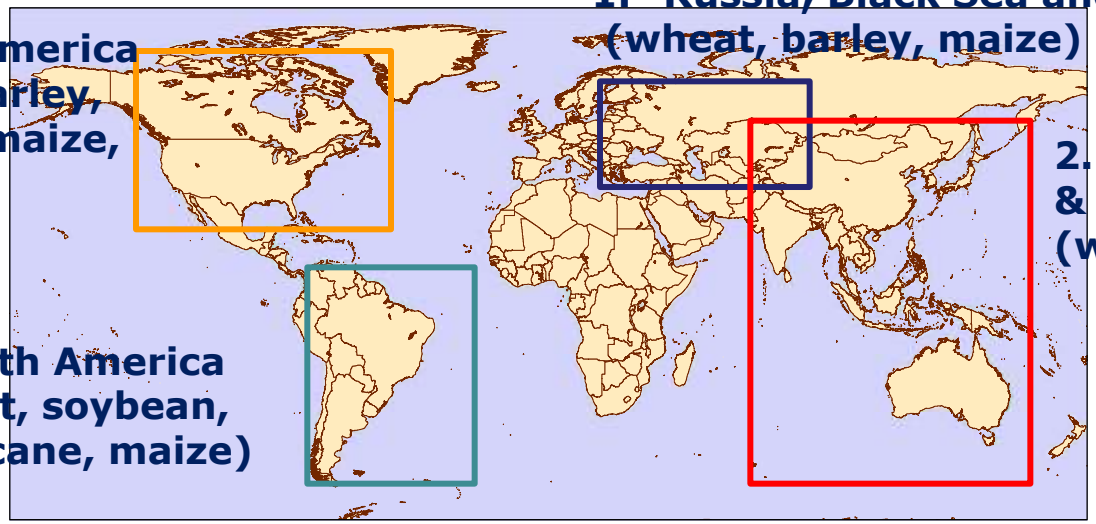
GLOBCAST – Global crop monitoring system

General objectives of GLOBCAST

- **Monitor the impact of weather in main grain producing areas**
- **Produce short-term forecasts**

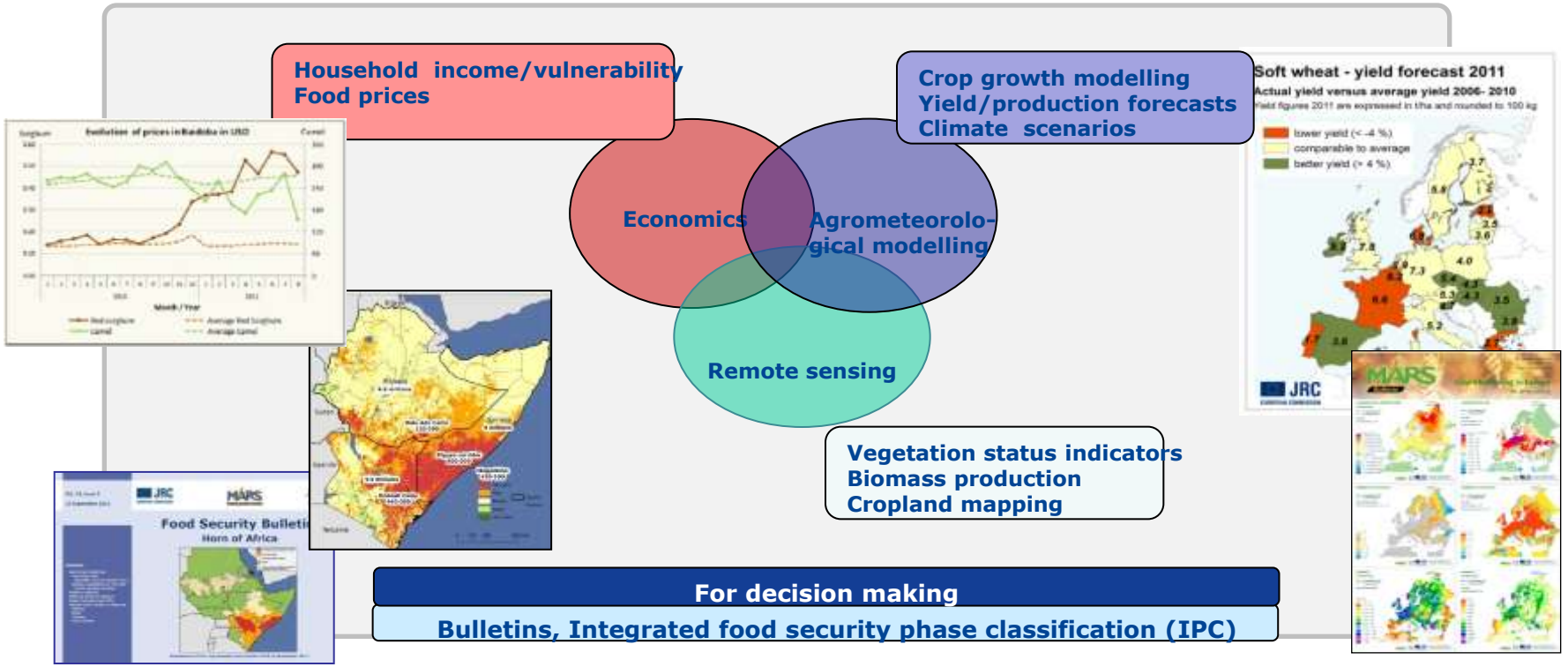
} 4 Zones of the world



The challenge of food security

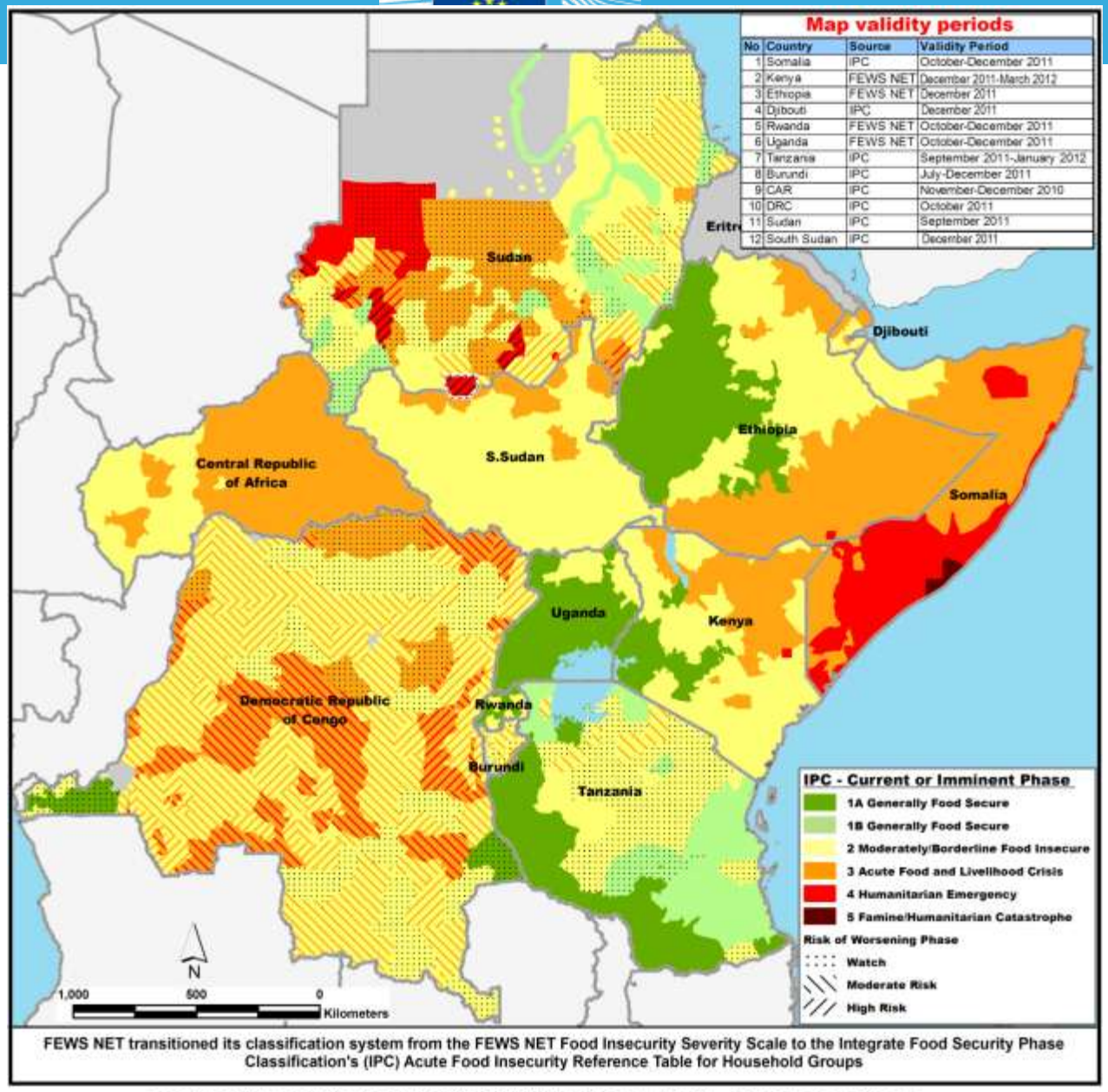
(the approach from current MARS activities……)

