



**Crop Monitoring as an
E-agricultural tool in
Developing Countries**



DISSEMINATION PLAN AND UPDATED REPORT

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Author(s): Qinghan Dong

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Author(s) : Qinghan Dong

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Executive Summary

The purpose of this dissemination plan is to structure the activities aiming to disseminate the project results and increase the visibility of this project. The plan indicates also a set of objectives which can be verified at the end of an implementation year. Finally, the achievements realized within this dissemination plan will also be summarized and updated in this document.

The activities of the dissemination can be divided into four areas:

- general public dissemination through a dedicated web-site, a project folder and regular updating of these media
- academic-focused dissemination by organizing the thematic workshops and presenting the project's results in diverse international conferences. The academic-focused dissemination includes also publication of most relevant results in scientific journals.
- stake-holder-oriented dissemination through publication of crop yield forecasting bulletins, especially in Morocco, using the technology transferred or developed in this project. This category of activities includes also a regular contact and results presentation to the policy making authorities such as DG-AGRI of the Commission or the Ministries of Agriculture in collaborating counties (Morocco, China and Kenya).
- collaboration-oriented dissemination through establishing common used tools or platforms, or jointly organising the training sessions with other EU funded projects.

The outcome and achievement of the dissemination are updated in this document at each review period.

1 Relevance of the dissemination activities

The dissemination activities of this project are intended:

- to answer the objective of the work programme which aims facilitating the wide diffusion and local exploitation of European information and telecommunication solutions in the developing countries, notably in the public sector, and in the area of agriculture.
- to contribute to the GMES Africa programme with a focus on the sustainable development in agriculture and food security.
- to raise the visibility of European expertise amongst the international agricultural research community
- to help the local policy makers in their tasks of reviving the rural economy, consolidating and strengthening the position of agriculture as the foundation of the national economy.

2 General public oriented dissemination

2.1 Frame of dissemination activities for general public

The channels of promotional folders and a dedicated website will be used for creating general awareness and promoting the achievement of the project.

- a project web site is to be built to depict the goals of the project and inform on the status of the development through regular updates. The results of piloting cases, eventual user feedbacks will be made available.
- a project folder will be made providing most relevant information on the project including the scale of the funding, the composition of the partnership, the technologies behind the project and the expected results.

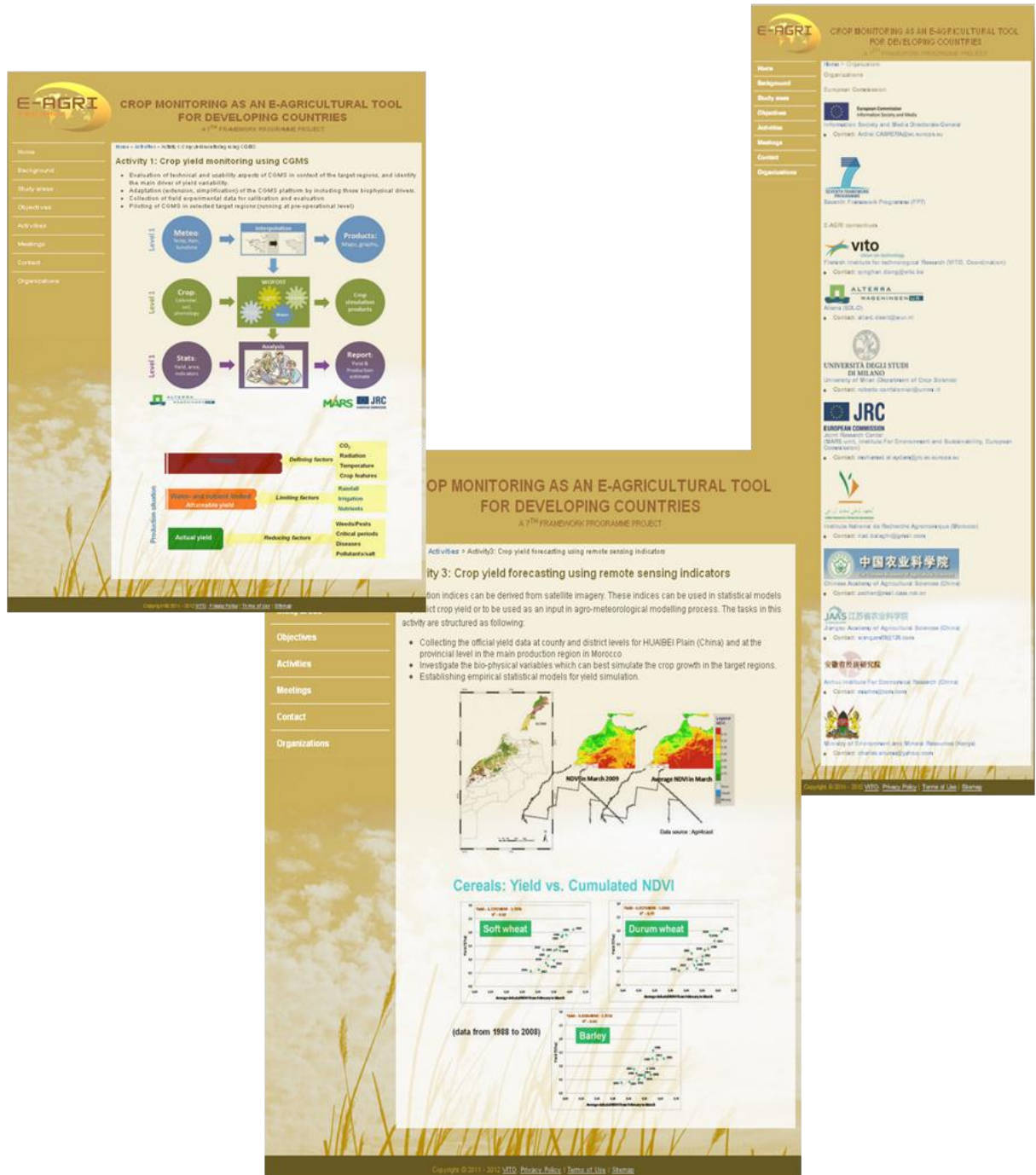
2.2 Outcome of the dissemination for general public

