Crop Monitoring as an E-agricultural tool in Developing Countries

COMPILATION OF THE PERIODIC REPORTS

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PROJECT PERIODIC REPORT

Grant Agreement number:	**270351**
Project acronym:	**E-AGRI**
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Date of latest version of Annex I against which the assessment will be made:	**2010-12-14**
Periodic report:	**1st**
Period covered:	**2011-02-01 to 2012-01-31**
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Project website:	**http://www.e-agri.info**

Declaration by the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [1]:

  X has fully achieved its objectives and technical goals for the period;

  ☐ has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ☐ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable

  X is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: ...Qinghan Dong.....

Date: .....31...../ ....05...../ ....2012.....

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism.

[1] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

1. Publishable summary

1.1. Project background and objectives

Agriculture is one of the most important domains to which the European Union (EU) exercises the direct competence via its Common Agricultural Policy (CAP). In order to support the implementation of the CAP which currently represents nearly the half of the annual budget of the European Commission (EC) and to **assess the agricultural production within EU and other critical regions,** the Directorate General Agriculture has funded the **MARS Programme** (Monitoring Agriculture with Remote Sensing).

Throughout the participation of the different phases of this programme, VITO and other collaborative institutions have been able to develop series of technologies based on the remote sensing, geographic information system and agro-meteorological modelling for assessing the crop yield as well as for estimating the crop acreage.

The technologies have essentially been developed in **three domains:**

1. Crop monitoring using space based information to monitor the crop growth status and predict the crop yield. The approach takes advantage of the earth observation information provided by satellite sensors which allow the observation of vegetation at day to day base by establishing different vegetation indices.
2. Crop monitoring can also be carried out by agro-meteorological modelling. The system CGMS (for Crop Growth Monitoring System) was developed following this approach. Together with the output of remote sensing, the CGMS forms the core component of European MARS Crop Yield Forecasting System. The system developed by Alterra and JRC assumes accurate and timely crop yield forecasts for the 27 member states and other strategic areas of the world. More recently, simulation capacities in terms of models and components have been extended by JRC and the University of Milan. A component-based platform BioMA has been developed to deal with specific modelling goals for example simulating rice cropping system.
3. In terms of crop area estimates, test pilot approaches using area frame sampling and remote sensing has been developed in Europe. VITO and its partners dispose of all infrastructure and expertise to apply the methodologies in the selected developing countries.

The **specific objectives** of E-AGRI:

1. **To transfer, adapt and demonstrate the European MARS Crop Yield Forecasting system for *wheat* cropping monitoring in HUAIBEI plain of China and Morocco.**
2. **To transfer, adapt and demonstrate the European BioMA platform , using the ensemble of models (WARM specific for rice, CropSyst and Wofost as generic crop simulators) for *rice* cropping monitoring in JIANGHUAI plain (located in Jiangsu province of China) and *wheat* simulation in Morocco.**
3. **To assess the crop acreage using area frame sampling and remote sensing in HUAIBEI Plain and in Morocco.**
4. **Creating a network for potential users of CGMS and BioMA platforms to obtain valuable feedback on system applicability.**

5. **To liaise other European crop monitoring activities such as GMFS, and contribute to strengthen European agricultural intelligence at world-wide level which is primordial for improving the competitive position of European agriculture in the global marketplace.**

The project entails a research and development (RTD) component and a demonstration (DEMO) component. The RD tasks aim to adapt European technologies to local agro-environmental conditions and to develop and integrate additional peripheral components if the local stakeholders' needs arise. The DEMO activities will measure locally the effectiveness of the transferred technologies through an establishment of users' networks. Finally a capacity building activity specifically designed for East Africa will be organized in Kenya, to pave the way for a further technological transfer.

1.2. Results summary

The deployment of project started with series of activities on capacity building and on knowledge dissemination. In order to pave a technical base for local partners, series of workshops and training sessions were organized. On the other hand, dissemination materials and infrastructures are prepared including workshop brochures, project flyer and several dedicated web sites. Finally, collaborations with other international crop monitoring and food security projects have been initiated.

Implementation of CGMS yield forecasting (WP2) has largely progressed beyond the schedule for the study area of Morocco. The level 1 operation related to the meteorological data processing is running using the local weather data provided by the Moroccan National Meteorological Department (DMN). An *ad hoc* visualisation software was derived from the original European viewing software package which requires a quite advanced hardware infrastructure and an important maintenance effort. On Huaibei plain in China, the set-up of CGMS started smoothly by taking advantage of a previous collaboration work with Chinese Academy of Agricultural Sciences.

Many results were also obtained in the frame of WP3 aiming establishing biophysical simulation platform BioMA for yield forecasting. The crop varieties were identified in the two test regions. The parameterisation of different models as well as the sensitivity analysis is being carried out.

Substantial advance has been achieved for crop yield forecasting using remote sensing indicators (WP4). The most suitable indicators, such as cumulative NDVI and cumulative DMP, have been identified and empirical regression models are created to predict crop yields for the current growth season. The progress enabled the Moroccan partner to publish their first forecasting bulletin national-wide.

In the domain of crop area assessment (WP 5) different approaches on segment sampling and satellite image classification have been analysed at pilot study level. Systematic sampling with stratification seems to produce most cost efficient results. In the domain of satellite image classification, the maximum likelihood classifier proved to be superior. Moreover, JRC and VITO tested a new point frame sampling method to improve the cost-efficiency of area assessment. Investigation will extended to a larger area in the second year.

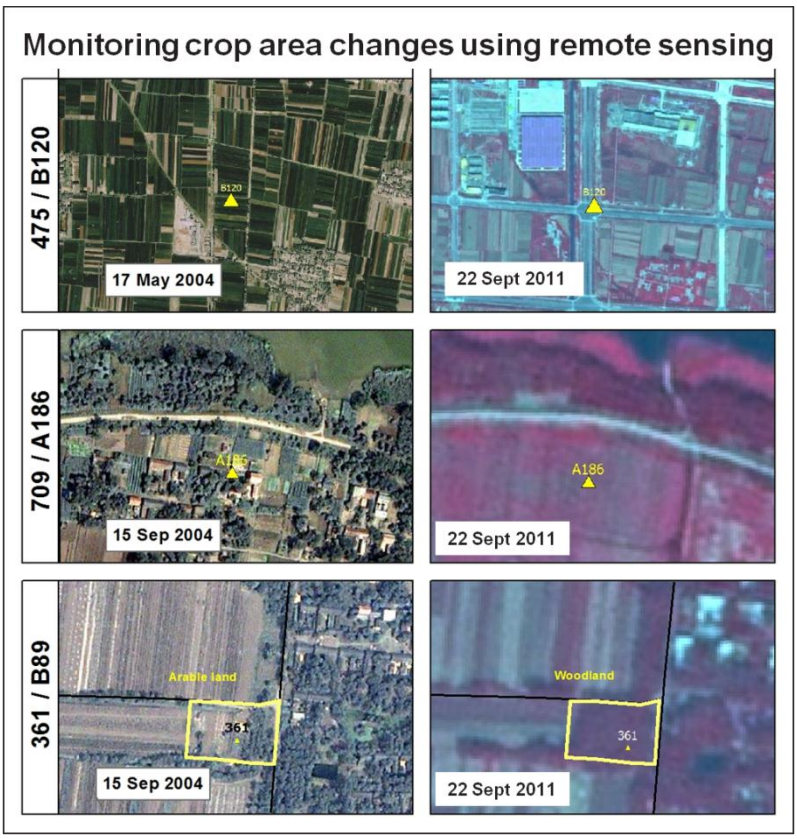

Figure 1: Monitoring crop area changes in pilot area Mengcheng County

The activities planned in the WP6 for establishing a statistical toolbox have been advanced to this year as the Moroccan partner needs the tool to produce their bulletin 2012. The main achievement includes the built-up of a statistical analysing chain capable to process most vegetation indicators in Morocco and a migration of the statistical toolbox to Windows 7 environment.

In the second year of the project implementation, the technologies can be deployed more extensively (from both technological and geographical points of view) including the running of CGMS at Level 2, first rice yield forecasting based on BioMA platform and validation of the remote sensing indicators at a large area (even beyond the previously defined study zones). The capacity building activities will be started in Kenya as well.

1.3. The relevance and impact

The final results will be the locally adapted versions of European crop monitoring technologies which will contribute to strengthen the European capability on global agriculture information and intelligence. The outcome of the project will also help the local authorities in their agricultural policy making.

1.4. Project's web-site

The project established three web sites. The general promotional site (http://www.e-agri.info) has objective of disseminating the project outcome (Figure 2).

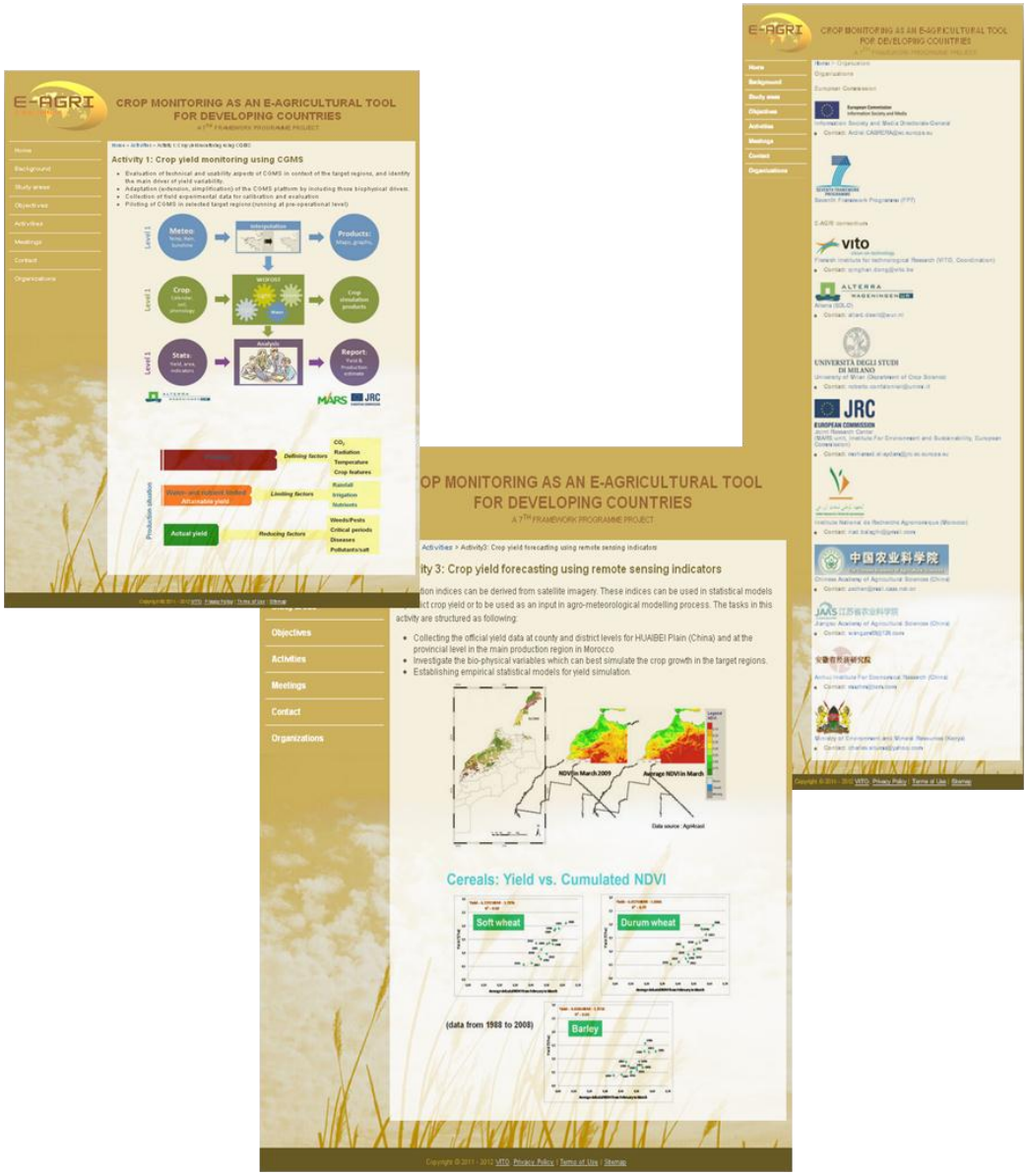

Figure 2: Project's web site screen capture

In line with this, diagrams or photographs illustrating and promoting the work of the project, as well as relevant contact details or list of partners can be provided without restriction.