Multidisciplinary approach to food security: availability, access [and utilization]



January 2012

Somalia and Sudan remain in emergency food security situation despite general improvement in most parts of the region



FEWS NET transitioned its classification system from the FEWS NET Food Insecurity Severity Scale to the Integrate Food Security Phase Classification's (IPC) Acute Food Insecurity Reference Table for Household Groups

Sources: IPC country teams; FEWS NET for Ethiopia, Kenya, Uganda and Rwanda.
The names and boundaries on this map do not imply official endorsement or acceptance by the UN.

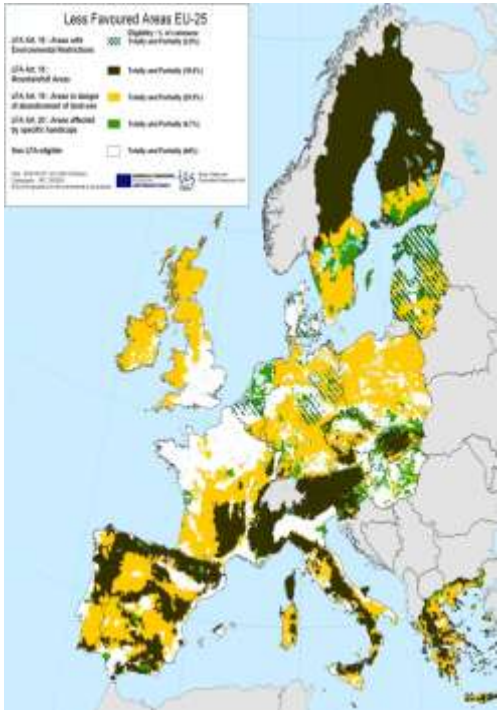
FSNWG
Food Security & Nutrition Working Group
Central & Eastern Africa

FACCE Core theme 3: Trade-offs, food, biodiversity, ecosystems

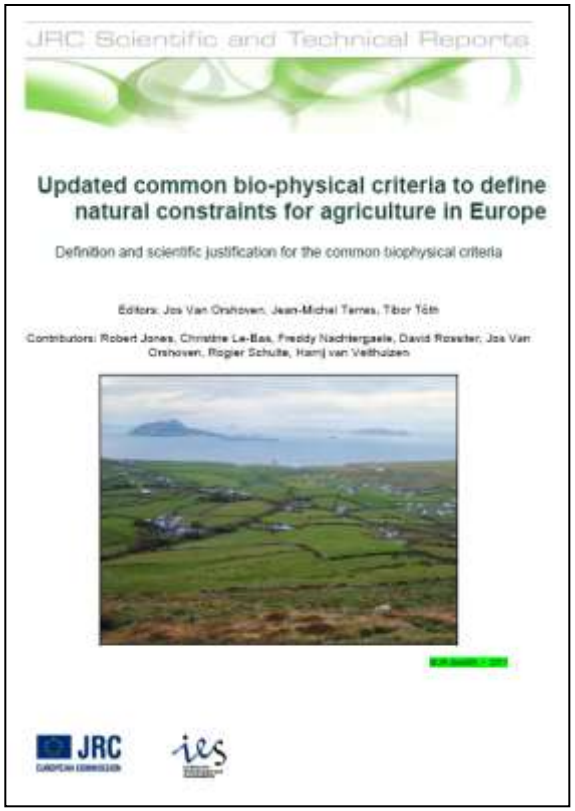
Characterisation of rural landscape

European Commission

Redefinition of "Less Favoured Areas" to "Areas of Natural Constraints "



JRC technical coordination
with Member States
for DG Agri and DG Env

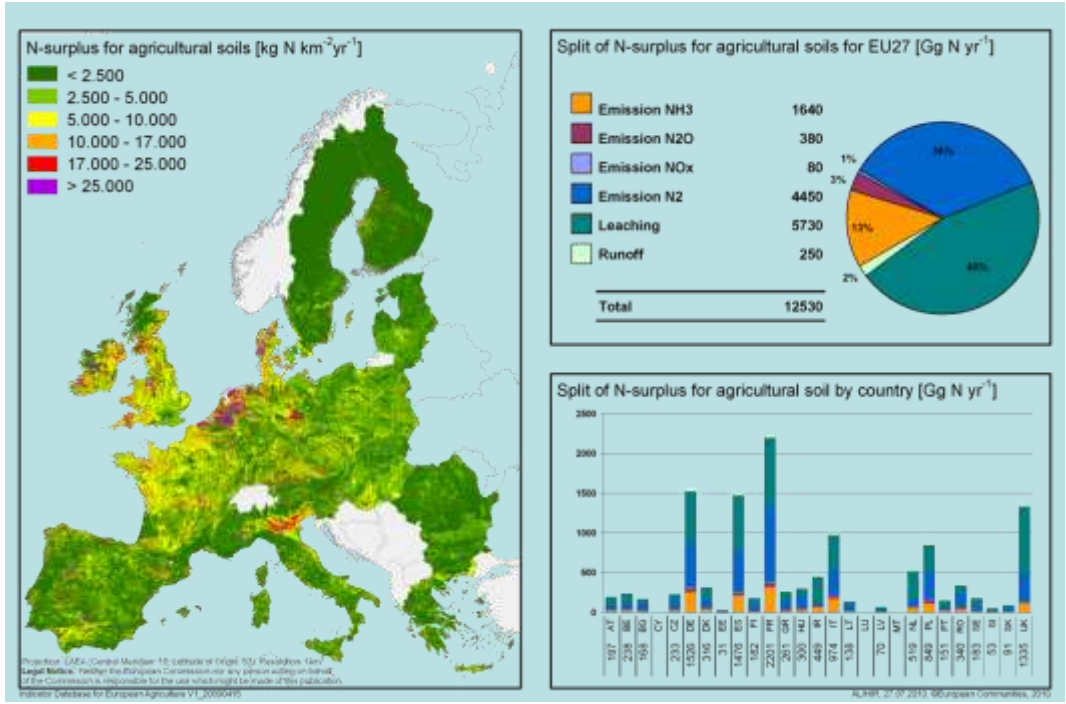


'Areas of Natural constraints' basis for possible top up payments over the flat rate of the new CAP

→ prevent land abandonment

Joint Research Centre

European Nitrogen Assessment – Key maps



Sutton, M. A, Oenema, O., Erisman, J.W., Leip, A., van Grinsven, H., Winiwarter, W., 2011. Too much of a good thing. **Nature**. 472, 159-61. doi:10.1038/472159a.

First continental-wide comprehensive assessment of nitrogen processes – flows – impacts – solutions

Low Carbon farming …

By: developing a tool to be used on FARM level:

An easy to use carbon calculator, to be used by farmers or the farming associations.