The general promotional site www.e-agri.info has been established (Fig. 1). Information harboured by the site is divided into eight sections: summary, background, study areas, objectives, activities (work-packages), meetings, contact and organization (partners of the project). The sections of “activities” and “meetings” will be updated regularly, and the photos and presentations from different meetings are to be added.

A folder was designed for local distribution during workshops, conferences or visits of external organizations (Fig. 2). As planned, it contains the basic numbers and information of the project and has objective to inform the readers at a glance.

2.3 Planning for general public-oriented dissemination

The sections “activities” and “meetings” will be updated.




The image shows a collage of screenshots from the E-AGRI website. On the left, there are navigation menus for 'Home', 'Background', 'Study area', 'Objectives', 'Activities', 'Meetings', 'Contact', and 'Organizations'. The main content area features several pages:

- Activity 1: Crop yield monitoring using CGMS**: A flowchart showing the process from 'Meteo' (weather) and 'Crop' (crop) data through 'Integration' to 'Products: crop growth'. It also includes a 'Stats' section for 'crop yield monitoring' leading to 'Report' and 'Production volume'. A table lists 'Production indicators' such as 'Actual yield', 'Defoliation factors', 'CO₂', 'Radiation', 'Temperature', 'Crop features', 'Soil', 'Irrigation', 'Nutrients', 'Weeds/Pests', 'Critical periods', 'Diseases', and 'Pests/diseases/pests'.
- Activity 3: Crop yield forecasting using remote sensing indicators**: A page with a title and a list of activities: 'Crop yield forecasting using remote sensing indicators'. It includes a list of bullet points: 'Collecting the official yield data at county and district levels for HUIBEI Plain (China) and at the provincial level in the main production region in Morocco', 'Investigate the bio-physical variables which can best simulate the crop growth in the target regions.', and 'Establishing empirical statistical models for yield simulation.' Below the text is a map showing 'NDVI in March 2009' and 'Average NDVI in March' with a 'Data source: Agribase'.
- Cereals: Yield vs. Cumulated NDVI**: Three scatter plots showing the relationship between 'Yield (t/ha)' and 'Average Cumulated NDVI (March to May)' for 'Soft wheat', 'Durum wheat', and 'Barley' (data from 1988 to 2008).

On the right side, there is a 'More' section with a list of 'Organizations' and 'Partners' including the European Commission, French Institute for Technological Research (IFIT), ALTERRA, UNIVERSITA DEGLI STUDI DI MILANO, JRC, and others. At the bottom, there is a footer with 'Copyright © 2011 - 2012 VITO, Privacy Policy, Terms of Use | Sitemap'.

Figure 1. Screen-captures of the general web site for E-AGRI project (2012).



E-AGRI

At a Glance

Title: Crop monitoring as an E-agricultural tool in developing countries.

Instrument: FP7, collaborative project (SICA)

Total costs: 2,302,113 EUR

EU contribution: 1,618,000 EUR

Duration: 36 months

Start date: February 2011


Consortium: 9 organisations from 7 countries or regions

Project coordinator: VITO

Project Web Site: www.e-agri.info


Email contact: qinghan.dong@vito.be

Key Words:
Information and Communication Technology, agriculture, crop monitoring, remote sensing, agro-meteorology, food security



The Background And Objectives:

The innovative application of information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture, is a new paradigm of sustainable development in developing economies, as more than 50% of population are still living in rural areas. The E-AGRI project aims to support the uptake of European ICT research results by setting up an advanced crop monitoring service in two developing economies, Morocco and China. The activities of capacity building will be carried out in the third developing country, Kenya, to raise the interest of local stakeholders on European E-agricultural practices and to pave the way for an eventual technological transfer in the future.



