



Crop monitoring to support food security policies - initiatives by the European Commission

Bettina Baruth / Felix Rembold

Monitoring Agricultural ResourceS (MARS)
Institute for Environment and Sustainability
European Commission
Joint Research Centre / Italy

Presented by Thierry NEGRE, Coordinator Food Security, MARS

The JRC at a glance

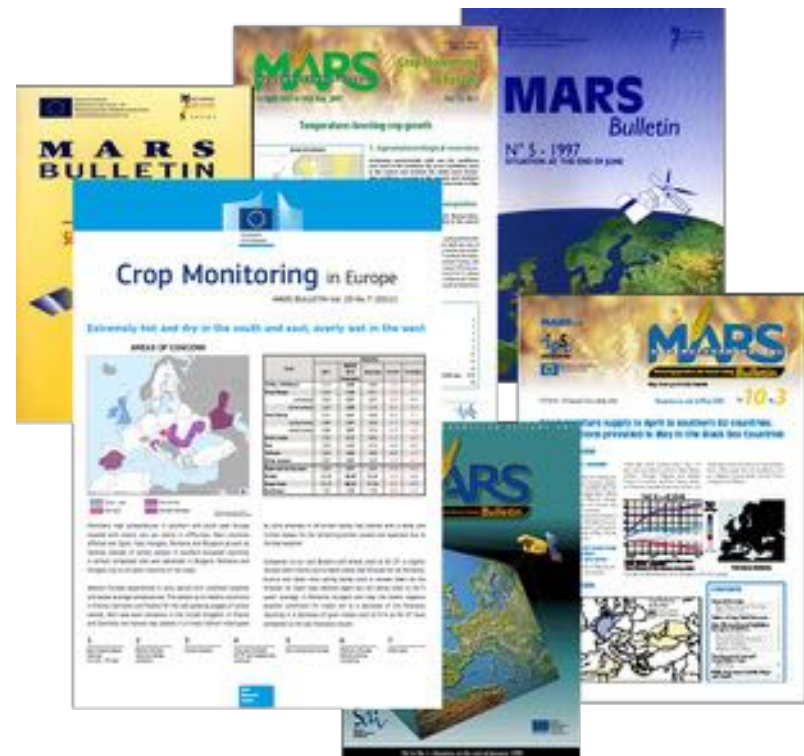
To provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

**Direct research:
The JRC is the European Commission's in-house science service providing scientific advice to EU policy.**



Crop monitoring in Europe

The MARS Crop Yield Forecasting System



Objectives since the start of the project 23 years ago

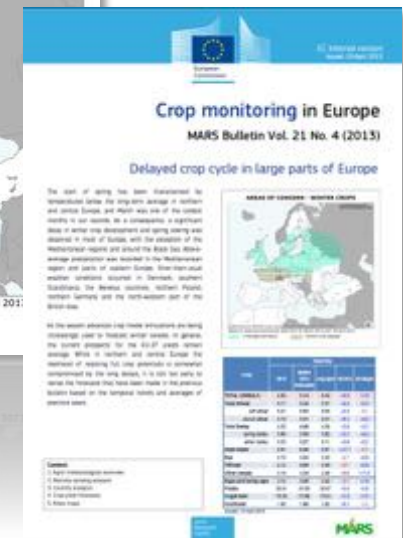
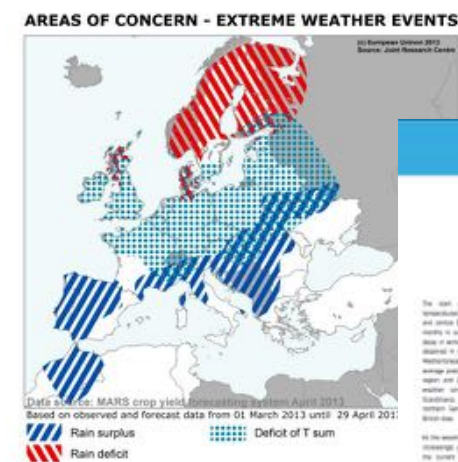
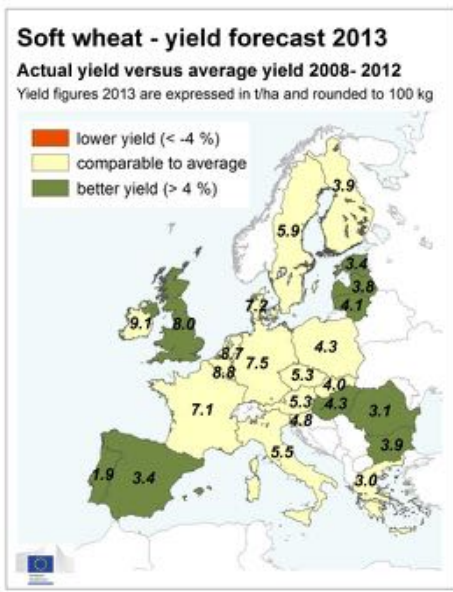
A quantitative yield forecast at national level for all major crops