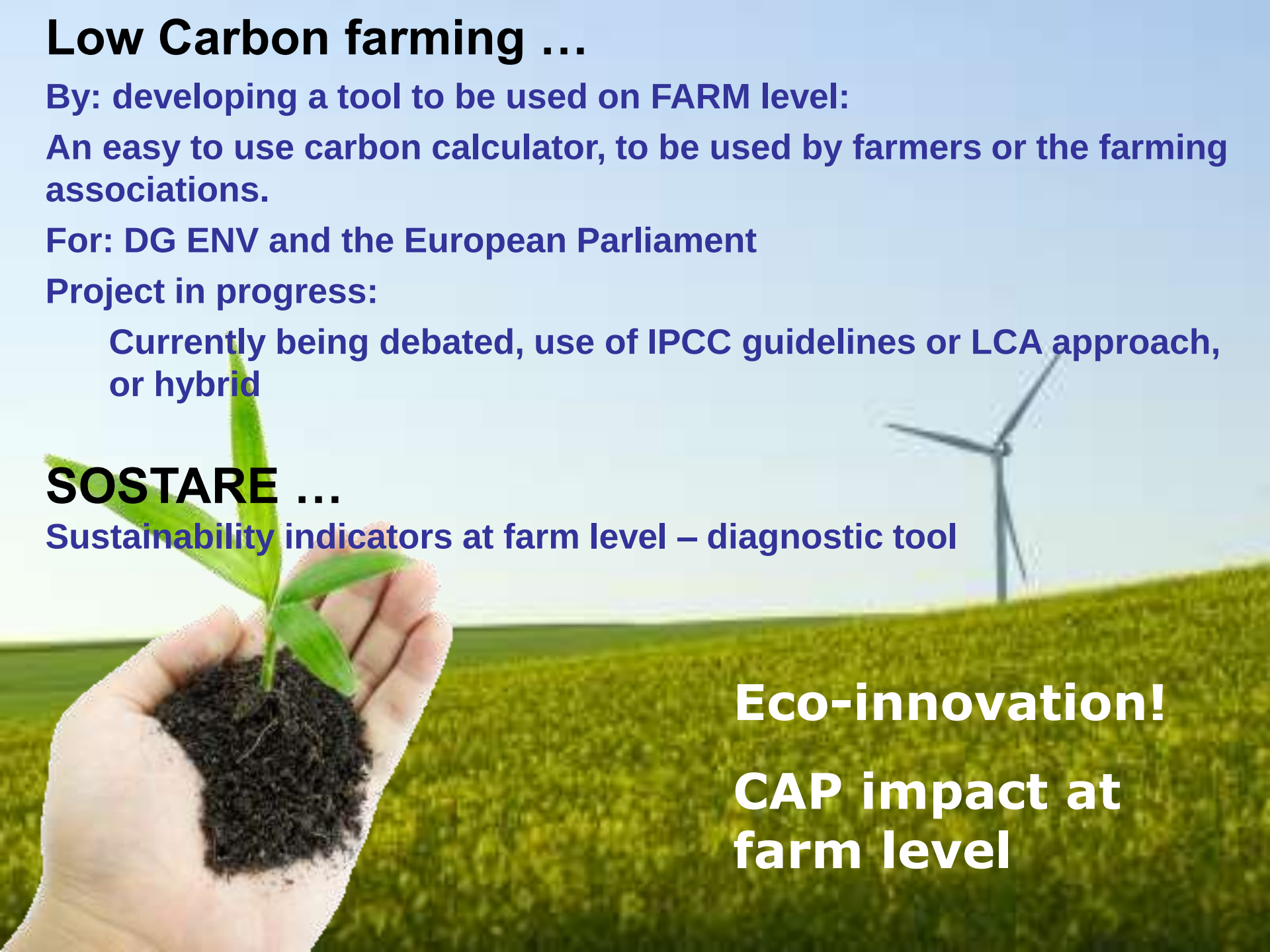
For: DG ENV and the European Parliament

Project in progress:

- **Currently being debated, use of IPCC guidelines or LCA approach, or hybrid**

SOSTARE …

Sustainability indicators at farm level – diagnostic tool



Eco-innovation!

CAP impact at farm level

What's for the future?

Detailed characterization of rural landscapes (Managed through Land Parcel System LPIS)

(Study done by Ekotoxa, CZ)

Landscape features (location, type)
- Hedgerow
- Group of trees
- Isolated trees
- Pond
- Ancient monument
- …

Land use / land cover
- Arable land
- pasture
- Forest
- Permanent crop
- …

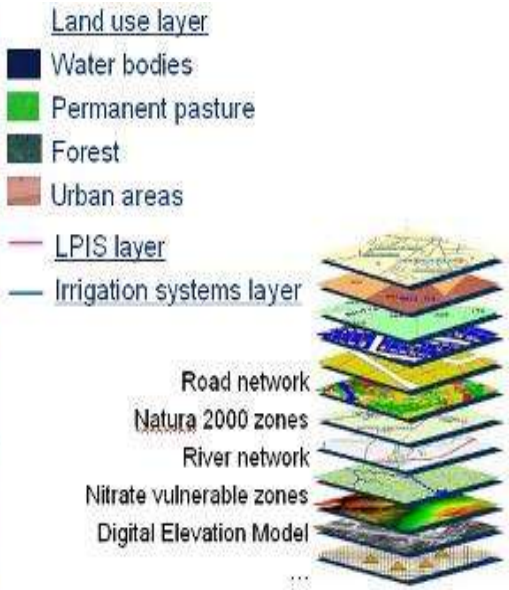
Eligibility of land — 100% eligible

Joint Research Centre

Exhaustive characterisation of Rural Areas ?

LPIS + **Satellite imagery** + additional GIS layers (Digital Elevation Model, …)

Location of: Parcels in vulnerable zones, rivers and green cover buffer, features



3D view of rural landscape

+ Collection of IACS data: history of farmers declarations

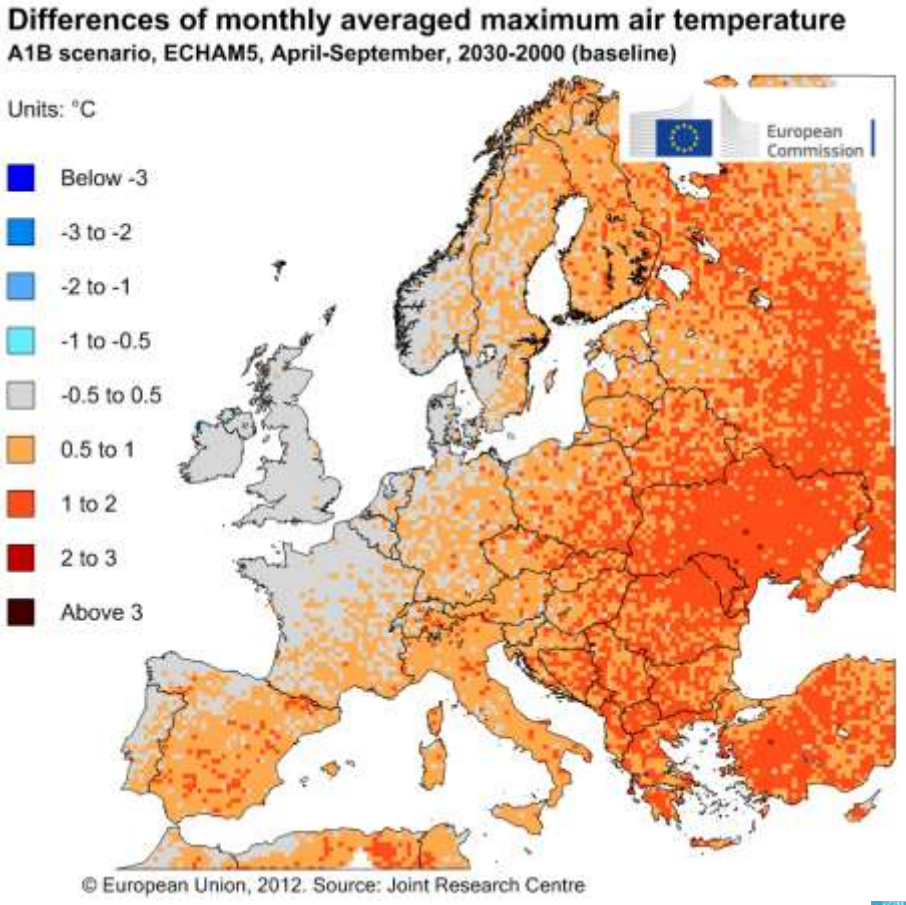
Provide relevant **information** to farmers (digital, paper)
Increase awareness on Cross Compliance (**Advice**: FAS)
Reduce risk of infringements