2. Objectives, work progress and project management

2.1. Project objectives for the period

The objective of this first implementation year is to initiate all work-packages (WP2 to WP6) by deploying knowledge transferring and capacity building activities. Moreover for activities related to crop growth monitoring as well as the crop area assessment, the ground data, ancillary and statistical data have to be collected and pilot studies or tests have to be carried out where it is indicated.
The dissemination activities (WP7) are to be developed especially in the domain of networking, scientific publications and promotional activities via dedicated web-sites or press/media.

2.2. Work progress and achievements during the period

At the end of the first year implementation, the activities related to the adaptation and implementation of the CGMS in Morocco and on the Huaibei Plain in China (WP2) have been well progressed. Particularly it is the case for Morocco, where some national institutions, non-partners of the E-AGRI consortium join with enthusiasm the adaptation and implementation tasks by providing local meteorological data, very long term (> 30 years) official statistics and locally developed software tools. Even the Research Department of the Morocco Central Bank participated in the scientific discussions. The European partners, especially, SDLO made an extraordinary effort to set up the statistical analysis capability of the project (WP6) planned initially for a later period. All these enthusiasm and effort allow the Moroccan Partner INRA to publish the very first crop yield forecasting bulletin in Morocco, which was much appreciated by the local policy makers (the Moroccan Ministry of Agriculture). The bulletin publication was initially foreseen as a dissemination activity only at the end of project implementation.

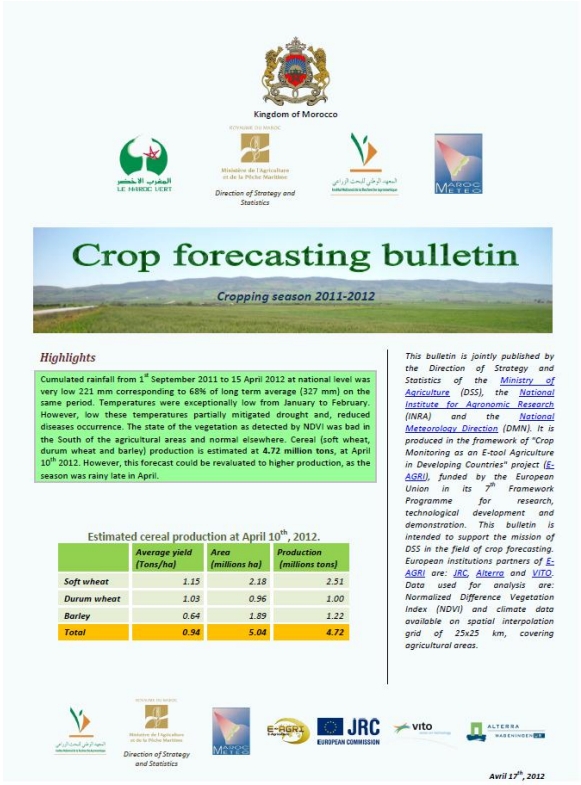

Fig.3 Crop yield forecasting bulletin 2012 (Morocco)

Regarding the activities on adaptation and implementation of BioMA model (WP3), the progress has been substantial. Especially in Jianghuai Plain in China, large number (9) experimental sites have been setup for rice growth observation. Huge amount of rice data have been collected, which allow a refined calibration of the model and a fruitful sensitivity analysis.

In the frame of crop yield forecasting using remote sensing (WP4), much progress has also been made. The yield forecasting models at national level in Morocco for three targeted cereals have been established. The validation showed that the solidity of the models. Forevermore, the models are already in application in the first crop yield bulletin. The forecasting models developed for Huaibei Plain displayed more scattered results. Each prefecture (district) has its own forecasting model. Partners are suggesting extending the regions of study to have a more consistent model for the whole area.

Within the activities of crop area estimation (WP5), different methods on ground sampling and satellite image classification have been compared in the local context. The ground sampling methodology was modified to adapt to local conditions by the partners JRC, VITO, AIFER and CAAS. A pilot study has been carried out in the county of Mengcheng. The adapted methodology, although labour intensive, show its flexibility and solidity in its estimation. A first cost efficiency analysis has been made.

Different dissemination activities (WP7) were conducted. It includes the construction of a dedicated web site, publication of the first crop yield forecasting bulletin in Morocco, preparation of three scientific papers, of which one has already published. Promotion was also made to the

decision makers including local ministries, EU delegations at the target countries and a local agricultural university. A communication to the press was also made during workshops.

The following tables provide more details on the progress realised within each work-package.

WP 21: Ground observation and data collection	
Summary progress	This work package aims to collect winter wheat growth data on Huaibei Plain for CGMS model calibration and adaptation The regional statistics are to be collected for regional assessment. The progress includes: - Collection of basic phonological data for winter-wheat in the study regions - Collection of basic map and vectors for the study areas - Collection of the statistical data regarding the winter wheat yield at province level for Morocco and at prefecture level for the region of Huaibei Plain. The statistical data for Morocco include 30 years of records which are far beyond the scope of the planning.
Significant results	The collection of the essential data needed for CGMS implementation is achieved.
Deviations from DOW and impact	Deliverables D21.3 were initially compiled according to study regions in two parts A and B, which could be merged upon a request from the Commission
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW: Person-months actual / planned: - INRA: 0.0 / 3.0 - AIFER: 3.4 / 9.0
Corrective actions	Not applicable.

WP 22: CGMS adaptation for Morocco	
Summary progress	This work package aims to evaluate the usability of CGMS for Morocco and its subsequent adaptation measures. - Provision of the Moroccan local meteorological data at real time basis which constitutes a great achievement following the refusal from JRC (the European Commission) to provide its model based meteorological data (not planned in DOW) - Adoption of a more locally adapted methodology for meteorological data interpolation in Morocco (not planned in DOW) - Infrastructure building at both hardware and software levels which need

	to meet cost efficiency criterion. - Implementation of Level 1 of CGMS - Development of a cost effective software for CGMS output visualization
Significant results	Successful implementation of CGMS Level 1 despite the unavailability, which has not been expected, of model based meteorological data.
Deviations from DOW and impact	Deliverables D22.1, D22.2 have a status of delay, which was mainly caused by an advanced implementation of the whole work-package 6 (WP6.1 and WP6.2). The delay has no impact on the implementation of the project but may have impact on the first period review process.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned: - SDLO: 1.21 / 9.5
Corrective actions	New deadlines for deliverable submission will be proposed.

WP 23: CGMS adaptation for Huaibei Plain (Anhui, China)	
Summary progress	This work package aims to evaluate the usability of CGMS for Huaibei Plain and its subsequent adaptation measures. - As provision of the real time local meteorological data turned out to be a sensitive issue, the local partner AIFER turned to the collection of 3 month old archive, freely available from 15 WMO stations in the region. A formal cooperation with the local Meteorological Bureau was proved necessary in an operational phase (beyond the pre-operational scope of the project). - Extraction of radiation estimates from ECMWF ERA-INTERIM database - Infrastructure building at both hardware and software levels in a cost efficient way. - Implementation of Level 1 of CGMS
Significant results	Implementation of CGMS Level 1.
Deviations from DOW and impact	Deliverables D23.1 was delivered with delay. In comparison with the implementation in Morocco, cooperation with local meteorological office was less successful. However this has no impact on the pre-operation finality fixed in the project, and does not therefore constitute a deviation.
Reasons for failing to achieve critical	Not applicable.

objectives	
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned: - SDLO: 1.13 / 9.5
Corrective actions	Not applicable.

WP 31: Ground data collection for BioMA	
Summary progress	This work package aims to collect rice growth parameters on Jianghuai Plain and winter wheat growth data in Morocco for modelling using BioMA platform. The progress includes: - Identification of the rice cultivars on Jianghuai Plain and collection their morphological and physiological parameters including plant height, leaf age plan density, Leaf Area Index and aboveground biomass. These parameters have been collected in 9 experimental sites (beyond the plan of DOW). - Collection of historical phenological data for wheat in Morocco. Data were derived from 4 experimental sites and for 5 varieties.
Significant results	Extensive collection of the field data (especially for rice varieties in China) paves a solid base for successful sensitivity analyses and calibration of models.
Deviations from DOW and impact	The collection of field data was started rapidly and extensively on Jianghuai Plain in China. Due to the early start of growth season in Morocco, field data in that region were first extracted from historical archives, the field data started to be collected from the growth season 2011-2012. From there , the deliverable D31.1 showed some disparity for two study regions and split into two parts A and B.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - UMIL: 0.4 / 1.0 - JAAS: 4.5 / 6.0
Corrective actions	The parts A and B can be merged upon the request of the Commission.

WP 32: Adaptation of BioMA for multi-model rice monitoring on Jianghuai plan

Summary progress	This work package aims to carry out the spatially distributed sensitivity analysis of the BioMA models for the study region on Jianghuai Plain. The progress during the first year includes: - Sensitivity analysis of models WARM, WOFOST and CropSyst for rice simulation - Scientific output: one paper published and the second one in the pipeline.
Significant results	Extensive collection of the field data for rice varieties led to successful sensitivity analyses.
Deviations from DOW and impact	Deliverable D32.1 was issued with delay.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - UMIL: 20.0 / 9.0 - JRC: 0.5/ 1.0
Corrective actions	A justification letter for delay is to be sent.

WP 34: Adaptation of BioMA for multi-model wheat monitoring in Morocco	
Summary progress	This work package aims to carry out the spatially distributed sensitivity analysis of the BioMA models for the study region in Morocco. The progress during the first year includes: - Sensitivity analysis of models WARM, WOFOST and CropSyst for rice simulation - Scientific output: one paper published and the second one in the pipeline.
Significant results	Collection of the historical phenological data as well as the previous studies carried out by JRC in the region led to successful sensitivity analyses for winter wheat. The collection of actual field data is ongoing, which will improve the sensitivity analysis and model calibration.
Deviations from DOW and impact	Not applicable.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the

	DOW. Person-months actual / planned : - UMIL: 2.9 / 1.0 - JRC: 6.7 / 12.0
Corrective actions	Not applicable.