A bulletin/report of current and future agromet conditions (EU level) and a detailed analysis for major crops (at national level)

Crop	Yield t/ha				
	2012	MARS 2013 forecasts	Avg 5yrs	%13/12	%13/5yrs
TOTAL CEREALS	4.83	5.14	5.04	+6.3	
Total Wheat	5.17	5.39	5.37	+4.2	
soft wheat	5.41	5.63	5.63	+4.0	
durum wheat	3.15	3.31	3.21	+3.1	
Total Barley	4.35	4.48	4.38	+2.8	
spring barley	3.86	3.99	3.82	+3.1	
winter barley	5.23	5.27	5.11	+0.8	
Grain maize	5.91	6.96	6.97	+17.7	
Rye	3.70	3.53	3.33	-4.7	
Triticale	4.12	4.09	4.06	-0.7	
Other cereals	3.16	3.34	2.99	+5.6	
Rape and turnip rape	3.10	3.09	3.04	-0.1	
Potato	30.61	31.53	30.67	+3.0	
Sugar beet	70.35	71.06	70.01	+1.0	
Sunflower	1.65	1.80	1.82	+9.1	

issued: 19 April 2013

Year	2012	2013	2014	%13/12	%13/5yrs
Wheat	5.17	5.39	5.37	+4.2	
Barley	4.35	4.48	4.38	+2.8	
Maize	5.91	6.96	6.97	+17.7	
Rye	3.70	3.53	3.33	-4.7	
Triticale	4.12	4.09	4.06	-0.7	
Other cereals	3.16	3.34	2.99	+5.6	



MCYFS - a model and data driven decision support system

Expert decisions along all steps of the process

Common spatial framework

Weather monitoring

Production of daily meteorological indicators

Site and crop specific information to tailor the system to the area/crop of interest