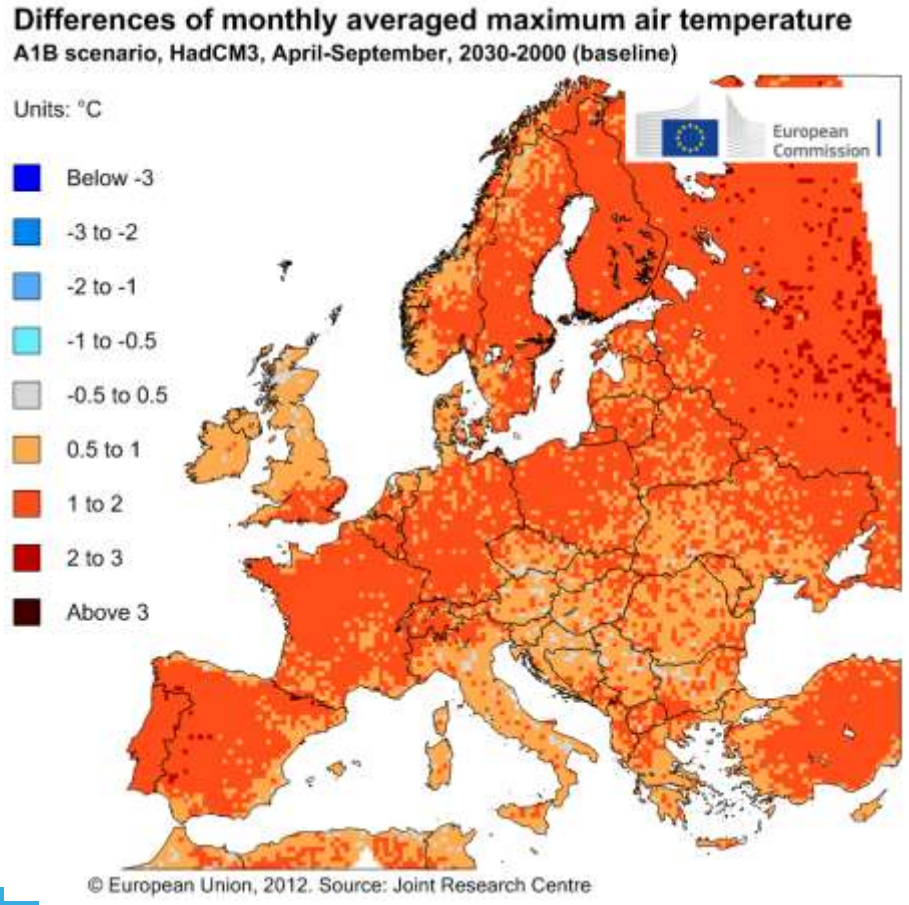
→ Sound **management of rural areas** (**LPIS as cornerstone**)