WP 41: Collections of Official yield statistics	
Summary progress	This work package aims to collect wheat yield data in two study region. As the task is already performed in the WP2.1, and the new needs to extend the monitoring region to the neighbouring areas, the local partner AIFER turned to collect additional yield data in neighbouring prefectures in provinces of Henan and Shandong. The target crops included maize which had not been planned in DOW. The progress includes: - Collection of extra wheat yield data in neighbouring provinces Henan and Shandong.
Significant results	Collection of wheat yield statistics in the neighbouring prefectures in order to prepare the spatial extension of simulation
Deviations from DOW and impact	The deliverable D41.1 was not able to include this additional part of work, collecting data beyond the study area, in neighbouring prefectures.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - AIFER: 0.0 / 5.0
Corrective actions	A new submission could be carried out upon the request of the Commission.

WP 42: Crop biomass derived from remote sensing	
Summary progress	This work package aims to compute the main biophysical variables NDVI, fAPAR and DMP used for crop growth monitoring. The progress includes: - The 10 daily composites of NDVI were extracted for two study areas and for the time series 2000-2009. - Extra-time series NDVI for 2010 and 2011 were added (non planned in DOW) - Smoothing procedure was performed to fill the missing data. - The crop mask map was contributed by JRC (including GlobCover V2.2, Corine-2000, Africa Cover the SADC and USDA cropland use Intensity datasets). Database of Area Fraction Image for this crop mask was

	derived and named to GLCropV2. - Five biophysical variables were finally selected as the most suitable vegetation indices to monitor crop growth in these two regions: NDVI (i), NDVI smoothed (k), fAPAR (a), FAPAR smoothed (b)and DMP smoothed (y). - The databases of "Regional Unmixed Mean" (RUM) for these five variables were established.
Significant results	Five biophysical variables are produced to monitor crop growth and will be used for establish empirical models for yield forecasting performed in the next work-package.
Deviations from DOW and impact	The yield statistics and RUM databases were also collected or generated for the prefectures outside of the prefecture initially fixed.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - VITO: 2.8 / 5.0
Corrective actions	Not applicable.

WP 43: Wheat yield estimation using Remote sensing in Morocco	
Summary progress	This work package aims to establish empirical models using biophysical variables derived from remote sensing at levels of province, agro-climatic zone or country. The progress includes: - Establishing three models to simulate the yields for soft wheat, durum wheat and Barley respectively using the cumulative k-NDVI from February to March. - Establishing three models to simulate the yields for soft wheat, durum wheat and Barley respectively using the cumulative DMP from February to March. - Analyzing the predictor errors and showing that the regressing models using cumulative DMP produce best results at national level. - Using the SIMILARITY analysis to predict the crop yield: an intuitive, straightforward method, validated by the historical yield statistics (not planned in DOW).
Significant results	Establishing the yield forecasting models using the cumulative NDVI and cumulative DMP. Test the SIMILARITY analysis approach Producing the first yield forecasting bulletin using this methodology.
Deviations from DOW and impact	Not applicable

Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - INRA: 1.5/ 6.0
Corrective actions	Not applicable.

WP 44: Wheat yield estimation using Remote sensing on Huaibei Plain	
Summary progress	This work package aims to establish empirical models using biophysical variables derived from remote sensing at levels of prefecture on Huaibei Plain. The progress includes: - Establishing models to simulate wheat yield using the biophysical variables: individual or cumulative K-NDVI and y-DMP. - The selected predictors for six prefectures are all different
Significant results	Establishing the yield forecasting models using the individual or cumulative NDVI / DMP.
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - VITO: 2.8 / 6.0
Corrective actions	Not applicable.

WP 51: Ground sampling and data collection on Huaibei Plain	
Summary progress	This work package aims to adapt, compare and design segment sampling method and to establish area estimation model for the study region. The progress includes: - Compare the different sampling strategies including: simple random sampling; spatial random sampling, systematic sampling, spatial systematic sampling and stratified systematic sampling. - Design a new sampling scheme adapted to the strip-wise cropping

	pattern on Huaibei Plain - Pilot study with 200 sampling points and 83 segments survey in one county.
Significant results	Design the most adapted sampling approach for the region Validate the approach by a pilot study with an extensive survey.
Deviations from DOW and impact	The sampling approach was adapted by CAAS, JRC and VITO to teak into account in strip-wise cropping pattern. The impact will be an improvement of accuracy for estimation.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - CAAS: 10.0/ 9.0
Corrective actions	Not applicable.

WP 52: Crop area estimation on Huaibei Plain	
Summary progress	This work package aims to compare and adapt image classification methods and generate crop area estimates using both best suitable classifier and statistical regression. The progress includes: - Comparing image classifiers including: maximum likelihood, Decision tree support vector machine, neural network and object oriented. - Image classification on Landsat TM to estimate the winter-wheat area and image classification on SPOT5 to estimate the maize area in the pilot county of Mengcheng. - Regression analysis combining the area frame sampling and image classification to estimate the maize and soybean area for the pilot study area.
Significant results	Clarifying the image classification approach Establish the regression estimation approach for the region.
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned :

	- CAAS: 6.8 / 9.0
Corrective actions	Not applicable.

WP 53: Ground sampling and data collection in Morocco	
Summary progress	This work package aims to adapt and design the segment sampling strategy in Morocco and establish a regression or calibration estimation approach to estimate crop areas in a pre-defined region. The progress includes: - Stratify the agricultural zones in Morocco using ortho-rectified SPOT 5 image. The agriculturally related strata have numbers 10, 20 and 30 for rain-fed arable land, irrigated arable land and orchards. Eight agriculturally important provinces are pre-selected for further analysis. - Establish primary and secondary sampling units. - 385 secondary sampling units are sampled in Chaouia-Ouardigha (4 provinces) and Mekenes-Tafilalet (4 provinces). Field surveys were conducted in Chaouia-Ouardigha region during the first implementation year.
Significant results	The ground sampling strategy has been designed and the first part of field survey for ground samples collection was conducted.
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - INRA: 1.4 / 9.0
Corrective actions	Not applicable.
WP 55: Accuracy and cost-efficiency assessment	
Summary progress	This work package aims to analyze the sampling and non sampling errors as well as analysis of mapping costs. The progress includes: - First cost-efficiency analysis of area estimation performed in the pilot study in Mencheng.
Significant results	A first estimation of the cost efficiency by including remote sensing in the regression analysis.
Deviations from DOW and impact	Not applicable

Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - VITO: 0.0 / 2.0
Corrective actions	Not applicable.

WP 61: Statistical toolbox Design	
Summary progress	This work package aims to design and implement the statistical tool box which can ingest most common crop yield indicators derived from crop modelling and remotes sensing based approaches. The progress includes: - Set-up processing line for ingestion all types of indictors derived from different sources. - Compilation of new database in which these indicators are stored - New spatial aggregation implemented for Morocco (not planned in DOW) - Migration of the statistical tool box to Windows 7 environment.
Significant results	Set up the entire CGMS statistical Tool box enabling ingestion of all yield indictors in Windows 7 environment.
Deviations from DOW and impact	New spatial aggregation and database updating according to local regional administrative and environmental hierarchy The implementation period was advanced to fulfil the publication requirement for very first Moroccan yield forecasting bulletin. This advance may have impact on the implementation of other WP especially on the submission of certain deliverables on WP2.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - SDLO: 1.5 / 6.5
Corrective actions	Not applicable.
WP 62: Statistical toolbox piloting/workshop	
Summary progress	This work package aims to disseminate and train local experts and technicians the use of the CGMS statistical tool box and to gain experience

	for an improved yield forecast. The progress includes: - Editing a wiki (http://e-agri.wikispaces.com/CGMSStatTool) - Organizing a workshop dedicated to CGMS statistical tool box
Significant results	Local scientists and technicians gained experience with using the statistical toolbox.
Deviations from DOW and impact	Advanced implementation of the whole work-package 6 (WPs 61 and 62) which has an impact on the submission of deliverables related to other WP.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - SDLO: 0.5 / 1.5 - INRA: 0.3/ 3.0
Corrective actions	Not applicable.

WP 71: Networking and Partnership in China and Morocco	
Summary progress	This work package aims to a general and global disseminate the European crop monitoring technology, establish a network in the domain of crop modelling and application of remote sensing in agriculture. The progress includes: - Organizing three workshops ***with the participation of stake holders or experts outside of the consortium***. - Networking by visiting other organization in China and Morocco including the Department of Strategy and Statistics, Morocco Ministry of Agriculture (January 2012 by J. Gallego JRC) and Anhui Agricultural University (by Q. Dong 03/2012) - Training sessions at VITO and SDLO
Significant results	Local scientists and technicians gained experience with using the statistical toolbox.
Deviations from DOW and impact	Advanced implementation of the whole work-package 6 (WPs 61 and 62) which has an impact on the submission of deliverables related to other WP.
Reasons for failing to achieve critical objectives	Not applicable.

Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : - VITO: 0.4 / 1.5 - SDLO: 0.9 / 2.0 - UMIL: 0.0 / 3.0 - JRC: 0.6 / 2.0 - INRA: 0.0 / 1.0 - CAAS: 1.2 / 1.0 - AIFER: 0.0 / 2.0 - JAAS: 0.0 /2.0
Corrective actions	Not applicable.

2.3. Project management during the period

The objectives of the project management are to:

- general coordination of the inter-institutional activities such as, data-sharing or expert trainings between two partner institutes
- preparing and coordinating the project events, including thematic workshops and progress meetings
- implementing the dissemination and networking activities towards organizations including scientific institutions outside of the project consortium and the European Commission
- ensuring legal management including making agreement on intellectual proprieties issues
- reporting to the Commission the progress of the project implementation including financial overview

The project coordination is undertaken by Qinghan Dong (VITO). The project official tasks were assumed by Thierry Devars till November 2011 and taken over by Ardiel Cabrera from December 2011. At the Joint Search centre, Dr. Mohamed EL-AYDAM played the role of contact person till January 2012 and left for another function in DG AGRI. Manola Bettio took over the role.

In general, the implementation is well on track or even beyond the schedule. Some delay on submission of deliverables has been observed due to the advanced execution for some work-packages scheduled in the third year.

Local partners showed in general their enthusiasm towards the crop monitoring technologies developed by European partners. However some preference towards certain aspects of methodologies led to some outperformance beyond the frame determined in the Description of Work. The implementation in one of the North African countries (scope for the project call), Morocco, was already a success evidenced by the participation from organisations outside of consortium such as the National Meteorological Department, Statistical Department of the Ministry of Agriculture and advanced publication of the very first yield forecasting bulletin in the country.

The first management tasks went to the standardization of the project output, promotion and dissemination. A template for deliverables and reports including project logo have been designed or prepared. Three web sites have been built for different purposes:

- *The general project promotion site: http://www.e-agri.info*
- *A project data sharing site: ftp://cvbftp.vgt.vito.be*
- *A project management and documents sharing MOSS site: https://sites.vito.be/sites/egari*

The project coordinator have played largely the roles of communication channel between the partner institutes, especially between the local partners (JAAS, AIFER and INRA) and the European institutions of the consortium, especially on the issues of data sharing and activity planning. The communication between the European and Non European partners has been largely improved whenever a face to face acquaintance is made. No intervention from tiers is needed anymore in daily communication between these partners. The coordinator has also taken steps to ensure collaboration with other international food security projects. Technical exchanges have been taken place between the GMFS (funded by ESA) and E-AGRI. Joint training activities are planned between the AGRICAB and E-AGRI.