European Commission
Information Society and Media

Figure 2. Project folder highlighting the content in a nutshell.

2.4 Updating 2013

During the implementation year 2012-2013, several activities of general dissemination have been carried out:

- The general project web site (www.e-agri.info) has been entirely renewed.



E-AGRI
E-Agriculture

CROP MONITORING AS AN E-AGRICULTURAL TOOL FOR DEVELOPING COUNTRIES
A 7TH Framework Programme Project

Home Background Study areas ▾ Objectives Activities ▾ Meetings Contact Organizations

Home

E-Agriculture

This project is designed to address one of the objectives of the FP7-ICT-2009-6 call, namely **the support to the uptake of European ICT research results in developing economies**. The objective will be realized by setting up an advanced **European e-agriculture service** in two developing economies, Morocco and China, by means of **crop monitoring**¹. The activities of capacity building will be carried out in the third developing country, Kenya, to raise the interest of local stakeholders on European e-agricultural practices and to pave the way for an eventual technological transfer in the future.

The European research institutions including VITO, Alterra, JRC and University of Milan, have developed series of agricultural monitoring approaches to support European **Common Agriculture Policy (CAP)**. These approaches are based on the European **Information and Communication Technologies including space-based Earth Observation (EO), geographical information systems and agro-meteorological modelling**. The transfer, adaptation and local application of these e-agriculture practices will assist the policy makers of developing countries in their challenge of sustaining agriculture growth. On the other hand, the feedback from this action will enhance the applicability of European crop production forecasting technology on a global scale, thus ultimately strengthen its capacity in **global monitoring of food security**.

Finally, the implementation will be strengthened by closely collaborating with other European food security projects focusing on African countries (link to African portal) such as GMFS or AGRICAB.



Figure 3. Renewed project web site (www.e-agri.info).

- There was a proposal to participate a documentary production displaying the European ITC transfer to the African continent organized by the European public television sender EURONEWS. The preparation at the test site Settat and Meteo Office in Rabat in Morocco was initiated. Unfortunately, for some budget reasons, the project was stopped in last minutes.

2.5 Updating 2014

The coordination, after discussion with the project officer, proposed to submitted the main outcome the project to the Research* EU Results Magazine, the main FP7 research results publication.



Figure 4. Research *EU Results Magazine.

The results of the project obtained in Maroc are compiled together in to a specific crop growth analysis site: www.cgms-maroc.ma



CGMS - MAROC
Système national de suivi agrométéorologique de la campagne agricole et de prédiction des rendements céréalières

Présentation :
La sécurité alimentaire repose sur une céréaliculture sensible aux aléas climatiques, aussi bien au Maroc que dans le monde. La production nationale de céréales est fortement exposée au risque climatique car elle est localisée essentiellement dans les zones arides et semi arides présentent des ressources en sol et en eau limitées et marginales par rapport aux besoins de croissance des cultures. Le suivi de la campagne agricole ainsi que la prédiction des récoltes est une composante essentielle de la gestion du risque climatique en agriculture.

Un système national de suivi de la campagne agricole et de prédiction agrométéorologique des récoltes céréalières, appelé « CGMS-MAROC » (Crop Growth Monitoring System – Maroc), a été initié par l'Institut National de la Recherche Agronomique (INRA), dans le cadre du projet E-AGRI. Le CGMS-MAROC est piloté par l'INRA et géré en consortium formel avec la Direction de la Météorologie Nationale (DMN) et la Direction de la Stratégie et des Statistiques (DSS). Le développement de CGMS-MAROC a été possible grâce à une collaboration technologique avec des institutions de recherche internationales, à savoir : l'Institut Flamand pour la Recherche et la Technologie (VITO), le Centre de Recherche Commun de l'Union Européenne (JRC), l'Institut de Recherche de l'Université de Wageningen (Alterra) et l'Université de Milan (UNIMI). Le CGMS-MAROC est ainsi le premier système opérationnel de suivi de la campagne agricole et de prédiction agrométéorologique des récoltes céréalières au Maroc, institutionnalisé par un partenariat stratégique qui permet son développement et sa pérennisation.

Le CGMS-MAROC surveille le développement des cultures, à partir des conditions météorologiques, des caractéristiques des sols et des paramètres des cultures.

Figure 5. CGMS-Maroc web site (www.cgms-maroc.ma).

3 Academy-oriented dissemination

3.1 Frame of dissemination activities at academic level

This scope of activities consists of:

- organizing our own thematic workshops
- participating the events (symposiums, conferences) organized by international scientific communities or other national/international agencies and
- submitting scientific papers for publication.