FACCE Core theme 4: Adaptation to climate change

European Commission

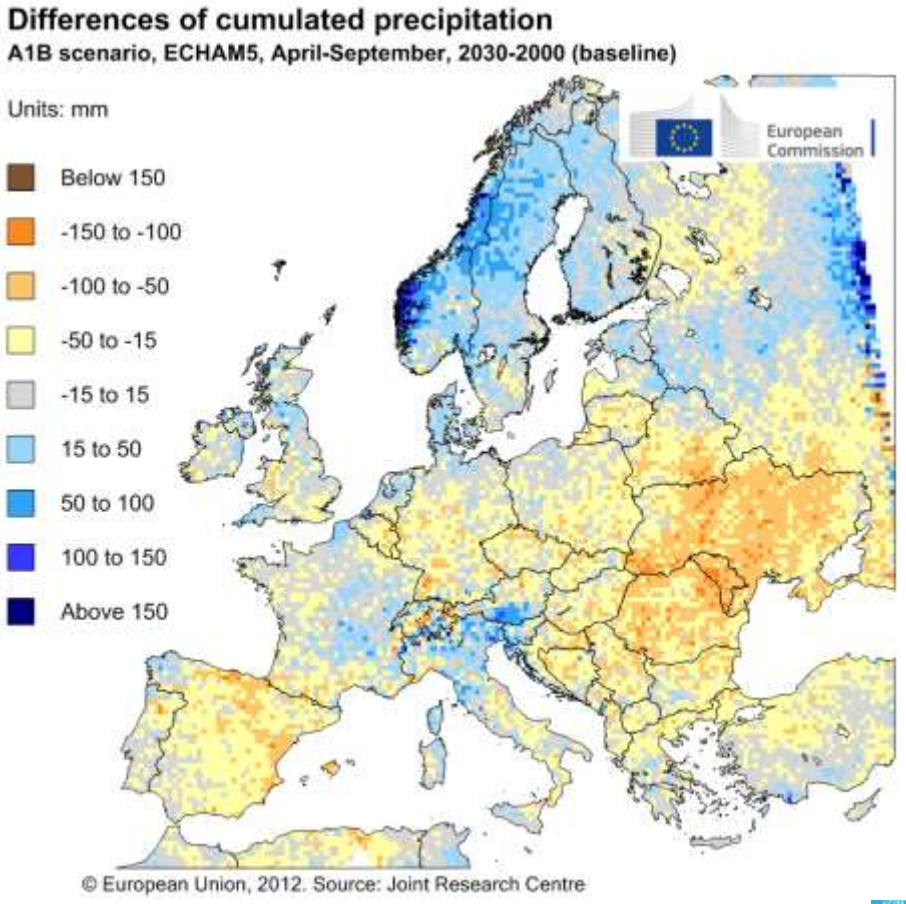
Temperature: COLD vs WARM A1B

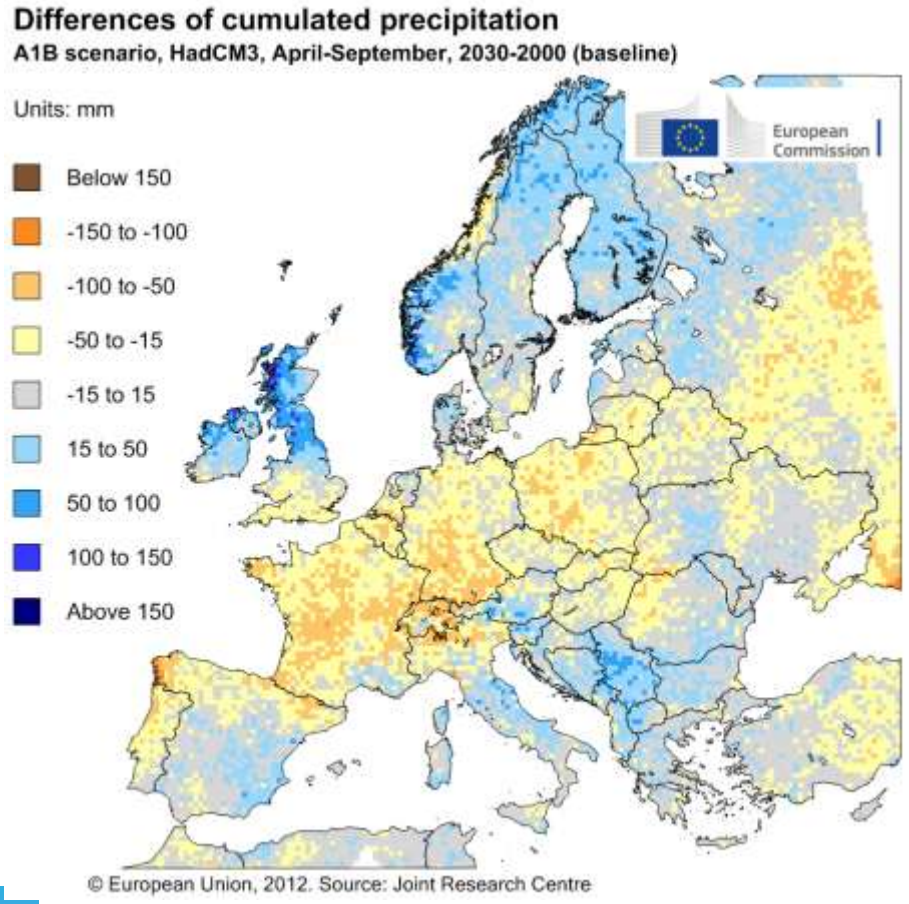




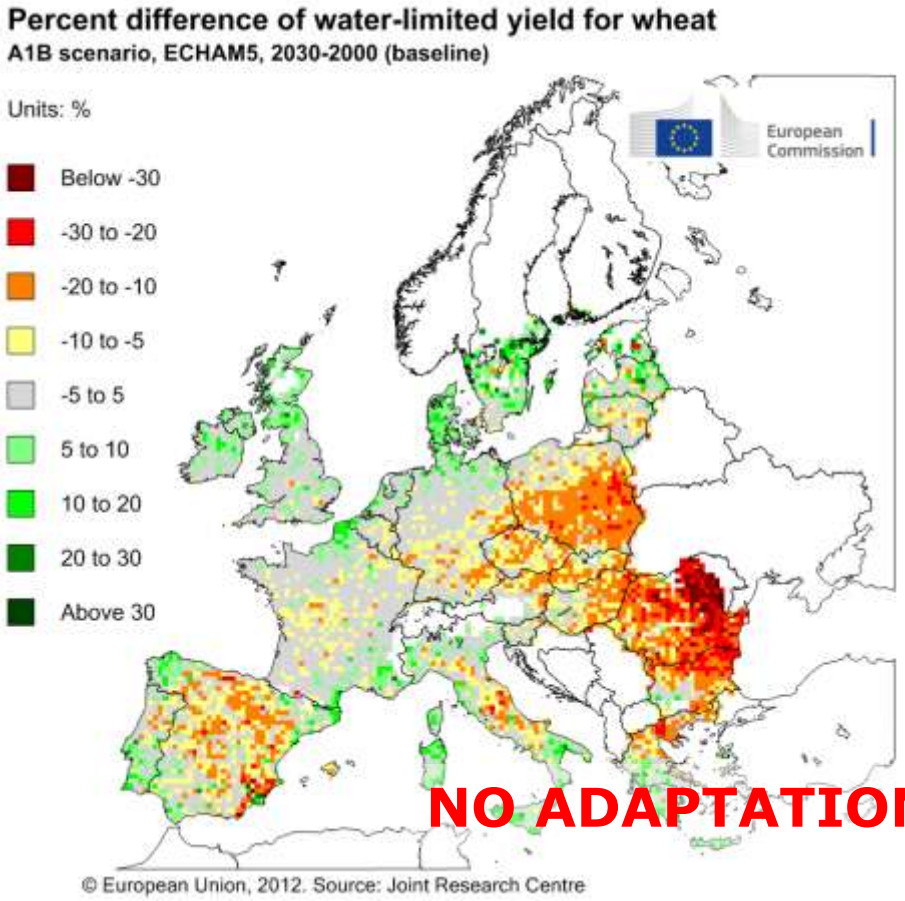
Joint Research Centre

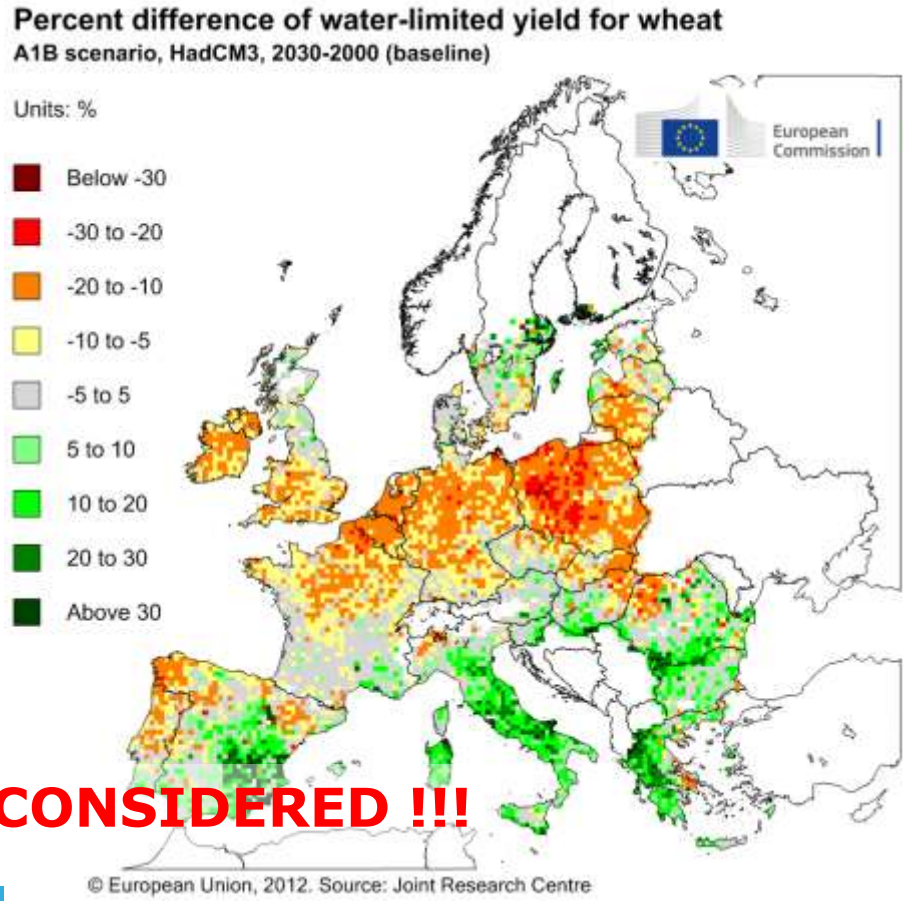
Precipitation: COLD vs WARM A1B





Wheat water-limited yield





NO ADAPTATION CONSIDERED !!!

Adaptation strategies

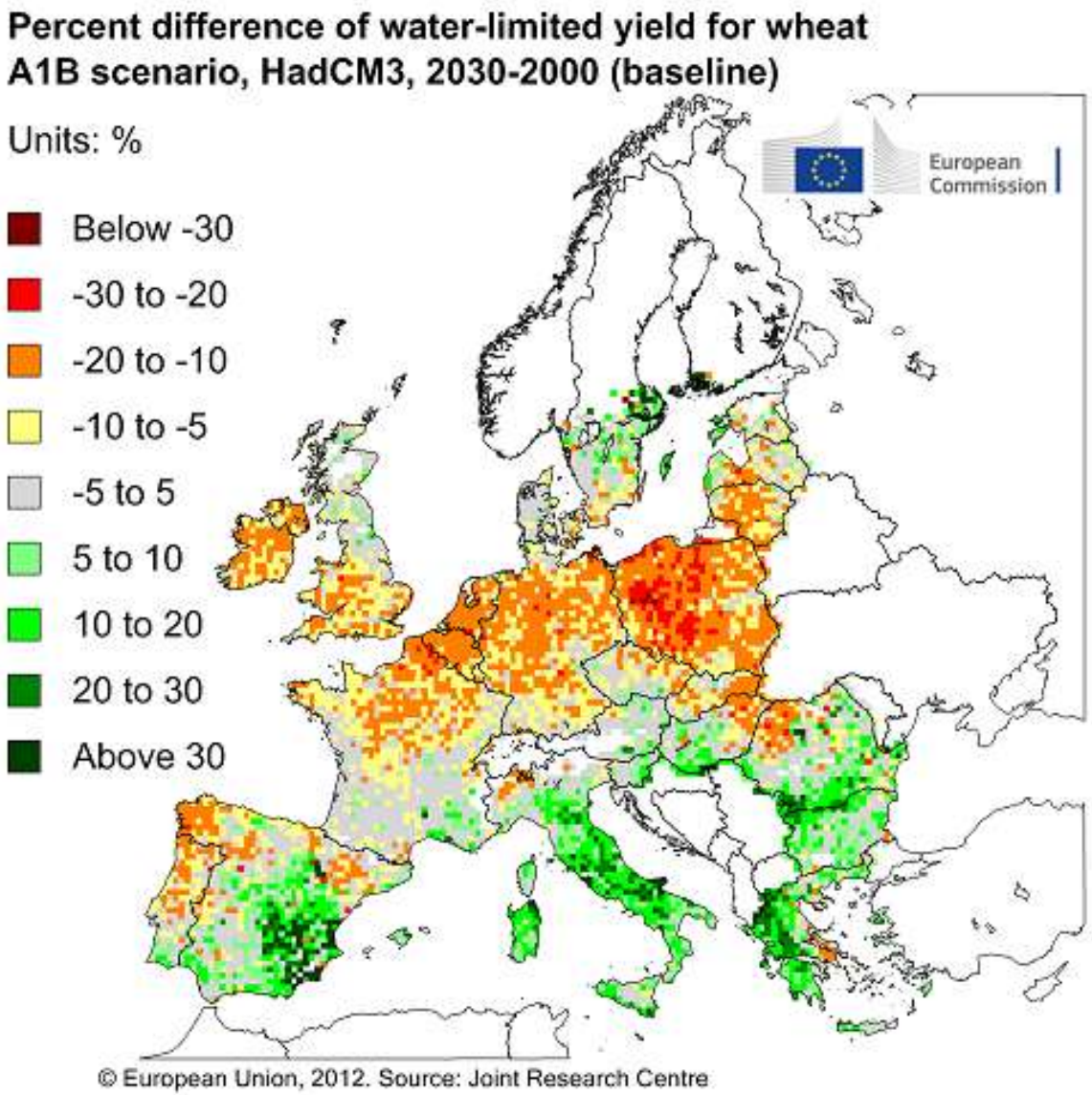
The adaptation strategies evaluated are examples of technical adaptation that farmer could implement autonomously;