The following official events have been organized:

Date and venue	Meeting	Meeting Deliverables	Networking
2011/03/24-25 Mol, Belgium	Kick-Off Meeting	Meeting Minutes (Annex)	
2011/10/12-14, Rabat, Morocco	Rabat workshop on yield forecasting using remote sensing)	Workshop Minutes Action list (see Annex)	Contacts with other organizations outside of the consortium such as, the National Meteorological Bureau, Statistical Department, Moroccan Central Bank (Bank AL-MAGHRIB), university of Gadarif, and the Ecole Normale d'Agriculture.
2011/11/02-04 Hefei, China	Hefei workshop on CGMS set-up	Workshop Minutes Actions list (See Annex)	Involvement of the EU delegation in Beijing; inviting head of INFOSO section *Frank Greco*; and the head of AGRI section *Hans Christian Beaumond.* Contact with Anhui Agriculture University and Suzhou University
2011/11/23,	Review Meeting	Meeting Minutes	Contact with participants

Ispra, Italy		(See annex)	of CGMS experts meeting held just before.

2.4. Dissemination Plan

Up the request of the Commission a dissemination plan has been edited and the output of the dissemination tasks will be summarized in an additional deliverable, D71.5 "Updated Report on Project Dissemination". The updating will take place in next periodic reports. The dissemination plan is added and framed in four areas:

(1) Through setting up a general web site: all the projects progress will be detailed and updated. All events organized by the project will be highlighted on the home page.

(2) Through the workshops or conferences: either organizing our own events and getting involved the policy makers such as ministries of agriculture, or actively participating the major international events in the domain of ICT transfer or food security organized by European Commission, United Nation's Food and Agriculture Organization, or other major decision makers (USDA for example)

(3) By publishing local yield forecasting bulletins, most likely in Morocco and by publishing the project results in specialized scientific journals.

(4) By maintaining contact with major stake holders such as DG AGRI of the European Commission and creating collaborations with other major international projects in the domain.

Dissemination Plan			
Through:	Categories	Contents/Examples	Numbers
Internet and promotional folders	Project web site	Project progress, events	1
	Flyer or folder	Summary of project	2
Workshops and Conferences	Organizing project's own events	• Rabat workshop on Yield forecasting • Hefei Workshop on CGMS setup • Nanjing Workshop on BioMA platform • Beijing Workshop on area estimation • Nairobi Workshop on crop monitoring in Kenya	5
	Participating on events organized by international agencies	• African Association for Remote Sensing and Environment conference • USDA Agro-Geomatics 2012 • More in 2013	At least 4
Publication	Yield forecasting Bulletin in Morocco		Each year

	Scientific publications		At least 5
Collaboration	European Commission's other actions	Periodic visits to DG AGRI	Each year or more
	Other international projects such as GMFS and AGRICAB….	Joint trainings and technical exchange	

2.5. Deliverables and milestones tables

Deliverables

Regarding deliverables, some of the deliverables are still in status of delay, due to advanced implementation of other WPs. New deadlines are proposed (see below). The compulsory format in report tasks has been clarified.

TABLE DELIVERABLES

Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	Nature	Dissemination level[2]	Delivery date from Annex I (proj. month)	Actual / Forecast delivery date	Status No-submitted /Submitted	Contractual Yes/No	Comments
D21.3	Regional Statistic Database	1.0	21	7	R	PP	12		yes		To be updated before 15/07/2012
D22.1	*Usability reports for application of CGMS for Morocco*			*2*	*R*	*PP*	*9*	*30/06/2012*	*no*		
D22.2	*Strategy report on CGMS adaptation for Morocco*		*22*	*2*	*R*	*PP*	*12*	*31/08/2012*	*no*		
D23.1	Usability reports for	1.0	23		R	PP	6		yes		To be updated

[2] **PU** = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).
Make sure that you are using the correct following label when your project has classified deliverables.
EU restricted = Classified with the mention of the classification level restricted "EU Restricted"
EU confidential = Classified with the mention of the classification level confidential " EU Confidential "
EU secret = Classified with the mention of the classification level secret "EU Secret "

	application of CGMS for Anhui, China										before 15/07/2012
D23.2	*Strategy report on CGMS adaptation for Anhui, China*		*23*	*2*	*R*	*PP*	*12*	*31/01/2013*	*no*		
D31.1	Ground data collection report	1.0	31	8	R	PP	6		yes		To be updated before 15/07/2012
D32.1	Sensitivity analyse report	1.0	32	3	R	PU	12		yes		Justification letter may be needed
D34.1	Synthetic report on the local crop classification and sensitivity analyses of parameterization	1.0	34	4	R	PU	6		yes		
D41.1	Databases on wheat yield	1.0	41	7	O	CO	6		yes		Data are already contained in the D21.3. It needs to be updated in view of new target region (more statistical data have to be collected)

Milestones

The milestones have been also clarified and updated below.

TABLE MILESTONES							
Milestone no.	**Milestone name**	**Work package no**	**Lead beneficiary**	**Delivery date from Annex I**	**Achieved Yes/No**	**Actual / Forecast achievement date**	**Comments**
MS1	Publication on the methodology or ground data sampling	WP21, WP31 WP51 WP53	6	24		31/01/2013	
MS2	Publication (submission) on adapted CGMS and /or BioMA platform	WP22 WP23 WP32 WP34	3	30		31/07/2013	
MS3	Implementation of CGMS and BioMA pilots	WP24 WP25 WP33 WP35 WP61	2	36		31/01/2014	Using archived or real time meteo data depending on the availability
MS4	Publication of yield forecasting bulletin in Morocco using the RS indicators	WP43 WP44	1	36	Yes on 30/04/2012		
MS5	Publication (submission) on crop area estimation	WP52 WP54 WP55	5	36		31/12/2013	
MS6	Publication in Press on the project and its impact in Morocco	WP71	4	36		31/01/2014	

2.6. Use of the resources

A notification from the European Commission specified the following:
"Up to now the "**Explanation of the use of the resources**" had to be provided in the scientific part of the project report via the Participant Portal. From 21st May 2012 this section will become **part of the financial reporting function".**

Subsequently, the tables stating the Use of Resources for 9 partner institutes are removed to the financial part of report, and also attached in the annex part of this report (Annex 6).

The Forms C's are now part of the financial reporting submitted via the Participant Portal

In summary, the use of resources within the consortium is not uniform. Some institutes, notably SDLO presents an obvious low level of utilization, while the achievement made by this institute in the project implementation has been appreciated by their partners. This may also explain partially the delayed submission of certain deliverables for which SDLO is responsible.

On the other hand, some partners, especially UMIL and CAAS, overshot largely their budgets. UMIL enforced their scientific team during this first year of implementation and undertook all work initially planned for subcontracting. This modification of the planning got a formal approval from the Commission. CAAS had to deploy a larger-than-foreseen effort to adapt the ground survey methodology and a lesser accessible road network in the study area. **It has been agreed between the partners and with the Commission that all deficits will be filled with each partner's own resources to ensure an achievement of objectives.**

2.7. Planning of second year

Within the second year of implementation, the CGMS set up (WP2) will continued at level 2 in both study regions and the level 3 (statistical toolbox) will be tested in Huaibei Plain. BioMA modelling will also follow its track and simulation up-scaling at field level is foreseen. The crop yield forecasting using remote sensing will be further deployed with newly available satellite images of 2012. On the other hand, the target area on Huaibei Plain may be extended. Activities of crop area estimation will be developed in the region of Meknes-Tafilalet in Morocco and in Guocheng County on Huaibei Plain. The capacity building activities in Kenya will be further carry out. The project coordinator will visit the country in later 2012.

Several workshops are already planned. It includes the BioMA workshop combined with a project progress workshop which will taken place in November 2012 and a workshop on

crop area estimation which will be organised by CAAS in January 2013. Moreover the representatives of the project consortium will attend at least three international conferences to disseminate the E-AGRI outcomes and submit two scientific publications.

Finally, information exchange and contact with major stakeholders will be maintained in the second year. Visits to EC DG-AGRI, FAO or USDA are being planned.

Annexes

Annex 1: Kick off Meeting Agenda

Kick-off meeting, 24-25 March 2011, VITO (Mol, Belgium)

Partners and their representatives:
European Commission (DG-INFSO): Thierry Devars
SDLO (Alterra): Allard de Wit and Raymond van der Wijngaart
University of Milan (UMI): Roberto Confalonieri
European Commission (JRC): Mohamed El Aydam
INRA (Morocco): Riad Balaghi
Chinese Academy of Agricultural Sciences (CAAS): Zhongxin Chen
Anhui Institute for Economical Research (AIFER): Zhongmo MA and Yang Qing
Jiangsu Academy of Agricultural Sciences (JAAS): Qiu Lin
Ministry of Environment and Mineral resources (DRSRS): Charles Situma
VITO: Qinghan Dong, Lieven Bydekerke, Herman Eerens and Ria De Breucker

AGENDA

Day 1: Formal meeting (24 March 2011)

09:30-09:45: Welcome and introduction of the partners

09:45-10:15: Presentation by DG INFSO Project Officer, Thierry Devars, on:

- DG INFSO and its programme and principal tasks within European Commission

10:15-10:45: E-AGRI project overview (VITO, Qinghan Dong)

- Introduction
- General and Specific Objectives
- WP structure: the way leading to these objectives
- Planning

10:45 -11:00 Coffee break

11:00- 13:00 Presentation by each partner organization on their major interests and expertise (core business) (10 min each)

13:00-14:00: Lunch

14:00-14:15: E-AGRI management structure and procedures (VITO, Lieven Bydekerke, WP1)

- Project management
- Decision making mechanisms

- Reporting

14:15-14:30: FP7 rules and duties (Ria De Breucker)
14:30-15:00 Coffee break
Workgroup discussion
15:00-16:00

- CGMS workgroup led by Alterra
- RS-Yield led by INRA & VITO

16:00 – 17:00

- BioMA workgroup led by UMI&JRC
- RS-Area led by CAAS

17:00-18:00: Activities in Kenya (requirement, interest, contribution)
Meeting Dinner 19:00

Day 2: Workgroup meetings (25 March 2011)

Discussions: around three issues: data, field surveys and workshops.
Morning (9:30-13:00):

- Presentation of the tasks and activity planning for the workgroup CGMS
- Presentation of the tasks and activity planning for the workgroup BioMA
- Presentation of the tasks and activity planning for the workgroup RS-Yield
- Presentation of the tasks and activity planning for the workgroup RS-Area
- Presentation of the activities on WP 6 statistic integration (Alterra)
- Discussion on the networking, dissemination and capacity building activities (in Kenya)

Lunch (13:00-14:00)
Departure: 14:00

Annex 2: Kick off Meeting Minutes

Kick-off meeting, 24-25 March 2011, VITO (Mol, Belgium)

Partners and their representatives:

- European Commission (DG-INFSO, EU): Thierry Devars
- SDLO (Alterra, NL): Allard de Wit and Raymond van der Wijngaart
- University of Milan (UMI, IT): Roberto Confalonieri
- European Commission (JRC, EU): Mohamed El Aydam
- INRA (Morocco, MO): Riad Balaghi
- Chinese Academy of Agricultural Sciences (CAAS, CN): Zhongxin Chen
- Anhui Institute for Economical Research (AIFER, CN): Zhongmo MA and Yang Qing
- Jiangsu Academy of Agricultural Sciences (JAAS, CN): Qiu Lin
- Ministry of Environment and Mineral resources (DRSRS, KE): Charles Situma
- VITO (BE): Qinghan Dong, Lieven Bydekerke, Herman Eerens, Anne Gobbin

Introduction and overview of the project and its partners:

- Welcome and introduction of nine partners including duties and expertise of each organization. The presentations are available on: https://sites.vito.be/sites/eagri.
- Thierry Devars, the project officer: Introduction of DG INFSO and expectations for E-AGRI implementation from the viewpoint of the European Commission:
- E-AGRI project overview (Qinghan Dong)

E-AGRI management and its share point server (MOSS) (Lieven Bydekerke)

Workgroup discussing and activity planning:

Workgroup CGMS (Work package 2)

The partner institutions of the workgroup include Alterra (leader) INRA and AIFER. Collaboration with the work group 3 will be substantial. 39 man/month (WP21 till WP25) will be dedicated to the activities of the workgroup.