During the 36 months of implementation, our project plans to organize five thematic workshops, as the research or demonstration activities of the project are structured into five work-packages: CGMS application, BioMA platform, crop yield forecasting using remote sensing, crop area estimation and statistical tools.

On the other hand, it is planned to attend some major international conferences where our project can have a major contribution or can have a raised visibility.

Major outcomes or results from the project, especially, those using European methodologies adapted to local conditions will be most relevant in dissemination point of view.

3.2 Outcome of the dissemination at academic level

During the first year of implementation, Three thematic workshops have been organized. It includes:

- the Rabat workshop on Yield forecasting using remote sensing (October 2011)
- Hefei workshop on CGMS setup (November 2011)
- the Kenitra workshop on statistic tool box (February 2012).

These workshops played fully the role of dissemination as they were attended not only by members of the project consortium, but also by the scientists, experts from other universities, research institutes and policy making organs such as the national central bank of Morocco or the Development and Reform Commission in China

One scientific paper has been published on the subject of BioMA modelling (Fig.3). The paper entitled: “Quantifying plasticity in simulation models” was published in an ISI journal “Ecological Modelling” volume 225 from pages 159-166.

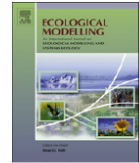
The second paper focusing on sensibility analysis for wheat simulation is already submitted in press.



Contents lists available at SciVerse ScienceDirect

Ecological Modelling

journal homepage: www.elsevier.com/locate/ecolmodel



Quantifying plasticity in simulation models

R. Confalonieri^{a,*}, S. Bregaglio^{a,b}, M. Acutis^a

^a Università degli Studi di Milano, Department of Plant Production, Via Celoria 2, I-20133 Milan, Italy

^b Agriculture Research Council, Research Centre for Industrial Crops, Bologna, Italy

Figure 6. . Publication acknowledged the funding of E-AGRI project.

3.3 Planning of the academic dissemination

The project coordination plans to organize one thematic workshop on BioMA modelling as a side event of the second progress meeting, which will be organised by JAAS in Nanjing in November 2012.

The project has scheduled to attend the following international symposia or conferences to present the results of the project:

- Dragon 2 symposium in Beijing organized by European Space Agency in June 2012
- First international conference on agro-informatics organized by US Agriculture Department (USDA) in August 2012.
- 9th conference of African Association of Remote Sensing and Environment in October 2012

The project plans to publish 1-2 scientific papers in international ISI journals.

3.4 Updating 2013

3.4.1 Publications

During the second year of implementation, the consortium was able to publish one peer-review paper on *Agron. Sustain. Dev.*:

Agron. Sustain. Dev.
DOI 10.1007/s13593-012-0104-y

RESEARCH ARTICLE

Wheat modeling in Morocco unexpectedly reveals predominance of photosynthesis versus leaf area expansion plant traits

Roberto Confalonieri • Simone Bregaglio •
Giovanni Cappelli • Caterina Francone •
Marta Carpani • Marco Acutis • Mohamed El Aydam •
Stefan Niemeyer • Riad Balaghi • Qinghan Dong

Accepted: 25 June 2012
© INRA and Springer-Verlag, France 2012

Figure 7. A peer-review paper resulted from the project and published in 2012.

A book describing the crop monitoring advance in Morocco has been published

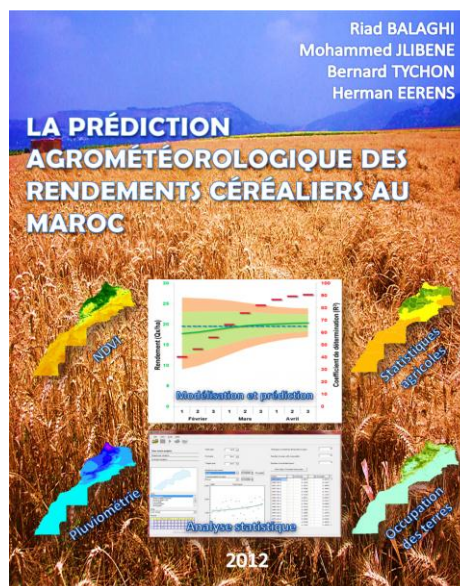


Figure 8. E-AGRI project contributed to the publication of this book.