Crop growth simulation

Production of 10-day biophysical indicators

Time series of crop specific area/yield statistics

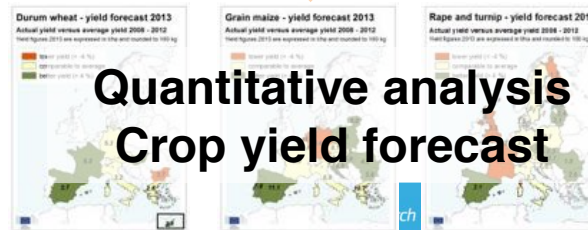
Statistical yield forecasting

**Vegetation monitoring
Remote sensing**

Qualitative analysis

**Quantitative analysis
Crop yield forecast**

TEAM of ANALYSTS



Research Centre

Dissemination

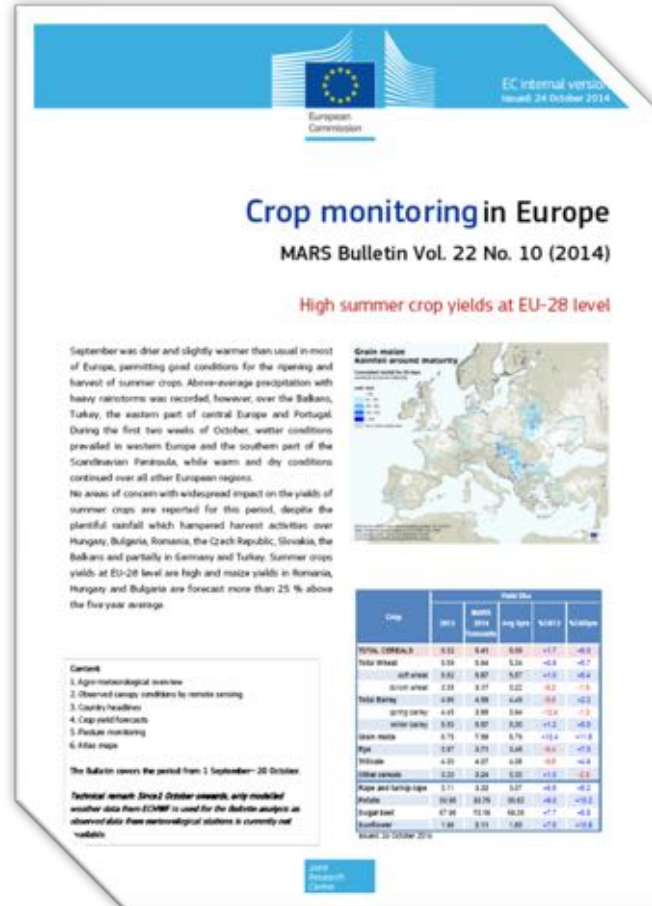
EC version / Public version

Distribution via email

Distribution via website

Printed Bulletin

Web service with maps and graphs



EC internal version
Issued 24 October 2014

Crop monitoring in Europe

MARS Bulletin Vol. 22 No. 10 (2014)

High summer crop yields at EU-28 level

September was drier and slightly warmer than usual in most of Europe, permitting good conditions for the ripening and harvest of summer crops. Above-average precipitation with heavy rainstorms was recorded, however, over the Balkans, Turkey, the eastern part of central Europe and Portugal. During the first two weeks of October, wetter conditions prevailed in western Europe and the southern part of the Scandinavian Peninsula, while warm and dry conditions continued over all other European regions.

No areas of concern with widespread impact on the yields of summer crops are reported for this period, despite the plentiful rainfall which hampered harvest activities over Hungary, Bulgaria, Romania, the Czech Republic, Slovakia, the Balkans and partially in Germany and Turkey. Summer crop yields at EU-28 level are high and maize yields in Romania, Hungary and Bulgaria are forecast more than 25 % above the five-year average.