Data to be collected or estimated at grid level in the test site Anhui and Morocco

- Precipitation (daily total)
- Temperature (daily maximum, daily minimum)
- Global radiation (daily total) or a proxy (sunshine duration, cloud cover)
- Vapour pressure
- Wind speed (daily average)
- Reference evapo-transpiration (derived from the above)
    - Potential evaporation of water surface
    - Potential evaporation of wet bare soil
    - Potential evapo-transpiration of a crop canopy

Establishing gridded weather data

Morocco:

- Weather data: Alterra checks if station observations for Morocco (as currently used in the MARS database) are available for E-AGRI. INRA checks if other station data are available. When: **1 month**
- Soil data: use 1:50.000 soil map of Morocco (for Agricultural part). INRA will check and provide derived product from soil map. When: **6 months**. Alterra will use fixed procedure to derive single layer parameter values.
- Statistics: a detailed database can be provided by INRA to Alterra containing data for +/- 40 provinces. When: **1 months**.
- Crop experimental data: Alterra will provide INRA with list of parameters needed by WOFOST and list of data that can be used for calibration. Even better, Alterra & UMI make joined list of required (for BioMA and CMGS) parameters and send this to INRA. When: **2 weeks**. INRA will check if local experiments are suitable to provide directly parameter values or data suitable for calibration. If not, INRA can do some very limited experiments to measure some key parameter values. When: **6 months**.
- Crop masks: Current mask in MARSOP is not covering all areas. For the purpose of this project a specific crop mask can be created using remote sensing for Wheat (and Barley) by INRA / VITO in WP4. When: **3 months**.
- Crop calendars: not available. Sowing data are most important. Calculable based on temperature. When: **6 months**.

Anhui:

- Weather data: ERA-interim already available at Alterra will be used during the setup. Alterra will send station metadata, while AIFER will do the interpolation and return grid weather during setup based on downscaled 10-daily observed data. When: **6 months**. Compare 10-daily observed results with ERA data.
- Soil: 1:5.000.000 FAO already available at Alterra. When: **ready**.
- Statistics: available on district level. AIFER will provide the data to Alterra. When: **3 month.**
- Crop experimental data: Alterra will provide list of data needed for calibration. When: **1 month**. Only few local experiments are available for Huaibei. AIFER will check if nearby experiments could be used. Probably these are not representative. For calibration it is best to have 6 to 10 year time series data of well distributed locations. AIFER will return available data and send it to Alterra. When: **3 months**.
- Crop mask: AIFER will provide 1x1 km weighted mask to Alterra. When: **3 months**.
- Crop calendars: detailed mask is available and delivered by AIRFER to Alterra. When: **3 months**.

Adaptation model Morocco / China

- Identify main drivers of yield level and variability,
- identify missing elements and improvements

Two actions are proposed:

- Questionnaire for identifying limiting factor. Integrate with some rules for irrigation and diseases. Designed as joined effort by Alterra and UMI and send to INRA and AIFER to be filled in by experts (returning +/- 10 each).
- Adapt interpolation according to method by Météo France for Morocco? Adapt resolution to 10x10 km for Morocco? Analyze relation between climate and diseases for Morocco?

Workgroup BioMA

The workgroup BioMA, composed by UMI, JRC, INRA and JAAS, will essentially deal with the work-package 3, from data collection, adaptation or parameterization, to the piloting phase. 52,5 man/month (WP31 – WP35) will be dedicated to the activities of this workgroup. The rice in Jiangsu and the wheat in morocco are targeted or simulated crops. Thanks to the modular structure, six modelling solutions will be developed and evaluated within E-AGRI:

- Rice in China: multi-model simulations with and without forcing the models with RS data
    - WARM (Confalonieri et al., 2010)
    - WOFOST (Van Keulen and Wolf, 1986)
    - CropSyst (Stöckle et al., 2003)
- Wheat in Morocco: multi-model simulations
    - WOFOST
    - CropSyst

Each modelling solution will include models for:

- Crop growth and development (CropML and CropML_WL)
- Soil water dynamics (SoilRE and SoilW)
- Diseases (DiseasesProgress, ImpactsOnPlant, BlastDiseases)
- Abiotic damages (AbioticDamage)
- Forcing models state variables with exogenous data (i.e., NDVI or NDVI-derived leaf area index) (used only for rice in China) (Forcing)
- Micrometeorology (TRIS)

Each modelling solution performs simulation for different production levels, keeping separated the outputs of the levels themselves.

Data Collection

UMI will send an Email **within 1 month** for the specification of the data to be collected**:**

- Specification for the identification and grouping of cultivars.

- Specification on the field experiments and measurements to be carried out.
- Metadata for field /agricultural management including the period of sowing, frequency of fertilization or insecticide application

The identification of cultivars will be ended **after 6 months**. The collection of the available data and the field experiments for the collection need to be ended **at the end of this year**.
If needed, the further collection of data will be repeated in the year of 2012.

Sensitivity analysis for identification of most important parameters

This task will started immediately and continue for the rest of the year 2011

Workgroup RS-Yield (work-package 4)

The workgroup is composed by VITO (leader), INRA and AIFER and will work on the both test sites (Anhui and Morocco). 18 man/month (WP41-44) will be dedicated to the activities of this Workgroup.

Data collection

The following data are required for assimilation of wheat year using remote sensing:

- Long-term crop yield statistics per administrative unit (county, district and province) ;
- Time series NDVI series (SPOT-VGT, optionally MODIS for Morocco) etc.);
- Accurate crop mask (GLC2000, CLC, GlobCover, etc.);
- local expertise and knowledge on cropping pattern;
- RS and statistic expertise (ΣNDVI, Median NDVI, Slope of NDVI, etc.).

The actions to be taken for Anhui and Morocco:

- AIFER and INRA will provide the vector files for the administrative unit within the two test sites (**1 month**).
- VITO provides the NDVI time series derived from SPOT-VGT from 1998 to 2010 for both test site and the database for Regional Unmixed Mean (RUM), this **within 2 months**.
- Optionally, the similar databases based on the indices fAPAR or DMP will be built up, **within 4 months**.
- Crop mask to be provided at resolution of 250 M or 1KM by AIFER (for Anhui) and VITO (for Morocco), **within 3 months**
- Crop yield statistics at county, district or province level to be provided by AIFER and INRA **within 4 months**
- Climatic data, 10 daily means for rainfalls temperature at the administrative unit level, will be collected **within 6 months** by AIFER and INRA.

The actions to be discussed regarding Kenya:

- VITO and DRSRS will have to agree and the area to be monitored **from 2012**.

Simulations of the yield

The activities can already be started in 6 months after the collection of data are achieved. To facilitate the collaboration AIFER will send a researcher to VITO in the second halve of the year or in the beginning of 2012.
The DRSRS would like to develop the expertise in this domain (yield prediction using remote sensing), considering that the Kenya experts have a relatively strong expertise in the crop area estimation but the estimation on the crop yield is rather weak. They requested subsequently to strengthen their expertise by spending the man power foreseen in the work-package 56 (crop acreage estimation) in the activities developed within this workgroup.
Discussion is under way over sending a Kenya scientist to VITO during the second (2012) and the third year of implementation.

Workgroup RS-area (work-package 5)

The workgroup is composed by CAAS (leader), INRA, VITO and AIFER. The objective is to improve the methodology of crop area estimation in a cost-efficient way. The study areas will be the HUAIBEI plain in Anhui province and at least a few representative (agriculturally and climatologically speaking) provinces. 44 man/month will be dedicated to the activities of this workgroup.
The general idea emerged from the meeting is that a piloting study has to be first carried out in the first year and more extended study will be carried out in second and third years. Therefore, the first priority is to define the pilot area in the first year in China and Morocco.

Data collection

Background data for the both test sites

- The background GIS maps, best including land use, administrative, road, soil, vegetation, contour, crop, geology, geomorphology and hydrology (**6 months or before 30 September). The database on crop acreage for each administrative units will be**
- Crop calendar and phenology ((**6 months or before 30 September)**
- Optionally climate data in the study areas
- Optionally social economical data of last 10 years if available

Ground data

Ground segment sampling will be carried out in the test sites Anhui and Morocco. The pilot tests will be set up for the first year at the smaller scale, although the objective of the ground sampling remains unchanged, meaning to generate crop area estimates on a statistically sound base.
In the study area of Morocco, since the growth season is ending, only a track survey in two climatologically different provinces will be carried out.

For the test site in Anhui, in 2011 a trial with 20-25 samples of 500x500m, concentrated on a smaller area (1 county for example) will be carried out.
For Kenya, the DRSRS will decide if they will carry out the activities of the WP5 (area estimation) or exclusively the activities they prefer (WP4). The advantage of DRSRS on area estimation is the availability of aerial data. A proposition for activities in 2012 and 2013 will be made by **DRSRS within 3 months**.

Remote sensing data

- Low resolution image: SPOT-VGT and MODIS are the basic low resolution data. Optionally AVHRR can be used.
- High resolution data: TM, ALOS and AWiFS are the basic data type. Optionally, HJ-1 can be used
- Very High Resolution: QB or IKONOS
- The first set of data will be collected **within 3 months**, and RS data collection will be continued, and collected progressively. The inventory of the available RS data will be made within 3 months.