One proceeding was published during the Dragon2 Symposium in Beijing organized by European Space Agency:

- *Kerdiles, H, Dong, Q., Spyros, S, Gallego, J. “crop area estimation in Mengcheng county using regression estimator”*

Four conference proceedings are published during the First International Conference on Agro-informatics organized by US Agriculture Department (USDA) in August 2012:

- *Di Wang, Qingbo Zhou, Zhongxin Chen and Jia Liu. “Optimization of survey unit size on spatial sampling for estimating winter wheat sown acreage”*
- *Jianqiang Ren, Zhongxin Chen, Xingren Liu and Huajun Tang, “A new method of spatialization of crop area statistical data supported by remote sensing technology”*
- *Zongnan and Chen Zhongxin, “Comparing two measuring methods of soil microtopography”*
- *Di Wang, Zhongxin Chen, Qingbo Zhou and Jia Liu. “Optimal design of spatial sampling schemes for winter wheat sown area estimation”*

3.4.2 BioMA workshop



Figure 9. BioMA workshop in Nanjing between 11-12 Dec. 2013.

A thematic workshop on BioMA platform was organized by UMI and hosted by JAAS, as a side event of the second progress meeting. The details of the workshop are described in the deliverable D71.2.

3.4.3 Networking with other public institutions

The networking and dissemination activities among the institutions other than E-AGRI partners were carried out. Exchange visits during the second year included:

- Visit of Qinghan Dong (VITO) to Anhui Agriculture University in March 2012. A lecture over the project was given.
- Visit of Qinghan Dong, Lieven Bydekerke, Roel Van Hoolst (VITO) to China Agricultural University in June 2012. A lecture over the food security issues was given.
- Visit of M. Merdas, M.F. Smiej from the Centre Royal de la Télédetection Spatiale (CRTS) to VITO on December 12, 2012. Several presentations including an introduction of E-AGRI project were given.

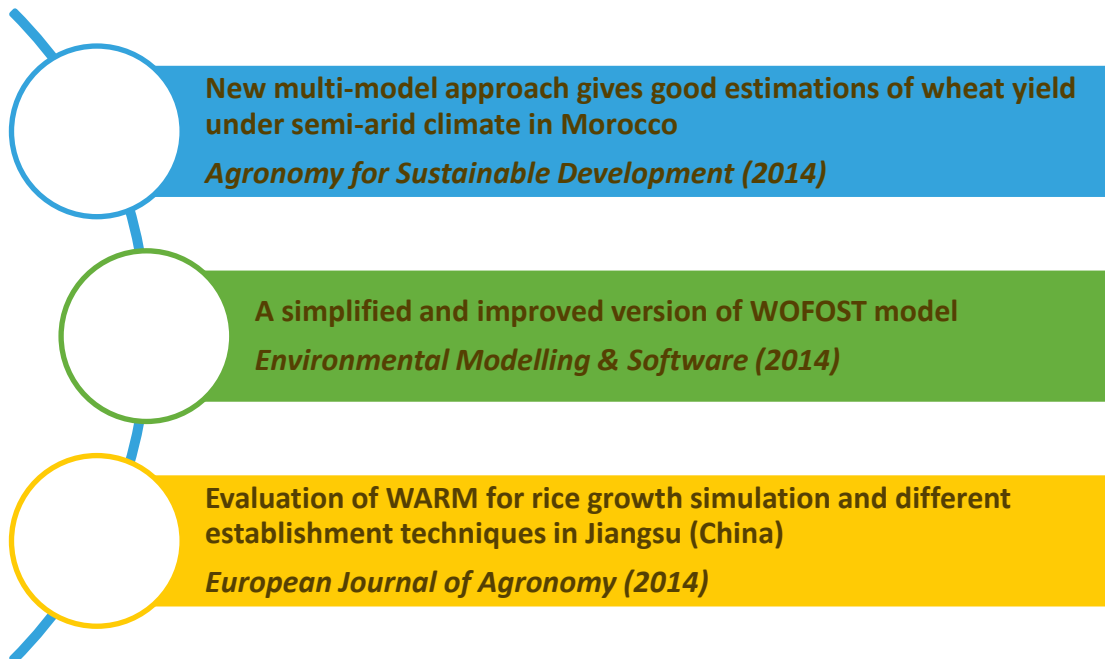


Figure 10. Exchange visits to Anhui Agriculture University and China Agriculture University in March and June 2012.

3.5 Updating 2014

3.5.1 Publications

Three peer review publications are submitted:



3.5.2 Attended Scientific Conferences

The following scientific conferences were attended to present the E-AGRI results:



3.5.3 Thematic Workshops and trainings

The following thematic workshops and training sessions were organized in 2013:

- Organizing a training course of one week (24-28 June, 2013) at VITO for INRA Morocco colleagues: three experts from INRA Morocco attended the training sessions: Hafida Bouaouda, Hamid Mayhou, and Riad Balaghi. Three trainers from VITO side included Herman Eerens, Roel Can Hoolst and Qinghan Dong. The training targeted the methodology of satellite image classification.
- Training workshop “2nd BioMA training (WP 34)”, 9-13 December 2013, Milan, Italy
- Training workshop “3rd BioMA training”, 19-21 March 2013, Rabat, Morocco
- “E-AGRI/AGRICAB Hands-on training on image classification using high resolution satellite imagery over Kenya”, Nairobi, Kenya, 25-29 November 2013
- Training session “CGMS-Anhui Set-up”, 3 – 9 November 2013, Hefei, China