Grain maize
Estimated average maturity




Table 1: Year-to-date

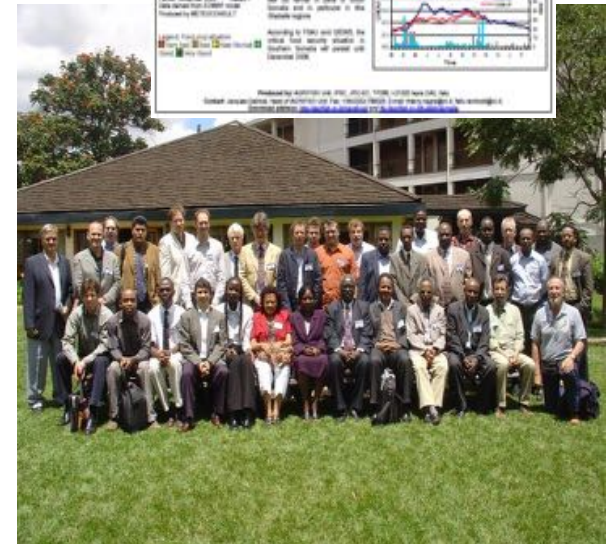
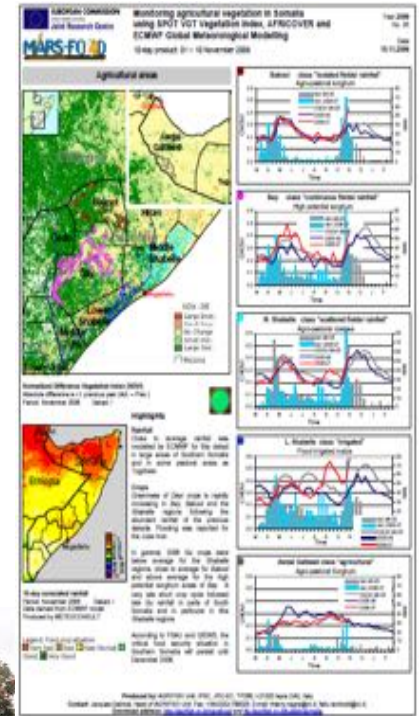
Crop	Year-to-date				
	2014	2013	2012	2011	2010
Wheat (durum)	0.92	0.81	0.99	+15.7	+19.2
Total wheat	0.98	0.84	0.91	+16.8	+16.7
- winter	0.92	0.87	0.87	+11.0	+14.4
- durum wheat	0.28	0.27	0.22	+2.2	+1.9
Total barley	0.99	0.98	0.98	+0.1	+0.2
- spring barley	0.45	0.89	0.94	+12.9	+1.3
- winter barley	0.53	0.07	0.04	+11.2	+6.9
Grain maize	0.75	0.89	0.79	+19.4	+11.9
Rye	0.97	0.71	0.68	+36.7	+41.9
Millets	0.20	0.27	0.28	-11.9	-16.9
Other cereals	0.20	0.24	0.22	+11.0	+12.0
Alfalfa and forage crops	0.11	0.20	0.27	+61.9	+41.2
Protein	0.08	0.29	0.62	-86.0	+110.2
Sugar beet	0.16	0.16	0.20	-17.3	-41.3
Oilseeds	0.94	0.91	0.89	+2.6	+10.8

Issue 20 October 2014

Joint Research Centre

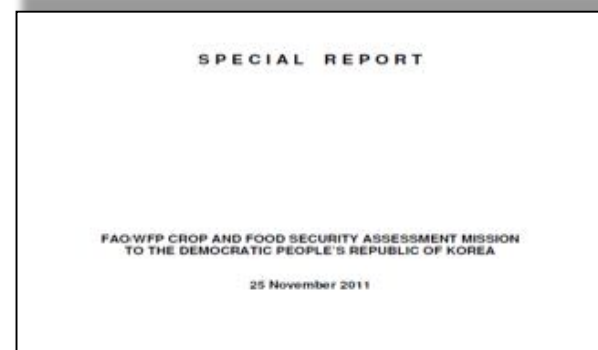
Activities outside Europe - Background

- Started in 2001 with application of MARS crop monitoring know-how in areas outside Europe
- First Somalia Bulletin in 2001, later joined by East Africa regional bulletin, Ethiopia, Eritrea, Kenya, North Korea etc..
- Remote sensing and agricultural statistics trainings
- **From 2005 gradual expansion to all dimensions of Food Security** (Availability, Accessibility, Utilisation and Stability)



Collaboration with FAO and WFP on food security assessments

Enhanced methodologies (revised handbooks) and transparency (observers)