Methodology

CAAS provided the flow chart of spatial sampling procedure. The approach need to be described for an implementation in Morocco and /or in Kenya. It would include:

- Selection of sampling frame
  - spatial vs. non-spatial
- Sampling methods:
  - Random
  - Systematic
  - Stratification
- Remote sensing sampling
- Extrapolation (scaling-up)
  - Relevant to sampling method
  - Regression with remote sensed info

Vito will provide a description of track survey and image classification, for an implementation in Morocco.
Both descriptions need to be made available **in 6 months**

Summary of action in 2011

No	Task	Description	Institutes	Time	Deadline
1	Definition of pilot region	Define the pilot study area for 2011 in China/Morocco/ Optionally, the study area in Kenya needs to be fixed**.	AIFER/CAAS/ INRA/VITO	1M	April 30, 2011

2	Background data collection	Socio- economic statistical data for 2001-10; Climate data for 2001-10; GIS maps (land use, administrative, road, soil, contour, crop, geology, geomorphology, hydrology); Crop calendar and phenology	AIFER/CAAS/ INRA	3M	June 30, 2011
3*	Ground Sampling for winter wheat in China*	20 - 30segments @ 500m x 500m for winter wheat*	AIFER/CAAS	2M*	May 30, 2011
4*	Ground Sampling for maize in China	20-30 segments @ 500m x 500m for maize *	AIFER/CAAS	6M	Sept. 30, 2011
5	Track survey in Morocco	2 climatologically different provinces	INRA	3 M	30 JUNE
6	Sampling for fall crops in Kenya	Using aerial photography 1,5km x 1,5 km	DRSRS	3M	30 JUNE
7	LR images - VGT	SPOT-VGT @ 1km for all bands and NDVI, DMP for 2001-2011 for research regions in China, Morocco and Kenya **	VITO	3M	June 30, 2011
8	LR images - MODIS	EOS-MODIS data @ 250m, 500m and 1km for all bands, NDVI, Ts, LAI for whole test sites in China, Morocco and Kenya (2001-2011)	CAAS/AIFER/ INRA/VITO	3 M	June 30, 2011
9	HR images -China	TM, CBERS, ALOS, HJ-1 and AWiFS data for the test site in North Anhui for 2011	CAAS/AIFER	6 M	Sept. 30, 2011
10	HR images - Morocco	TM, ALOS or AWiFS data for the 2 targeted provinces for 2011	INRA	6 M	Sept. 30, 2011
11	HR images Kenya**	TM, CBERS, ALOS data for the study area in Kenya for the entire implementation period **.	DRSRS	6 M **	Sept. 30, 2011**
12	Sampling model for crop area	Test the sampling methods in pilot study region in North Anhui	CAAS/AIFER/ VITO	8 M	Nov. 30, 2011
13	Test classification methods	Test crop classification methods focus on the various HR image and with different registration periods	CAAS/AIFER/ INRA/ VITO	9 M	Dec. 30, 2011

****Suggestions from VITO: It will be much better to concentrate to one season (wheat or maize) and sample 50 segments in the 2011***.

** A study area for Kenya can be defined optionally if DRSRS wished to elaborate the capacity building activities in this domain (see 3.5)

Kenya activities

Kenya partner has expressed a clear preference to strengthen their activities in the area of yield forecasting. The subject is crucial in the mission of early warning against famine.

Towards this request, VITO is favourable to integrate the DRSRS in the activities of yield forecasting using remote sensing. This could be scheduled in the activities of WP4 for 2012.

Concerning the crop area estimation, the Kenya partner has already acquired much experience in the domain of aerial survey. However for cost efficiency purposes, a combination of use of satellite data and aerial photography should be proposed. A pilot study could be carried out in one defined region. The field survey can be replaced by the aerial survey using aerial photography.

*Tasks **in 2011***

- Define the regions which will be monitored from 2012 in terms of crop yield.
- Define the region (provinces or districts) which will be monitored in terms of crop acreage using satellite imagery
- Collection of the needed data (see below)
- An introductory session on field sampling is suggested.

*Data to be collected **in 2011**:*

- The crop yield statistics for the principal agricultural region at level of district for the last 10 years.
- The meteorological data (last 10 years if possible) for the regions to be monitored.
- The aerial photographic images taken in 2011
- The satellite imagery provided by the sensors TM, LISS3, SPOT or ALOS-AVNIR-2

Tentative schedule for E-AGRI events

Event	2011	2012	2013	2014
Progress meetings Who: **members of consortium plus the European Commission** What: **Project implementation progress** **Admin/consortium issues**	*Limited consortium meeting:* *Review of the project progress in 4 workgroups or* *Reinforce the communication aspects: dissemination of E-AGRI results in Africa. May be held together with other food security projects.* Autumn 2011, Brussels (EC)?	First Progress meeting Preferably jointed with CGMS expert meeting (JRC) When: March 2012 Where: *Morocco (?)* *Organizer: INRA*	Second Progress Meeting When: March 2012 *Where: The Netherlands* *Organizer: Alterra*	Final meeting When: Feb. 2014 *Where: Ispra* *Organizer: JRC*
E-AGRI workshops target: **Policy makers from ministries of agriculture, attachés of agriculture of EU, DG's INFSO, RTD,AGRI** Aim: **promotion and dissemination of European crop monitoring technology**		When: JUNE 2012 **Where: Beijing, China** **Organizer: CAAS** Technical promotion: Agro-meteorological modelling	October 2013 **Where: Kenya** **Organizer: DRSRS** Technical promotion: RS applications	
Training sessions in Aggro-meteorological modelling	CGMS set up Nov. 2011, China Organizer: Alterra	**BioMA Setup** **January Milan** **July China** **CGMS set up** **September Morocco**	**BioMA Piloting** ? Morocco ? China **CGMS Piloting** ? Morocco ? China	
Training In RS Applications	**Training at INRA** **October? 2011 (?)** In Rabat, Morocco	Training at VITO February-June September-November	To be determined	
Capacity building in Kenya	Introduction of field sampling December 2011 (?) Organizer: CAAS	Introduction of crop growth monitoring using agro-meteorological modelling	Training on crop acreage estimation combining aerial and Satellite data	

Annex 3: Workshop CGMS Set Up Action List

November 2-4, 2011, AIFER (Hefei, Anhui, China,)

Meteorological data must become available:

- Locations of meteo stations and attributes:
  - Only data from 3 stations within Anhui province (up to 10 when surrounding area <250 km is taken into account) can deliver data (freely available over internet).
- List of meteo variables needed:
  - TMAX
  - TMIN
  - RAIN
  - WIND
  - VAPOUR PRESSURE
  - SUNSHINE (optional)
  - CLOUD COVER (optional)
  - MEASURED RADIATION (optional)
- List of available meteo variables:
  - To be checked by AIFER
- Archive of daily meteo data (2000-2011, preferably 1990-2010):
  - Possibly archive data can be retrieved from the national meteorological office. Disadvantage: 10 daily aggregates and no near real time (NRT) deliveries. This involves extra work: disaggregation from 10-daily to daily weather.
  - If the availability of observed weather data is delayed, alternative ECMWF data could be used during set-up (later to be replaced by observed weather). JRC will be asked to grant the use of downscaled ECMWF reanalyses product for ANHUI grid cells (+/- 240). This is a very limited amount of the JRC ECMWF archive.
- Regular updates of the meteo data (daily or 10-daily):
  - It will be unlikely that daily data will become available in NRT during the project. At least with a 3 month delay.

Crop experimental data that must become available

- Observations of sowing date and phenology:
  - Dong Qinghan will contact CAAS (Chen Zhongxin) to request crop experimental data (phenology) from test sites in Anhui province.
  - Needed amount: 15 combinations of year / stations (for calibration: 3 stations, 5 years; for validation 2 stations, 5 years)
  - This seems feasible for Anhui province.
- Observations of yield, LAI, total biomass
  - Official statistical data of yield en total biomass are available.

Basic GIS data to be used:

- Soil map and attributes
  - Needed parameters: soil depth (rootable depth), porosity, field capacity and wilting point.
  - Possibly 1:500K map is available. Only available attribute is soil type according to Chinese classification. This would require a manual conversion to American

classification. Within Anhui province only a limited number of soil types are present. This might be feasible.
    - Fall-back solution = FAO 1:5M
- Map of regions of Anhui
    - Available
- Crop mask showing locations of crop types
    - Only a general crop mask for cereals is available.
    - There is little difference between crop specific masks within Anhui province, therefore the general crop mask will do.
- Regional statistics of crop yield and area

Crop calendar

    - Available

Setup a database system

- Access (well-tested, limited to 2Gb)
    - Available and good option during setup because of
    - Because area is limited (+/- 240 25x25km grid cells)
    - Because no station weather, only 10 years of ECMWF grid weather.
- ORACLE (well-tested but expensive & complicated)
    - Option when database is growing
    - Needed when extra data become available
    - Needed when system runs in operational mode (oracle packages and procedures).
- MySQL (free, easy, but not yet well-tested: can be done in e-AGRI)
    - A number of scripts, oracle packages and procedures would need to be converted or rewritten.

Anhui test site: EC deliverables

Anhui usability report: Inventory of usability of CGMS for Anhui:

1. Inventory of available data sources and their suitability for applying CGMS
    - See above
2. Inventory of factors explaining regional yield variability in Anhui: irrigation, fertilizer, disease, lodging (hard wind)
    - Allard de Wit will create a list of factors to be ranked by partners.
3. Inventory of technical constraints, e.g. is ORACLE available/usable for AIFER to work with
    - With implemented in Oracle: No constraints.

Moroccan test site: set-up the system

Meteorological data must become available:

- Classical interpolation approach OR AURELHY approach (only 10-daily temp, rain): Classical CMGS interpolation
- Archive of weather data (1990-2010): Available
- Daily or 10-daily updates of weather data: Daily updates available

Crop experimental data must become available

- Observations of sowing date and phenology: Available
- Observations of yield, LAI, total biomass: Available

Basic GIS data to be used:

- Soil map and attributes: Available EU 1:1M; possibly local soil map?
- Administrative regions of Morocco: Available
- Crop mask showing locations of crop types: Available

- Regional statistics of crop yield and area: Available

Crop calendar of Morocco

- One national calendar available.
- What about using GWSI method of finding season start and season duration, calibrated on national calendar? For example maize: FAO start = dekad 5. GWSI start =

Dekad	number of grid cells
5	9
6	5
7	108
8	16
9	11

Not so good in this case but with local calibration it could be improved. This example is based on a global 'calibration'

Setup a database system

- ORACLE (well-tested but expensive & complicated)
  - Available

Moroccan test site: EC deliverables

Morocco usability report: Inventory of usability of CGMS for Morocco:

1. Inventory of available data sources and their suitability for applying CGMS
2. Inventory of factors explaining regional yield variability in Morocco: irrigation, fertilizer, disease, heat damage
3. Inventory of technical constraints, e.g. is ORACLE available/usable for INRA to work with

Annex 4: Progress Meeting Minutes

November 23, 2011 JRC (Ispra, Italy)

Participants

- European Commission (DG-INFSO, EU): Ardiel Cabrera
- SDLO (Alterra, NL): Allard de Wit
- University of Milan (UMI, IT): Roberto Confalonieri
- European Commission (JRC, EU): Mohamed El Aydam
- INRA (Morocco, MO): Riad Balaghi
- Chinese Academy of Agricultural Sciences (CAAS, CN): Zhongxin Chen
- Anhui Institute for Economical Research (AIFER, CN): **not present (excused)**
- Jiangsu Academy of Agricultural Sciences (JAAS, CN): **not present (excused)**
- Ministry of Environment and Mineral resources (DRSRS, KE): **not present (excused)**
- VITO (BE) & coordination: Qinghan Dong

François Kayitakire, René Gommes, Javier Gallego, Amit Srivastatva and Stefan Niemeyer (from JRC), Simone Bregaglio (UNIMI), Sliman El Hani (INRA, MO).