The adaptation strategies tested group under three main aspects:

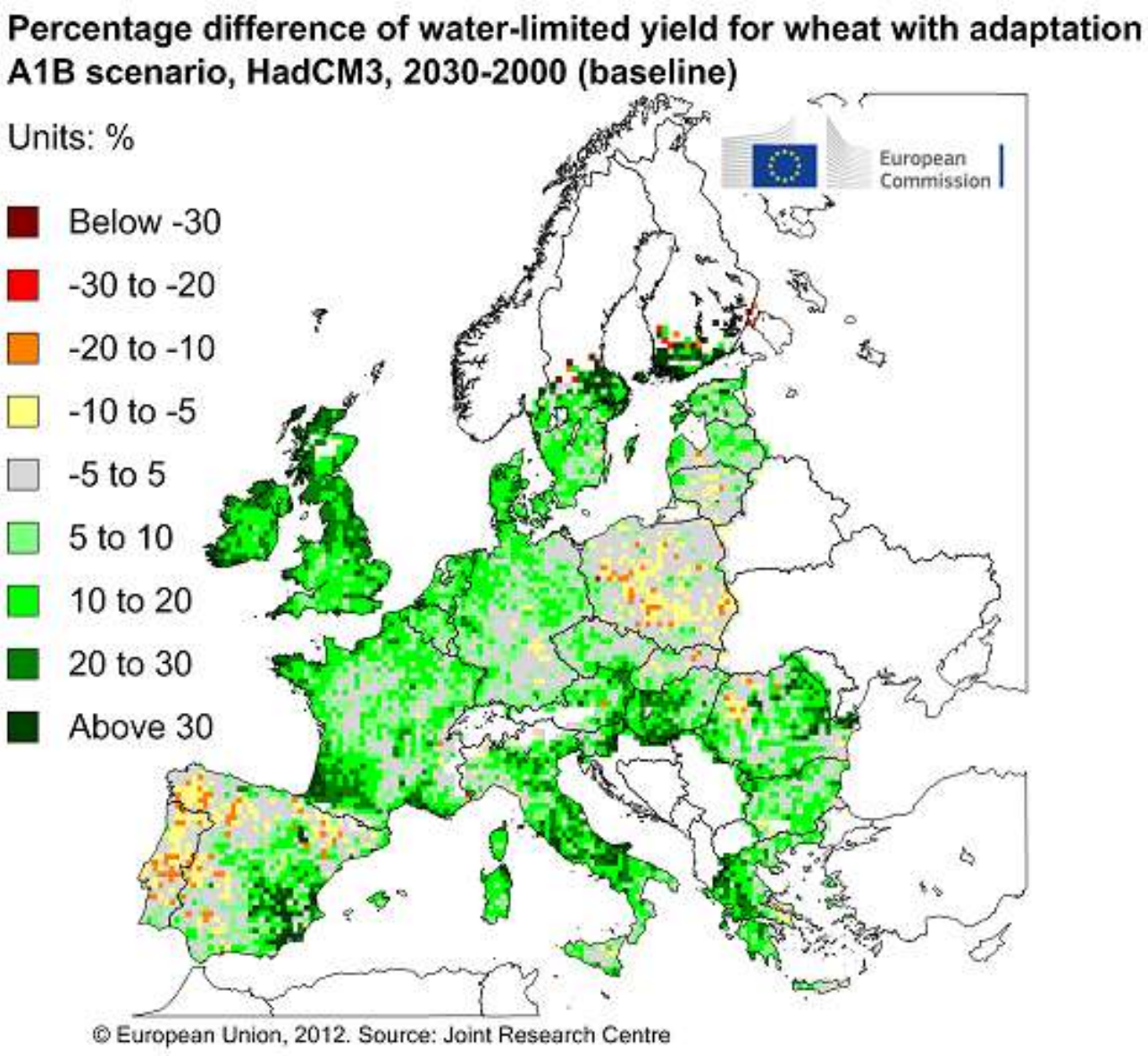
- Use of different varieties and hybrids;
- Changing planting time;
- Allowing for a larger use of irrigation water (maize only).

Given the time frame of the analysis, a conservative choice was made with respect to possible choices of varieties to be tested, which have not included new, improved varieties.

Wheat – water limited, no adaptation



Wheat – best adaptation (%)



JRC

Agriculture and Life Sciences in the Economy

July, 2012

Different Aspects...

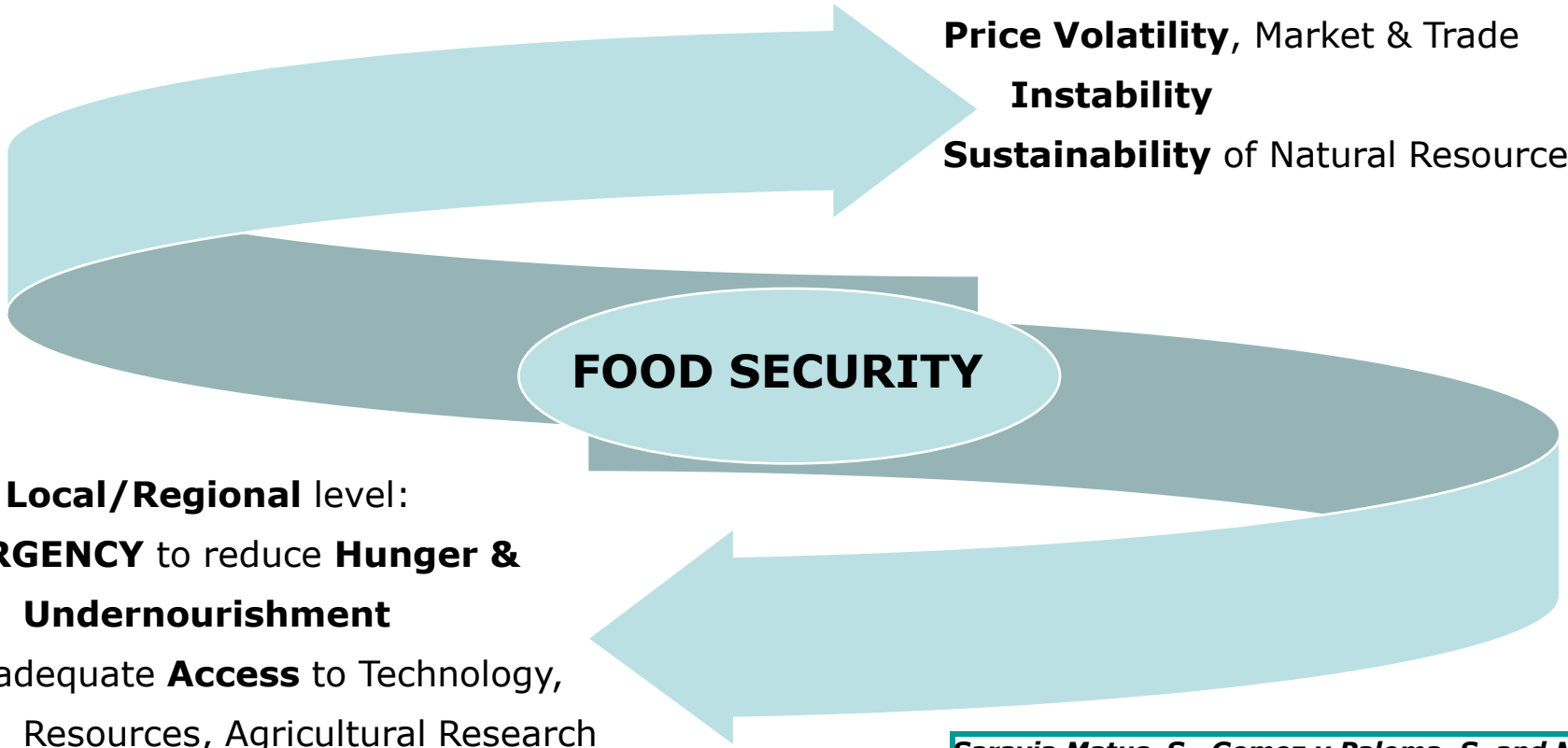
At **Global** level:

Long Term Food **Availability**

(70% increase towards 2050, FAO, 2009)

Price Volatility, Market & Trade **Instability**

Sustainability of Natural Resources



At **Local/Regional** level:

URGENCY to reduce **Hunger & Undernourishment**

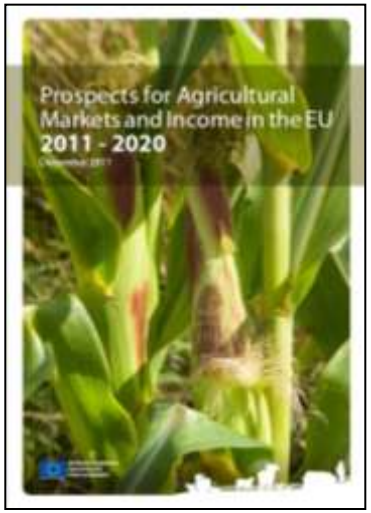
Inadequate **Access** to Technology, Resources, Agricultural Research

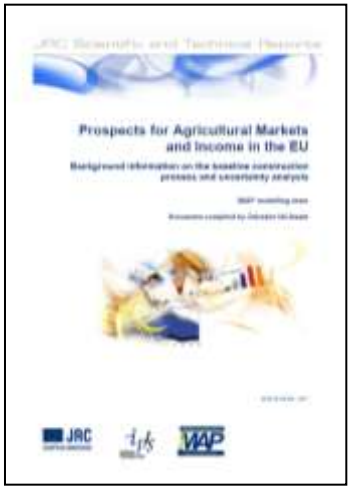
Semi-Subsistence Farming

Saravia Matus, S., Gomez y Paloma, S. and Mary, S.* (2012) *Economics of Food Security: Selected Issues
Bio-Based and Applied Economics

European outlook 2020: sensitivity of macro-assumptions and production costs

- JRC cooperates with DG AGRI on the annual agricultural market outlook
- Volatility of prices increases uncertainty
- JRC provides sensitivity and stochastic analysis
- Example: Impact of potential input cost developments on EU agriculture
- Identification of most affected regions and most vulnerable production systems
- Scenario analysis against DG AGRI baseline 2020 with the CAPRI model





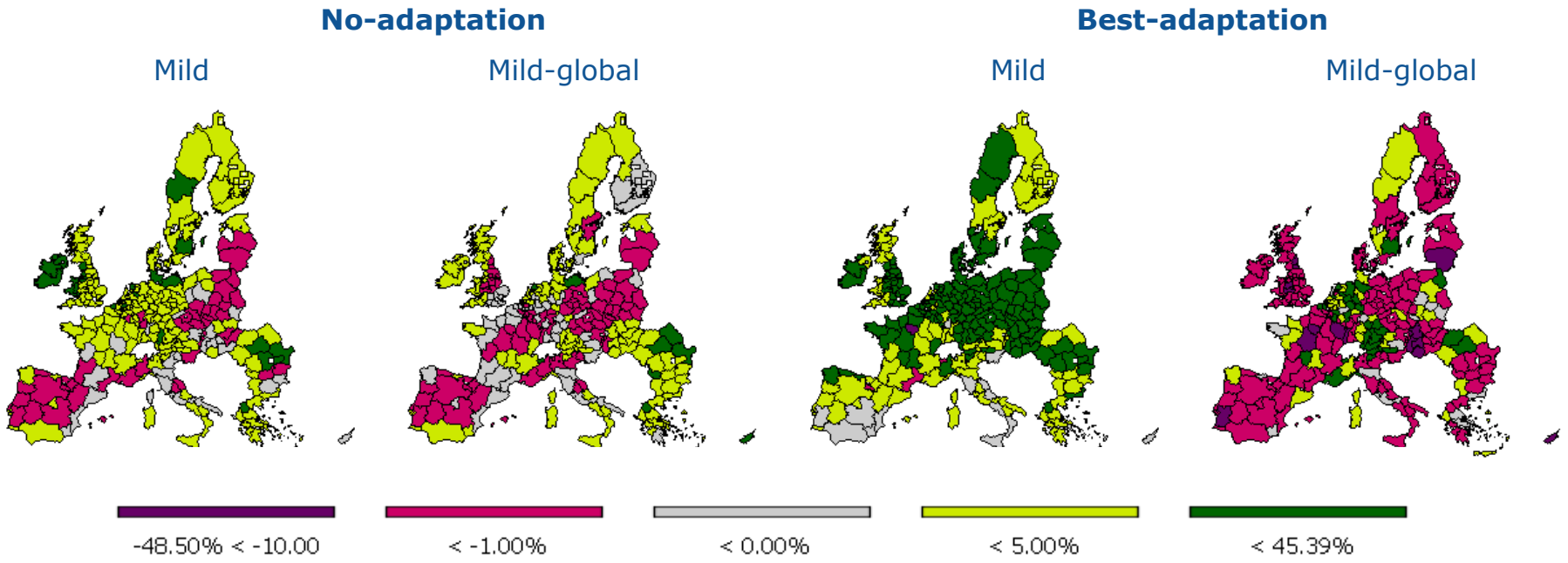
PESETA 2 – agro-economic modelling

- The project investigates the economic impact of climate change on EU agriculture using CAPRI model
- Climate change is reflected through yield changes which are available from BIOMA model (JRC-IES)
- Two climate change scenarios:
  - ‘warm’ scenario (A1B realized in HadCM3 model)
  - ‘mild’ scenario (A1B realized in ECHAM5 model)
- Two adaptation scenario:
  - ‘no-adaptation’
  - ‘best-adaptation’
- Adaptations considered through BIOMA model; CAPRI takes on small adjustment – technological options
- *Shrestha S. et al. (2012): Regional Impacts of Climate Change on EU Agriculture. IAAE 2012 forthcoming*

Selected results

- Yields and production increase due to climate change; there is significant variation at regional level.
- Without price adjustment the agricultural income improves (between 1% and 8%); if price effect is accounted for income slightly declines (between -0.1% and -0.3%).