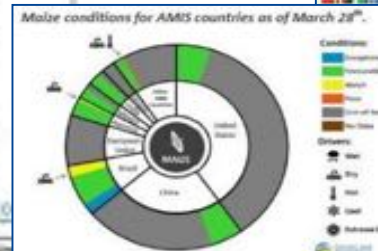
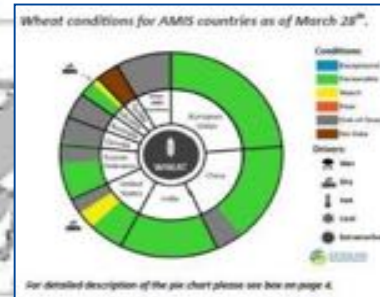
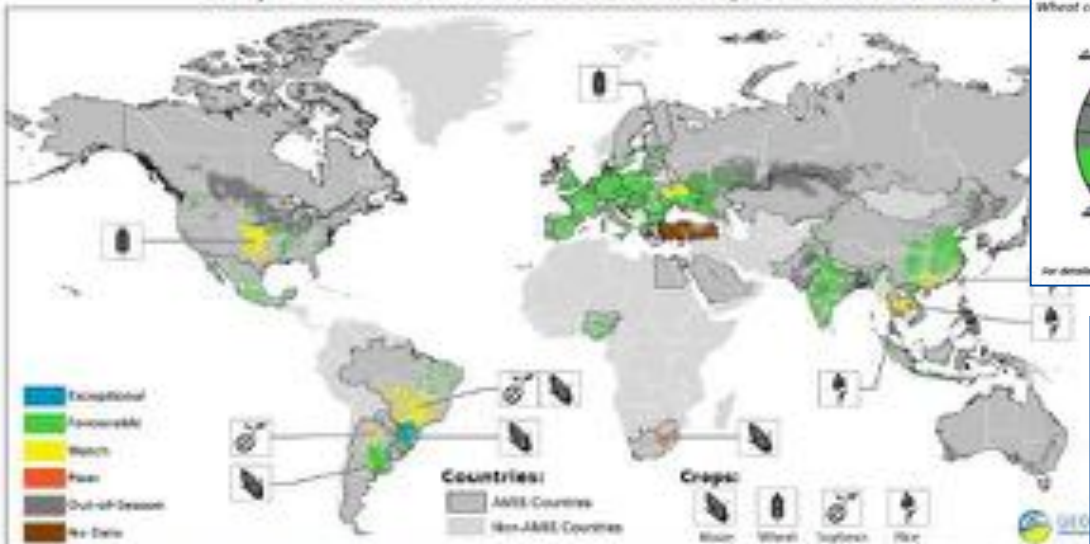
Report on agricultural prospects

Bulletins made in support of EC services, and cover both agricultural areas and rangeland

- Initial focus on the horn of Africa (JRC staff member 2011-2014, part of the Somalia delegation)
- Also on the Sahel, West Africa, North Africa, South Sudan
- + ad-hoc analysis (e.g drought)



Crop Conditions in AMIS countries (as of March 28th)

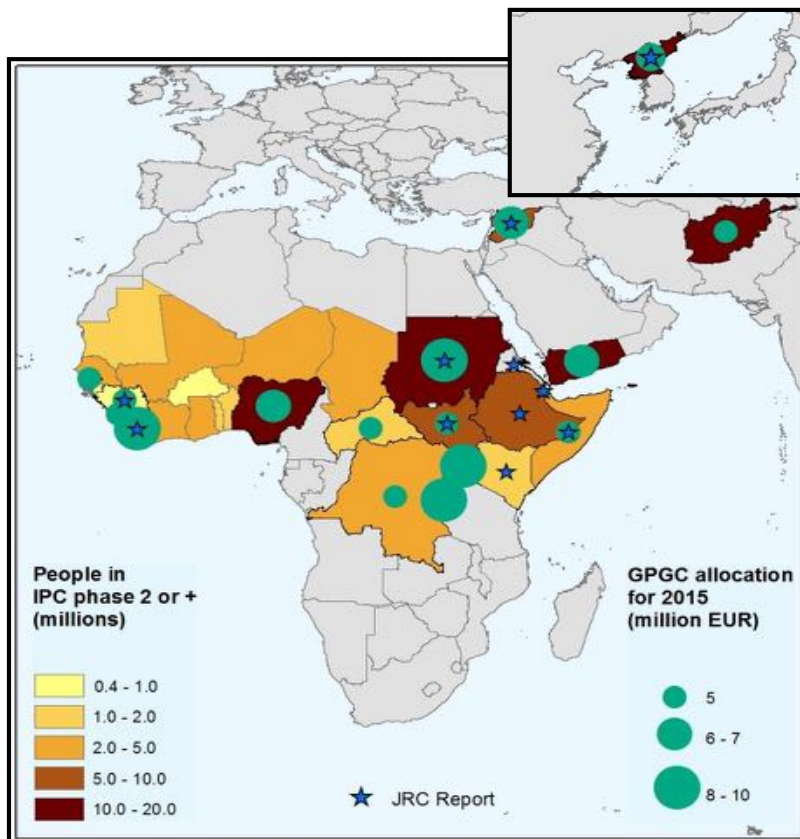


MARS developed with US and key global partners the overall CROP Monitor system, operated by Uni MARYLAND

since Sept 2013 GEOGLAM provides monthly global outlooks to AMIS Market Monitor on G20+7 mains producers and 4 commodities