Agenda (see annex)
Welcome addresses

- Welcome and information by **Stefan Niemeyer**
    - M. El Aydam will leave the action and the management of E-AGRI project from JRC side will be taken by Manola Bettio (this has to be confirmed)
    - S. Niemeyer mentioned that, while CGMS and BioMA are the property of the European Commission, JRC appreciates that the technology transfer of these tools is supported and executed in E-AGRI by the project partners Alterra, Vito, or Univ. Milano that are knowledgeable of the systems due to their long-standing scientific relationship with the MARS unit.
      As for the technology transfer, the property rights of the European Commission must always be respected. No software, data, or related tools must be distributed by the project partners or third party without prior informing the Commission and having received its approval.
- **Q. Dong** introduced the new project officer from DG INFSO. Mr Cabrera informed the consortium partners about his work at DG INFSO since July 2011 and the coming FP7 call (probably in January) which is in direct link with the current project, focusing on low cost technology transfer and use of ICT, Africa being particularly targeted.
  Mr Cabrera was already informed and briefed by Q. Dong about the E-AGRI project in Brussels before the meeting in Ispra.
- **Q. Dong** as coordinator of the projected gave a presentation to highlight the objectives of the project (focusing on the following dimensions: demonstration, dissemination, added-value for EU (increase of know-how) and collaborations), the three study areas (China, Morocco, Kenya) and the research angles of the project (yield and crop estimation). Mr. Dong

presented also all work packages highlighting the partners involved, the related methodologies and the main deliverables.

- WPs are :
    - WP1 - management (VITO).
    - WP2 – CGMS,
    - WP3 – BioMA,
    - WP4 – yield using Remote sensing,
    - WP5 – crop area estimation.
    - WP6 – capacity building in Kenya and it will particularly be built up at the later stage of the project. It will be carried out in close collaboration with AGRICAP, another FP7 project led by VITO.

Workgroup presentations and discussion:

WP1. Management

Q. Dong presented the status of the deliverables. Most of the deliverables due for the month 6 were available prior to this progress meeting except two deliverables (WP2). The status was notified to / agreed by the project official. Alterra will do the necessary to send them soon. The rules of deadlines for the interim reports were reminded: the consortium has each time 60 days after the year 1 and 2 of implementation to submit the report.
For the first implementation year ended on the 1st February 2012the report has to be delivered before 31st March 2012.
About the past E-AGRI events, all actions were conducted successfully:

- KO meeting in Mol
- workshop in Rabat on crop yield forecasting using remote sensing (WP4)
- workshop in Hefei (China, WP2).

About the Consortium Agreement (CA), a new version is now reviewed by the Legal Service of VITO after amendment requested by JRC.

M. El Aydam insisted also on the notion of the 'background' knowledge in viewpoint of JRC. Before receiving the final version of the CA to be signed, all partners should pay attention to the data use policy stated by JRC. Only interpolated meteorological data are made available from MARS database to be used within this project (that means the availability will be re-considered after the end of the project). The condition on the use of CGMS and BioMA tools are also revised by JRC.

WP2. CGMS

De Wit presented the status of advancement. The missing deliverables mentioned above will be sent as quickly as possible.

As the complete set-up for the Moroccan version of CGMS, named "CGMS_MA" is due for the end of the project: an alternative was proposed by De Wit to allow INRA to forecast crop yields in Morocco from 2012 growth season by using all existing infrastructure in CGMS (Europe), especially the CGMS statistical tool box. The forecasting will be, after the end of the project,

taken over by the CGMS_MA using Moroccan meteorological data, locally calibrated WOFOST model and the statistics from DSS.

WP3. BioMA

As the leader for this WP, R. Confalonieri (UMI) presented the status of advancement for wheat (Morocco) and rice (China) growth monitoring using BioMA approach. All deliverables scheduled in first 9 months were available (confirmed by Q. Dong) for this WP.

Mr Confalonieri explained also in detail his sensitive analysis. His study aimed to identify the most relevant parameters of WOFOST and CropSyst as first steps of calibration. The methodology is well-established: the sensitivity analysis is first performed under the potential conditions with no water limitation. The conditions of water limitation were added in a second stage as in all environmental modelling processes. The modelling approach was acknowledged by Alterra and JRC. INRA stressed the impact of rainfall, thus water-limitation conditions on crop yields (the rainfall could explain till 80% of the variability on yield). It is also important to calibrate the WOFOST model using the local weather stations data to integrate as much as possible the climatic specificities of the region. Allard (Alterra) confirmed that the inter-annual variability on yield can be “explained” by the calibrated parameters. Kayitakire also emphasized on the importance of including water limitation conditions in the modelling processes.

Concerning the ground data collection (experimental field observations) in the studied areas of China and Morocco, JAAS has done an excellent job in delivering detailed observation data beyond the initial planning. Four groups of varieties for rice have been identified in Jianghuai Plain and the management practices such as direct sowing or transplanting have been recorded.

Four wheat varieties have been identified for the study region of Morocco. Other wheat related data are from JRC agro-pheno structure database. Balaghi (INRA) commented on the importance of agro-ecological zoning in Morocco on crop varieties and yields.

Confalonieri (UMI) commented on the possibility to use the available data at INRA related to the impact of diseases on wheat. These data could be used to calibrate parameters of models.

A visit of UNIMI to INRA could be relevant for field data collection.

WP4. Yield estimation with remote sensing

R. Balaghi (INAR) presented the results obtained for Morocco (soft and durum wheat, barley) and China. Balaghi explained that for this type of research, Huaibei Plain with its 6 districts is rather too small. He suggested for this WP to extend the region of the interest to the neighbouring regions or even neighbouring provinces. Furthermore the statistical data at county level will be useful as well (to be added to the action list).

Balaghi also suggested using in this WP the facility of the CGMS Statistical Toolbox which should allow the inclusion of remote sensing indicators as predictors (to be added to the action list).

Allard (Alterra) commented on the possibility of correlation between the predictors issued of remote sensing.

Balaghi suggested also for statistical analysis to re-group the historical years into: good/average/ bad production years. The year 2010 is a good production year due to the abundance of rainfall. The remote sensing indicators showed saturation and the forecasting had to rely on the agro-meteorological modelling such as CGMS.

Question on the acceptable accuracy on yield forecasting (Dong): the answer by Balaghi is that the accuracy should stay above 90% to be credible. For Huaibei Plain, an accuracy of 90% can be achieved if the specific crop mask is available. Chen (CAAS) commented that the trials of CGMS application in China carried out within other projects show a forecasting accuracy around 90%.

Another specificity for forecasting using remote sensing on Huaibei Plain (remark from Balaghi), is the dekads selected for the regression analysis thus forecasting, varied from one district to another. It should further investigate this issue and to better fix the dekads used for prediction (*question: what are the data needed to fix the dekads? To be added to the action list*).

WP5. Area estimation with remote sensing

Z. Chen (CAAS) presented the results achieved in the study region in China, most related to the WP5. The field data collected in the study region in Morocco were sent after the meeting. No presentation on this part of work was available.
Many data on this study area have been collected. This includes the official statistical data on yield and acreage: at district level within Anhui province and at county level within Bozhou district. It would be interesting for the execution of WP4 to collect the statistics on the neighbouring districts, even within the neighbouring province such as Henan and Shandong (Balaghi's suggestion to the action list).
The phonological data have been assembled as well for the use of WP2. However Alterra would expect to collect the historical phonological data (last 5-10 years) from some experimental sites in the neighbourhood. CAAS promised to look for it (action list).
Concerning the WP5, the presentation was focused on the sampling method and sampling design. Five sampling schemes have been tested in the county of Mengcheng (which has 6000 km^2). For the winter wheat season, 12 frames have been surveyed. For the maize season 31 frames have been visited some of them twice.
The stratified systematic sampling delivered most efficient sampling results. An increasing number of strata led to a decrease of variance within each stratum
Comments were added by J. Gallego about the variance computing in case of systematic sampling. Furthermore when the same ground data are used for stratification and sampling, the efficiency of the systematic sampling (against random sampling) is often overstretched.
J. Gallego is now involved with DSS (Morocco) for area estimation. A first visit to DSS (Min. of Agriculture of Morocco) is planned mid-January 2012.Javier suggested some references to Chen:

GALLEGO, F.J. and DELINCÉ, J., 2010, The European Land Use and Cover Area-frame statistical Survey (LUCAS). In *Agricultural Survey Methods*, R. Benedetti, M. Bee, G. Espa, F. Piersimoni. (Ed.),pp. 151-168 (New York: John Wiley & sons).

Remote sensing and land cover area estimation - INT. J. REMOTE SENSING, 10 AUGUST, 2004,VOL. 25, NO. 15, 3019–3047
F. J. GALLEGO

Summary of action in 2012

This action list is a follow-up of the action lists agreed at the Rabat and Hefei workshops

No of deliverables	Task	Description	Partner Institutes	Action / Implementation	Deadline (Month)
D21.1	**Experimental databases**	**Field experimental / observation data related to the phenology and the field management practice**	**Alterra INRA AIFER**	**Alterra will send a question list to the local partners (in Morocco? and) on Huaibei Plain in China. CAAS will help Alterra and AIFER to collect historical phenological records in the agronomical experimental sites in the region. Alterra will look at the availability and the usability of phenological data in Morocco collected between 2001 and 2005.**	
D21.3	Regional statistic database	Databases have been collected	INRA AIFER	Report to be submitted in month 12 (January 2012)	12
D22.1 and 22.2	**Usability report and strategy report on CGMS adaptation for morocco**		**Alterra INRA**	**Status: partially delayed To be submitted as soon as possible *Scheduled in February?***	12
D23.1 and 23.2	**Usability report and strategy report on CGMS adaptation for morocco**		**Alterra AIFER**	**Status: partially delayed To be submitted as soon as possible *Planned in February?***	12
D31.2	Ground info database	Experimental observation data for different varieties of wheat in Morocco and rice on Jianghuai Plain in China. The targeted observation includes phenological parameters and the field management practice.	UMI / INRA / JAAS	The observation will last two years. The calibration will be fine-tuned during these years. JRC agro-pheno structure database can also be used as reference. *INRA will plan some new observation to fill the project database on will rely only on JRC agro-pheno database?*	**MS1 = month 24**
32.1	Sensibility analysis report	Application of BioMA on rice growth on Jianghuai Plain, China	UMI/JRC		12
32.2	Databases for		UNM/JRC	Databases need to be yearly updated	30

	parameterisation				
D41.1	**Databases on winter wheat yield for two study region**		**INRA AIFER CAAS**	**The yield data have been collected as planned. The empirical model can be established based on the collected data. However, there is always room for improvement. INRA asked AIFER and CAAS to help collected more yield statistical data on Huaibei Plain (in the neighbouring districts, province) if feasible.**	
D43.2	**Empirical models for yield forecasting**		**INRA AIFER**	**Investigate the dekads of biophysical variables used for regression on Huaibei Plain**	
51.1 and 51.2	Segment sampling DB and accuracy assessment report	Raster Database	CAAS INRA	Final version is due for the month 30. But it will be started in the year 1 and gradually updated.	30
61.1 62.2	**CGMS tool box**	**application of statistical analysis for use of yield forecasting**	**Alterra**	**Normally it is due for the Month 30 and 36. Now it will be available at month 14. Thus more updates and improvement possible. Integration of remote sensing indicators should be possible (possibility of testing multiple (combinations of) dekads??).**	