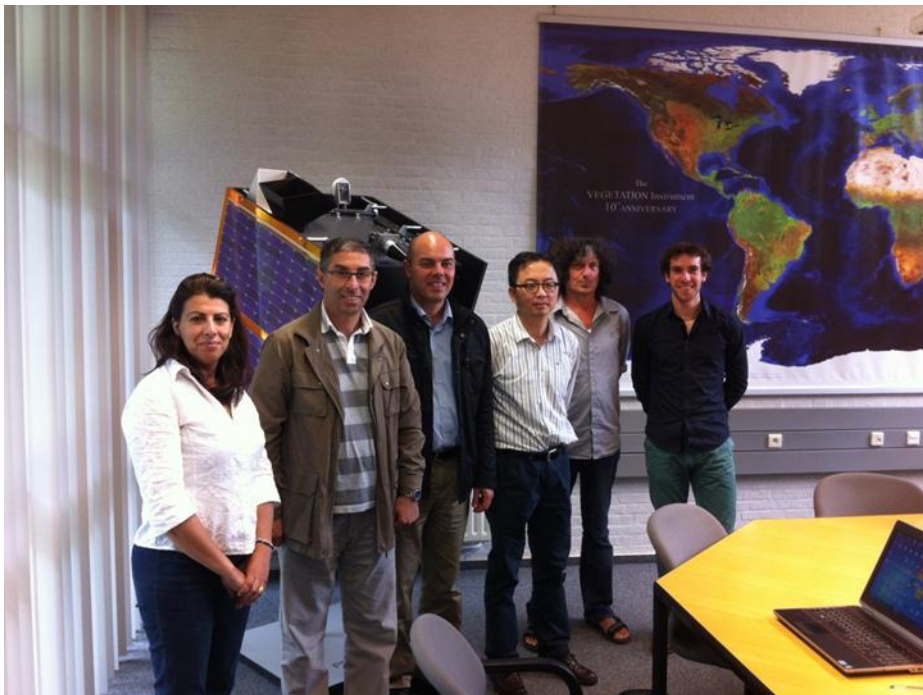


Figure 11. Satellite image classification training in Mol Belgium.



Figure 12. BioMA training in Rabat, Morocco.

4 Stakeholder-oriented dissemination

4.1 Frame of dissemination activities focusing on stakeholders

The dissemination activities focusing on the stakeholders have the following scope:

- to reach the stake holders by publishing the crop monitoring bulletins
- to maintain the contact with the policy making authorities, namely the Directorate General of Agriculture in the European Commission or the ministries of agriculture in three collaborating countries, Morocco, China and Kenya.

Crop monitoring and yield forecasting bulletins have been published regularly by the partners in Morocco and China. However, through the implementation of the project, these bulletins will be enriched with data and results retrieved by new modelling and remote sensing approaches adapted to local conditions.

The contact with the policy makers in African continent will be most relevant as the monitoring architecture established by the Moroccan partner in the frame of this project, can be without much re-calibration effort, transposed to another North African country such as Tunisia, with which much collaborative work has been conducted.

From European side, the results obtained in this project can be used by European institutions for supporting EU Food Security Programme, focusing particularly on Africa. On the other hand, through the Joint Research Centre (JRC), which runs main European agricultural monitoring activities, the research results from this project can be rapidly disseminated and integrated into their daily operational tasks thanks to their participation of this project.

4.2 Outcome of the dissemination towards stake-holders

The first crop yield forecasting bulletins for Morocco was drafted in the beginning of 2012. A final release is scheduled for the spring 2012. The forecasting was made using the methodologies adapted within E-AGRI project

Contact with Moroccan Ministry of Agriculture has been initiated. One of the departments, the Direction of Statistics and Strategy (DSS) showed their enthusiasm of contributing to this project. As a dissemination activity, a training of one week is planned for June 2012 for an expert from the Department DSS.

4.3 Planning for dissemination towards the stake-holders

The dissemination activities towards the stake holders within the long second implementation year are planned:

- timely publish the first Morocco crop yield forecasting bulletin using e-AGRI methodologies.
- keeping contact with European and local policy makers:
 - o conducting a training session for managers or experts from the Ministry of Agriculture
 - o presenting the E-AGRI results at the DG-AGRI of the European Commission
 - o contact/visit USDA/NASS (US department of Agriculture, National Agricultural Statistic Service)

4.4 Updating 2013

The first bulletin for crop yield forecasting in Morocco was published on April 17, 2012 based on E-AGRI methodologies:

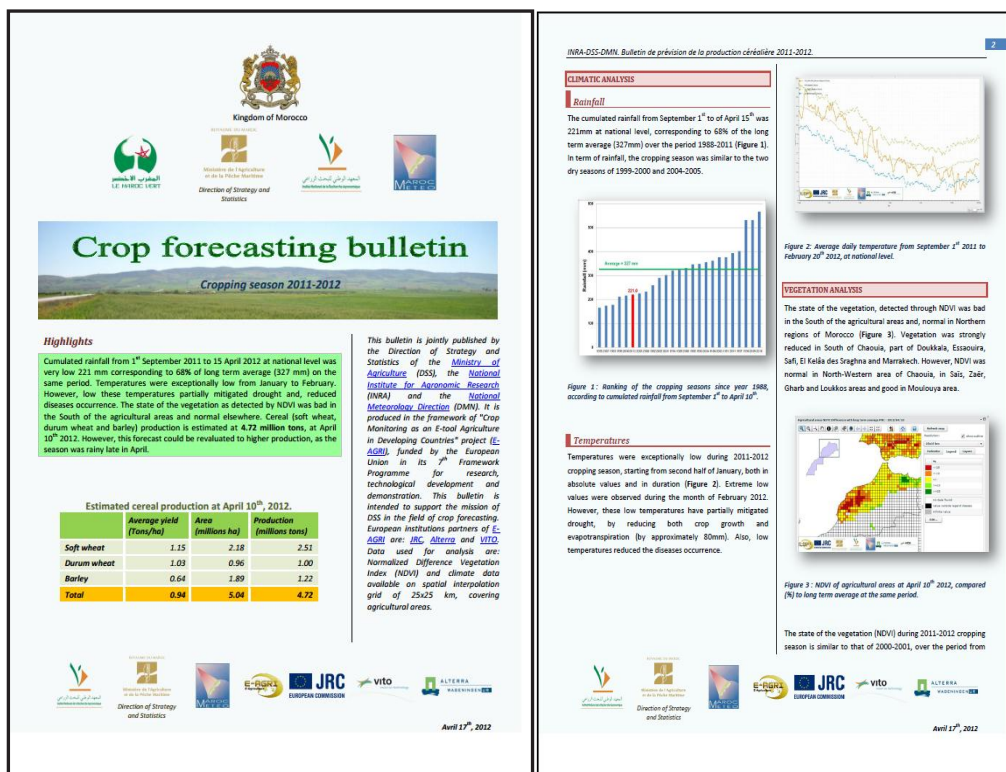


Figure 13. First crop yield forecasting bulletin for Morocco.

The second bulletin will be published in April 2013. The publication will be for the first time using CGMS-MAROC, the CGMS system adapted and calibrated using local weather, soil and plant (phenological) data. CGMS-MAROC is one of the major outcomes of the E-AGRI project and its dedicated web site (<http://www.cgms-maroc.ma>) is under construction.

A training session for Morocco stakeholders will be organized in March 2013.

A first briefing of E-AGRI project to the DG AGRI of the European Commission was organized on Feb. 7, 2013. A more official lecture on E-AGRI project will be given to a bigger audience at DG AGRI in May 2013.

A visit to the US Department of Agriculture (USDA) is planned for August 2013, during The Second International Conference on Agro-informatics, in Fairfax, US.

4.5 Updating 2014

The second bulletin of crop yield forecasting in Morocco was published in 2013:



Figure 14. Second crop yield forecasting bulletin for Morocco.

The Project E-AGRI was also presented to principal major agricultural policy makers:

- **Presenting the project E-AGRI in the DG AGRI of the European Commission, attended by the administrators / managers of the DG and their advisers, in Brussels, July 2, 2013.**
- **Presentation of E-AGRI project for FAO experts (Paul Racionzer, Oscar Rojas and Renaldo Cumani) in Antwerp, 11 October 2013)**
- **Presentation of the project to USDA experts in 16, August 2013 in Washington.**

The major dissemination event at the end of the project will be organized in Rabat on March 26, 2014:

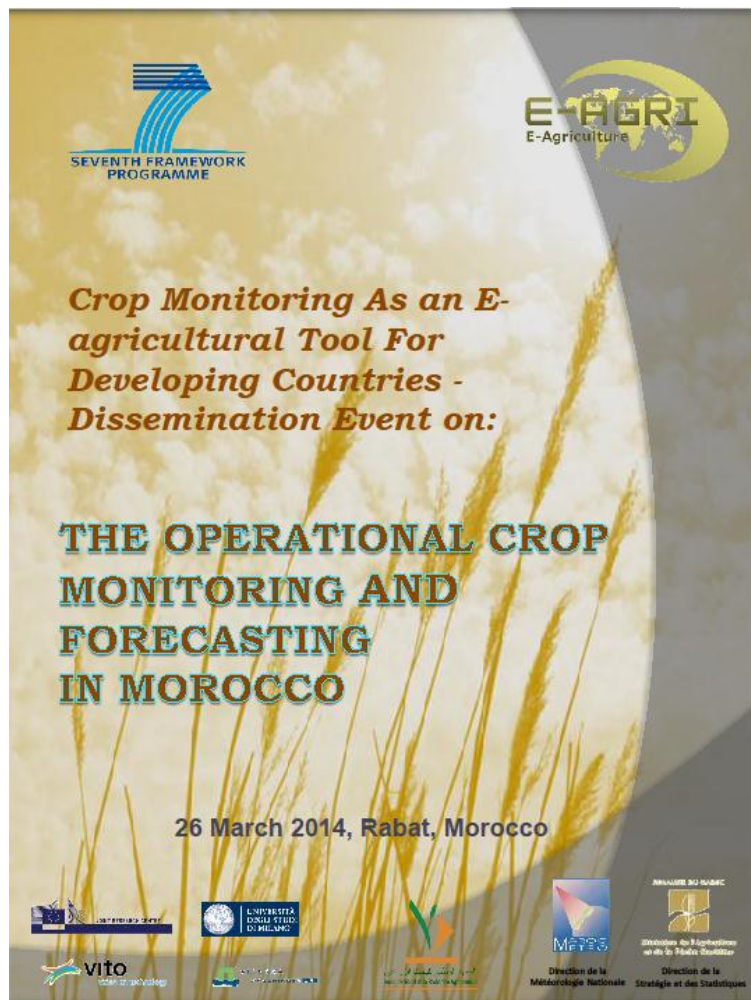


Figure 15. Final dissemination event announcement.

5 Collaboration-oriented dissemination

5.1 Frame of dissemination activities aiming collaboration with other European actions

The synergy between different crop monitoring or food security projects can be exploited through knowledge sharing and joint organization of training with other European actions.

Such actions include “Global Monitoring For Food Security” funded by European Space Agency, AGRICAB and Geoland funded by FP7 Programme and Food Security Action of MARS unit at JRC-EC. While African continent is a common geographic area of interest, many methodologies or platforms can be shared or exchanged, such as statistical tool box or automated photo-interpretation tool. Furthermore through commonly organized training sessions or workshops by these projects, the knowledge or outcome can be better disseminated as the partners of the projects are from different organizations and from different countries.

5.2 Outcome of dissemination through collaboration with other European actions

During the first year of implementation, different methodologies from these projects were exchanged. That was the case for the automated photo-interpretation tool developed in the GMFS project, as well as the statistical tool box developed by E-AGRI project.

5.3 Planning of dissemination through collaboration with other European actions

During the second year of implementation, two joined training session or workshops are planned to be organized with AGRICAB, another FP7 project. One workshop will focus on the agricultural applications of remote sensing technologies, in which the use of SPIRITS software package developed joined by VITO and JRC will be introduced. The second one scheduled in October 2012 will gather the agricultural stakeholders or policymakers in Kenya to raise their awareness of using advanced information and communication technologies.

Finally, the results from E-AGRI is planned to be presented in the final Conference of Geoland in Copenhagen in October 2012.

5.4 Updating 2013 and 2014

The collaboration with other European projects on food security and disaster early warning continues.

The major dissemination event in this aspect the Kenya National Workshop organised jointly by the projects AGRICAB and E-AGRI. The local partner, DRSRS, under auspices of the Ministry of Environment and Mineral Resources, in collaboration with VITO, ALTERRA, and Consorzio ITA, organized a one day workshop on the Tuesday 23-10-2012. The main objective of the workshop was to analyse the present agricultural statistical systems in Kenya, with a focus on crop monitoring and area estimates. The workshop aimed also to help defining user needs and possible linkages with the estimate of crop yields and early warning, and enhancing the role of remote sensing in crop production monitoring in Kenya. The detailed programme and minutes are annexed to the Periodic Report 2013.



Figure 16. Kenya National Workshop in Nairobi on October 23, 2012.

A second Kenya workshop was organized in November 2013 focusing on image classification always in collaboration with AGRICAB project.



Figure 17. Second workshop in Kenya in November 2013.

6 Conclusions

The dissemination activities are conducted throughout the implementation of the ensemble of work-packages, from research to demonstration activities. However, these dissemination activities can be structured around the four themes: raising general public knowledge, enhancing scientific level of our research, increasing stake-holder's interest and contributing to the European crop monitoring expertise through collaboration. Finally, feedbacks of these dissemination activities will also enhance the European capacity of agricultural monitoring at global scale, using its own information and communication technologies.

During the second implementation year, progress has been made in these four directions, demonstrated by a renewed project web site, the first Kenya national workshop, several scientific publications, as well as the first bulletin of crop yield forecasting in Morocco.

The dissemination has been strengthened in the third year with several presentations at policy making authorities, in different scientific conferences and with many publications.