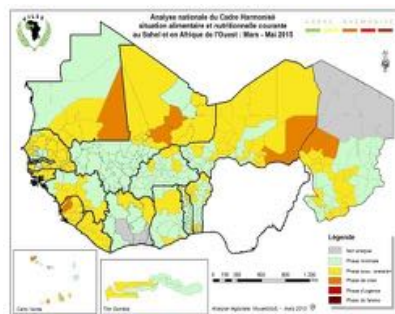
Plans to develop in 2015 an Early Warning Crop Monitor on countries at risks ...

Assess food security situation



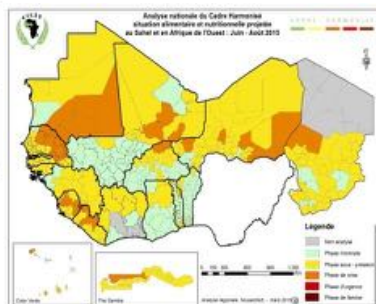
Integrated Food Security Phase Classification (IPC)

- **Prioritization of interventions – ECHO-DEVCO**
- **Common currency for food security analysis**
- **Objective methodologies – comparability**
- **Science for consensus building**
- **Now chronic and nutrition scales**



(March-May 2015)

(June-August 2015)



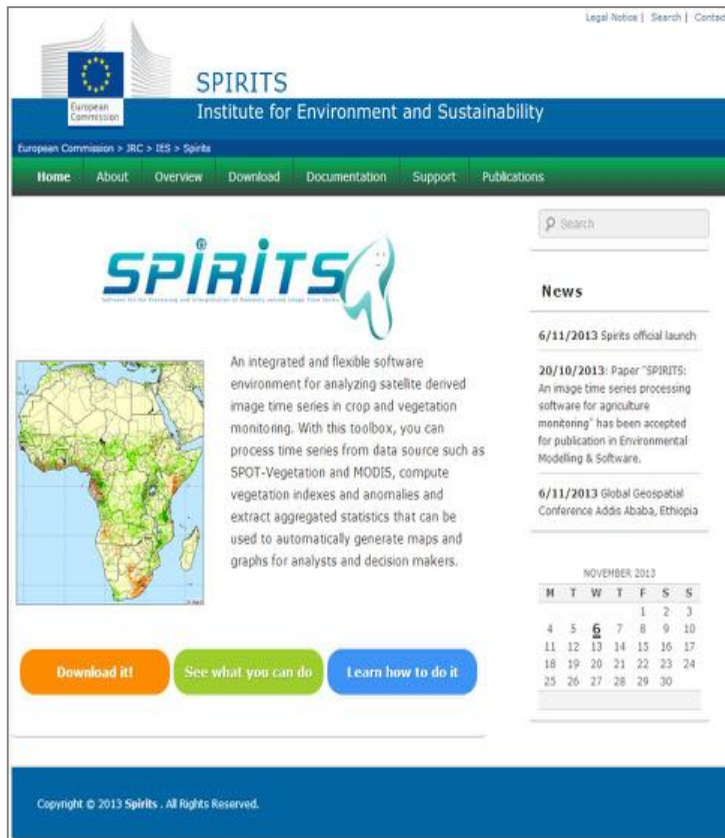
- **11 global agencies – JRC represents EC**

EXPO Milano 2015
IPC Global Event:
May 20-21, 2015
JRC – Ispra (Italy)