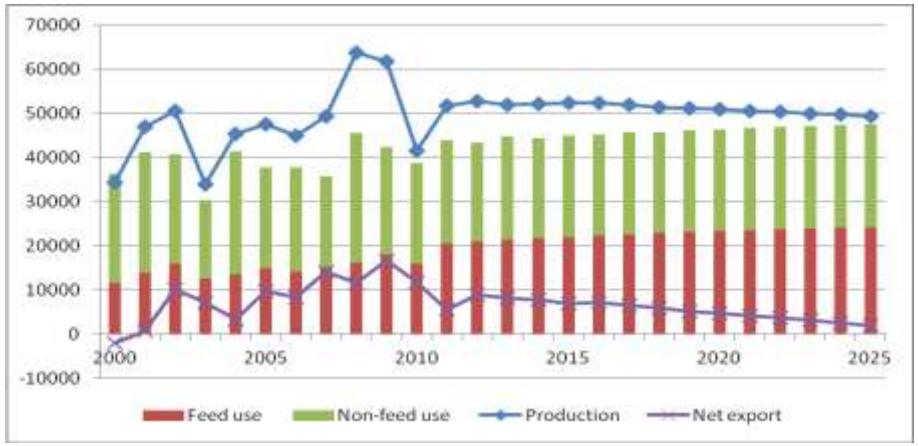
Income change/ha in EU-27 relative to baseline - % change



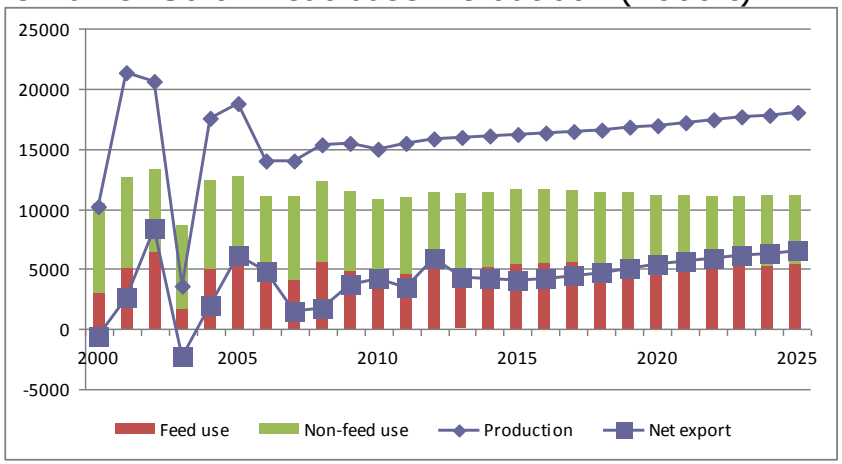
Source: Shrestha S. et al. (2012)

Food supply: Russia & Ukraine markets 2025

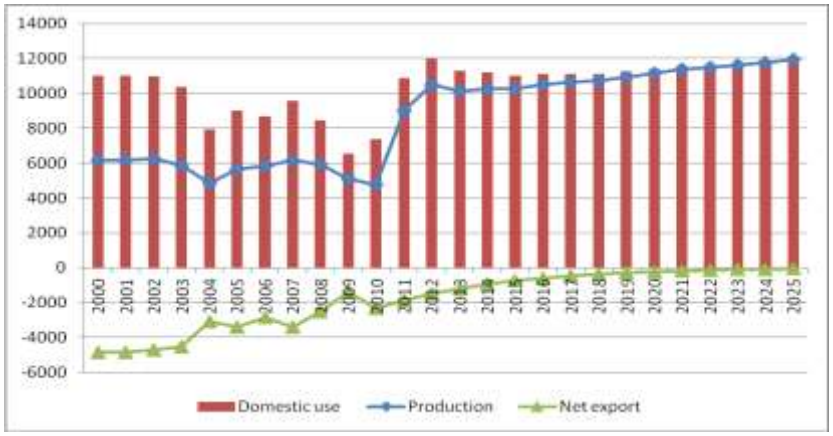
Russia: Soft wheat baseline outlook (1000 t)



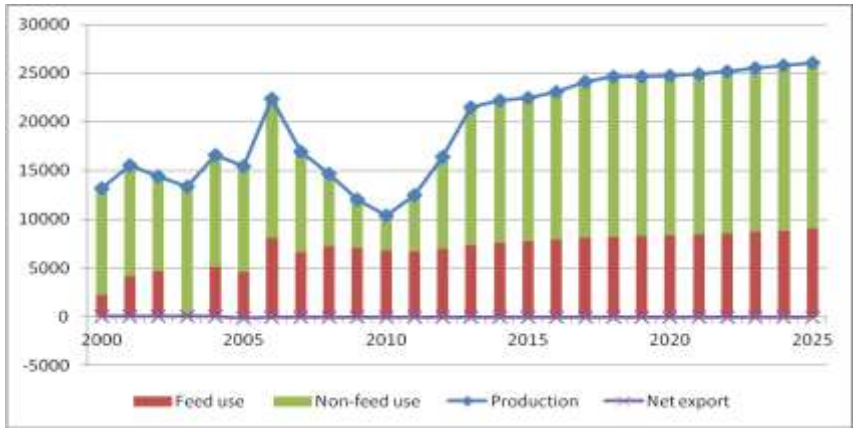
Ukraine: Soft wheat baseline outlook (1000 t)



Russia: Sugar baseline outlook (1000 t)



Ukraine: Sugar baseline outlook (1000 t)



The agri-food sector in Ukraine: status quo and market outlook until 2025; Editors: Fellmann, Nekhay, M'barek; JRC report 2012 forthc.

Prospects of the FARMING SECTOR and Rural Development (Food security at the FARM => regional => national/world levels)

Identification and evaluation of challenges & opportunities

- *Farming structure, institutional environment, risks…*
- *Farm support, credit access, transport/storage…*

Russia 

 Ukraine

➢ Some key preliminary results

- ❑ Problematic land consolidation
- ❑ Dual structure
- ❑ In a context of WTO accession, link between farm policies and profitability
- ❑ Lack of financial resources and skilled labour
- ❑ Grain storage capacity, rail wagons, logistic problems
- ❑ Nontransparent tariffs at inspection points and borders

Prospects of the FARMING SECTOR and Rural Development (2)
(Food security at the FARM => regional => national/world levels)

The current and future capacity of agriculture to fulfil the domestic demand for foodstuff and its role in international markets

Turkey

Kazakhstan

MAIN ISSUES

Farming systems
Food production, consumption and surpluses
Trade infrastructure
The credit markets and access to credit for farmers and trade operators
Logistics and infrastructure
Governance and supporting policies
Environmental indicators, CC and risks

TO BE LAUNCHED Q3/2012

Modelling tool for long-term (2050 +) projections and analysis of various scenarios related to food security, climate change, etc.

Key drivers expected to affect situation in 2050+:

- Increasingly binding environmental constraints from natural resources, climate, water, GHG, etc.
- Change of existing consumption patterns due to demographic and socio-economic factors
- Effects of technological change (in production-, distribution-, consumption- systems)
- Performance of key global players, e.g. USA, EU, BRICS, Japan, etc.
- New substitution possibilities generated by high price levels (e.g.: traditional fuel-biofuel)

Long-term modeling: Impact of key drivers

Challenges for economic modeling tools:

- Affect parameters and behavioural specification of the model
- Amend expectations of relative prices, consumption, investments, and savings
- Affect all model endogenous variables (incl. the baseline)

Outlook:

- Feasibility study for a long-term modeling tool with experts from FAO, IIASA, INRA, academia, DG-ECFIN
- Case study: long-term projections (+2050) using innovative modeling approaches
- Close international cooperation with leading research centres working on long-term projections

European Commission

European Commission

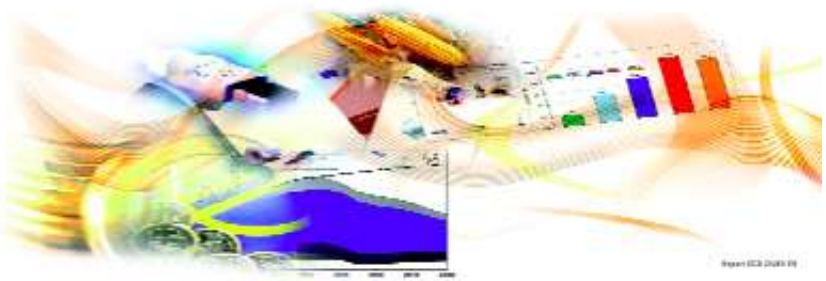
JRC SCIENTIFIC AND POLICY REPORTS

International workshop on socio-economic impacts of genetically modified crops co-organised by JRC-IPTS and FAO

Workshop proceedings

Maria Lusser, Terri Raney, Pascal Tillie, Koen Dillen and Emilio Rodriguez Cerezo

2012



JRC Scientific and Technical Reports

Comparative regulatory approaches for new plant breeding techniques

Workshop Proceedings

Maria Lusser and Emilio Rodríguez Cerezo

EUR 25237 EN - 2012

Thank you for your attention!

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