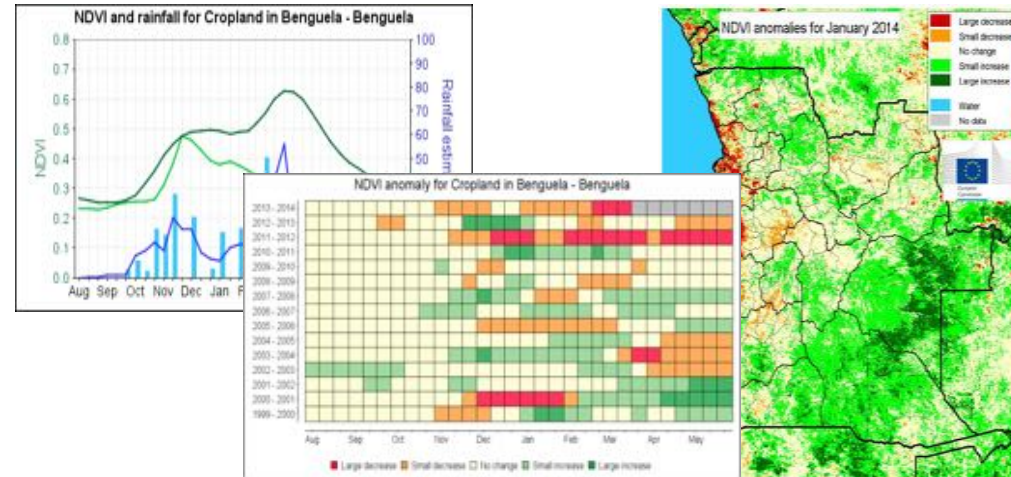


MILANO 2015

Tool-box for time series analysis



The screenshot shows the SPIRITS website homepage. At the top, there is a navigation bar with the European Commission logo and the text "SPIRITS Institute for Environment and Sustainability". Below this is a secondary navigation bar with links: Home, About, Overview, Download, Documentation, Support, Publications. A search bar is located on the right side of the page. The main content area features the SPIRITS logo and a map of Africa. To the right of the map is a text block describing the software: "An integrated and flexible software environment for analyzing satellite derived image time series in crop and vegetation monitoring. With this toolbox, you can process time series from data source such as SPOT-Vegetation and MODIS, compute vegetation indexes and anomalies and extract aggregated statistics that can be used to automatically generate maps and graphs for analysts and decision makers." Below this text are three buttons: "Download it!", "See what you can do", and "Learn how to do it". At the bottom of the page, there is a copyright notice: "Copyright © 2013 Spirits. All Rights Reserved."



- Software for processing and Interpreting Remote sensing image time series
- Rapidly growing user community
- Technical paper on the tool is the 8th most frequently downloaded paper of the journal "Environmental modelling & software"

<http://spirits.jrc.ec.europa.eu/>

Post-Harvest Losses Information

Provides:

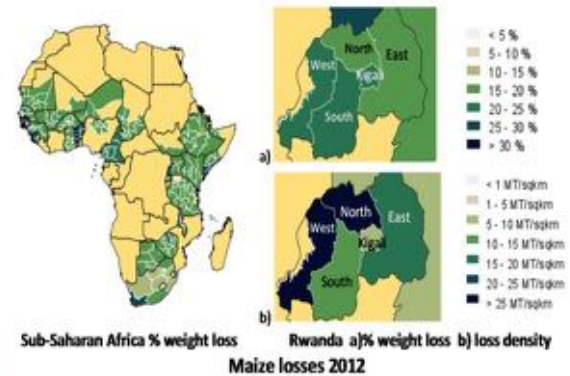
- Cereal losses by country and province
- Network of experts

www.APHLIS.net

Used for:

- improving food security assessment (cereal supply estimates)
- monitoring and evaluating loss reduction activities

Loss estimates: maps



Loss estimates: tables



Weighted average according to reported figures

Regional total for cereals [% of total annual production]							
	2007	2008	2009	2010	2011	2012	2013
	15.0	15.6	14.8	15.2	14.9	15.0	14.8

Regional PHL by cereal [% of total annual production]

Cereal	2007	2008	2009	2010	2011	2012	2013
Maize	18.9	19.9	17.8	18.8	17.8	18.0	17.8
Rice	11.8	12.1	12.0	12.6	12.0	13.9	12.1
Sorghum	12.3	12.8	12.5	12.6	12.4	12.4	12.4
Millet	10.1	10.0	9.7	9.4	9.8	9.6	9.6

- APHLIS+ with Bill and Melissa Gates Foundation

Agricultural statistics – Area Estimates

Ground Area Frame Survey

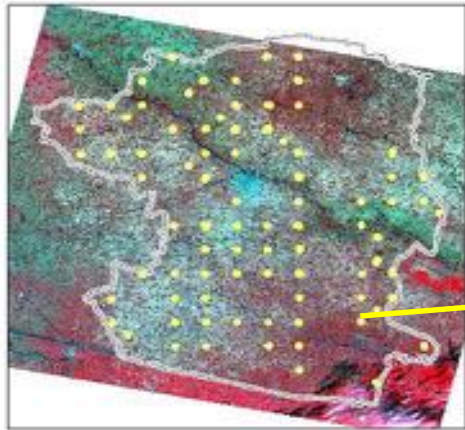
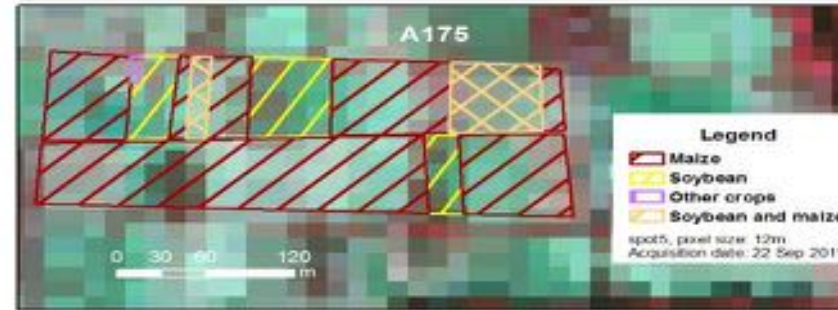


Image Classification

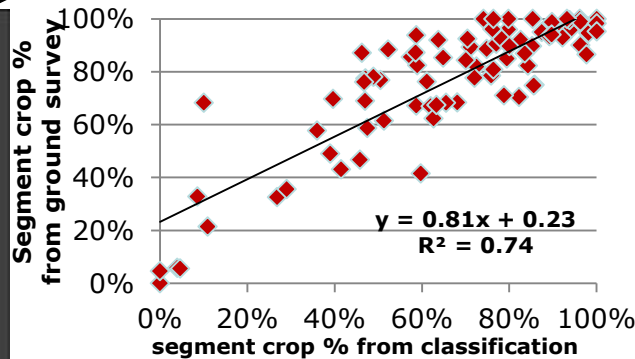
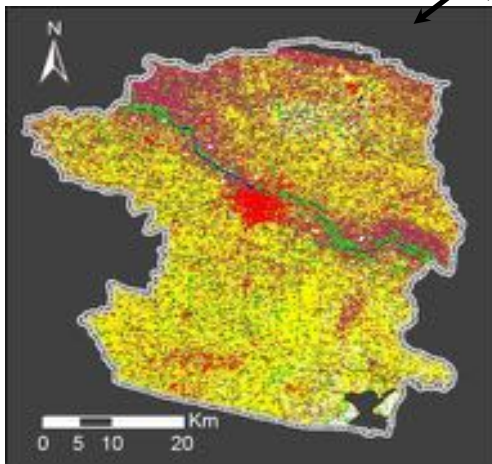


Regression Estimator



Main advantage of area frame sampling

- Independent from list frame (based on population or farming census)
- Provides objective information on all land use (link of Agriculture with environment- fallows, grassland)



Here extracts from pilot study in China ... some other projects in Malawi, Ukraine, Tunisia, Senegal (associated to EU partners / various FP7 or ESA funded project)