Updated schedule for E-AGRI events (Progress Meetings, E-AGRI Workshops and (on-site) training sessions)

event	2011	2012	2013	2014
Progress meetings **Who:** members of consortium plus the European Commission **What**: Project implementation progress Admin/consortium issues	*Limited consortium meeting: Review of the project progress in 4 workgroups or Reinforce the communication aspects: dissemination of E-AGRI results in Africa. May be held together with other food security projects.* Autumn 2011, Brussels (EC)?	2nd Progress meeting When: October /November 2012 Where: *Nanjing* *Organizer: JAAS* *To be combined with BioMA workshop*	2nd Progress Meeting When: September 2013 *Where: The Netherlands* *Organizer: Alterra*	Final meeting When: Feb. 2014 *Where: Ispra* *Organizer: JRC* *Or: Rabat* *Organizer: INRA*

<table>
<tr><td></td><td>First meeting 23rd Nov</td><td colspan="2"></td><td colspan="2"></td><td></td></tr>
<tr><td>E-AGRI workshops
target: Policy makers from ministries of agriculture, attachés of agriculture of EU, DG’s INFSO, RTD,AGRI
Aim: promotion and dissemination of European crop monitoring technology</td><td></td><td colspan="2">When: 2012? 2013? 2014?
Where: Beijing, China
Organizer: CAAS</td><td colspan="2">2013
Where: Kenya
Organizer: DRSRS
to be hold together with other projects such as AGRICAB</td><td></td></tr>
<tr><td rowspan="7">Training sessions in Aggro-meteorological modelling</td><td rowspan="7">CGMS set up
Nov. 2011, Hefei, China
Organizer: Alterra</td><td colspan="2">BioMA Setup</td><td colspan="2">BioMA Piloting</td><td rowspan="7"></td></tr>
<tr><td>??</td><td>JRC (Marchello?)</td><td>?</td><td>Morocco</td></tr>
<tr><td>October</td><td>China</td><td>?</td><td>China</td></tr>
<tr><td colspan="2">CGMS set up</td><td colspan="2">CGMS Piloting</td></tr>
<tr><td>September</td><td rowspan="2">Morocco</td><td>?</td><td>Morocco</td></tr>
<tr><td></td><td>?</td><td>China</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Training In RS Applications</td><td>Training at INRA
October, 2011
In Rabat, Morocco</td><td colspan="2">Training at INRA-DSS and VITO
Spring 2012

Introduction of field</td><td colspan="2">To be determined</td><td></td></tr>
</table>

		sampling 2012 Organizer: CAAS To be confirmed		
Capacity building in Kenya		Introduction of crop growth monitoring using agro-meteorological modelling	Training on crop acreage estimation combining aerial and Satellite data	

Annex: Agenda of the Day

Progress meeting – 23rd November 2011
JRC –Ispra (Italy)

Programme

9.00 – 9.15	Welcome address O. Léo (MARS Head of Unit) and/or S. Niemeyer (AGRI4CAST Action Leader)
9.15 – 9.45	Presentation of E-AGRI partners and E-AGRI project Q. Dong (VITO/ project coordinator) –
9.45 – 10.00	WP1 presentation / VITO
	Coffee break
10.30 – 10.45	WP 2 presentation / Alterra
10.45 – 11.00	WP3 presentation / UNI/JAAS/JRC
11.00 - 11.15	WP4 presentation / VITO/INRA
11.15 – 11.30	WP5 presentation / CAAS/VITO
11.30-12.30	Questions/Discussion (Moderator: Q. Dong)
12.30 – 13.45 lunch (JRC / piccola mensa)	
Meeting restricted to E-AGRI partners	
13.45 - - 15.30	Discussion on interim report and deliverable (15 min / WP) Moderator: Q. Dong
	Coffee break
15.00 –	Discussion Near term actions (action list) and next events/meetings
17.00 End of meeting	

Annex 5: Workshop on statistical tool held at Kenitra from February 15 to 17, 2012 (Report)

Introduction

The picture below shows all the participants as well as the undersigned. We were received very nicely by Mr Hassan Benaouda (shown on the right), manager of the "Centre Regional de la Recherche Agronomique" at Kenitra, Morocco. The venue was the building of the "Unité de Recherche sur l'Amélioration et Conservation des Ressources Phytogénétiques". During the three days, Mr Benaouda took very good care of us as far as food and drinks were concerned.

Programme

Day 1

On this day, the web viewer was introduced. It is a web application hosted on a web server in Wageningen: http://www.marsop.info/glw/bin/webviewer.html. Each participant was given a username and password. In all, the participants were asked to do 7 exercises with the web viewer, which were all meant to make the participants familiar with the available data and the various options to retrieve, visualise and analyse the weather indicators in the form of maps and graphs and the effect of the weather on the crop indicators. All exercises pertained to Morocco and during the day the focus gradually from the

technological possibilities to the relevance of the web viewer for crop yield forecasting in Morocco. In the last exercise, the bulletin of 2011 was discussed. The presentation with the exercises can be found on the E-AGRI FTP site under folder /Morocco/Training_Feb_2012/Day1

Day 2

On this day, the CGMS Statistical Tool or CST was dealt with. Some of the participants had difficulties with installing the tool on their computers. Those difficulties were mainly issues related to the fact that Windows is now 64-bits whereas the CST is still a 32-bits programme. In all, the participants were asked to do 3 exercises with the CST which were meant to enable the participants to carry out time trend analysis, to analyse data availability, to detect anomalies in the data, to carry out regression analysis, to select the best model and to arrive at a forecast based on that model. In addition, there was an exercise that was meant to enable them to carry out scenario analysis. This involves a principal components analysis (PCA) on the indicator data. On the basis of the results of the PCA, a number of similar years are identified and the realised yields for those years are then used as a basis for a forecast for the current year. The presentation with the exercises can be found on the E-AGRI FTP site under the following folder: /Morocco/Training_Feb_2012/Day2.

Day 3

On day 3, we continued with the CST. The participants were asked to finish their work on the exercises. An example was included that demonstrated how yield forecasts can develop over time (regression and scenario analysis). This was very useful for our understanding. It showed that during the cropping season, the accuracy of the regression forecast increases until a certain date. After that date, the accuracy of the forecast did not improve further. This can be considered as a general pattern. For the scenario analysis – as it has been implemented in the CST – the accuracy of the forecast did not improve over time.

In addition, we had a look at the software that is available for running the WOFOST crop model – i.e. the WOFOST Control Centre. It was explained that with WOFOST a simulation is done for a specific point location. With the CGMS programme, in effect the same WOFOST model is applied but then for grid areas. In order to obtain reliable results with CGMS, WOFOST will have to be used first to calibrate the model for various locations across the country. The files needed for carrying out the exercises can be found on the E-AGRI FTP site under the folder /Morocco/Training_Feb_2012/Day3.

Lessons learnt

During the training we had a lot of fruitful discussions. The following things were learnt:

Within Morocco, the meaning of the administrative units in NUTS Level 1 is very limited. Before Mr Riad Balaghi already proposed to group the provinces into agrozones; within each of these zones more or less similar conditions can be found

Difference between map of long-term rainfall as obtained from webviewer and map shown by Tarik El-Hairech. Rainfall sums from the viewer are a lot higher than those observed at the meteorological stations, even when the crop mask is applied.

The bulletin of last year was used in one of the exercises. It was produced by Riad Balaghi and Mohamed El Aydam. It included a paragraph stating that a longer vegetative cycle would affect yields favourably. This is the case when rainfall is high, as was the case during the time the bulletin was released. Otherwise, radiation in Morocco is always enough. Rainfall and heat after March are rather the phenomena posing constraints to yield development.

So far, the CST has not been tested sufficiently. In fact, it has been used by Alterra and JRC only to a limited extent so far, with only few indicators. In fact, the participants did a good job in testing the software: several bugs were found in CST. These will be fixed in the foreseeable future.

Major installation problems were encountered by those having Microsoft Office 64-bits installed on their computers. Conclusion is that there is the need for a 64-bits version of the CST for those users.

Even for those with Microsoft Office 32-bits installed, it seemed to be impossible to add an extra data source – also known as ODBC link – in the ODBC Data Source Administrator. However, this was sorted out and solved by Alterra in Wageningen.

Yields obtained in 2011 in the various provinces were not yet added to the database, because they were made available at a late point in time. Remote sensing indicators (NDVI and DMP) were highly correlated to official yields at both national and NUTS levels. However, the crop indicators were not correlated to cereal yields for Morocco, most likely because they are based on sowing dates valid for Europe. Hence, there is a need for WOFOST calibration.

Epilogue

Special thanks to Mr Riad Balaghi for organising the training. We look forward to cooperating further. Since the return of the undersigned to Wageningen, one the most important bugs in the CST has been fixed. Moreover, the NUTS level 1 in the database of the CST has been replaced by the AgroZone level. Crop and remote sensing indicator data have been made available for this level as well as for the provincial level. NDVI data based on NOAA / AVHRR – available for the years since 1982! - were also made available in the database. More bugs of the CST will be fixed in the foreseeable future.

Anne

Use of Resources

Period 1 (1 - 12)
(01-02-2011 - 31-01-2012)

Project Number	270351	Project Acronym	E-AGRI

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 1 for the period.
VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V.

Work Package	Item description	Amount in €	Explanation	Free Text
WP42	Personnel costs	28,293€	4 persons, 2.8PM	3 researchers, 1 IT support
WP42 WP44	Other direct cost	330€	Travel, Prague, 1 person	20/06/2011 - 24/06/2011
WP44 WP42	Other direct cost	3,448€	Travel, Anhui, 1 person	1/8/2011 - 11/8/2011
WP44 WP42	Other direct cost	1,647€	Travel, Rabat, 2 persons	11/10/2011 - 15/10/2011
WP42 WP44	Other direct cost	2,824€	Travel, Anhui, 1 person	27/10/2011 - 8/11/2011
WP42 WP44	Other direct cost	93€	Asus EeeSlate EP121-1A013M	
WP42 WP44	Other direct cost	946€	Storage capacity	Internal Rent
WP42 WP44	Other direct cost	250€	Canon Powershot SX230HS	
WP44	Personnel costs	28,293€	4 persons, 2.8PM	3 researchers, 1 IT support
WP71	Personnel costs	3,736€	4 persons, 0.4 PM	1 researcher, 2 IT support, 1 coord support
WP10	Personnel costs	26,730€	4 persons, 2.7 PM	2 researchers, 2 supporting staff
WP10	Other direct cost	87€	meeting PO brussels	2 persons
WP10	Other direct cost	708€	progress meeting E-AGRI, ISPRA	1 person
WP10	Other direct cost	3,114€	KO meeting, Mol	cost regulation partners
WP10	Other direct cost	780€	DHL	
WP10	Other direct cost	974€	meeting accomodation, bread lunch, diner	KO meeting
	Indirect costs	66,159€		
	TOTAL COSTS	168,412€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 2 for the period.
STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK

Work Package	Item description	Amount in €	Explanation	Free Text

1

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Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 2 for the period. STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP22	Personnel costs	2,290€	Researcher Franke / 0.41 PM	
WP23	Personnel costs	2,290€	Researcher Franke / 0.41 PM	
WP61	Personnel costs	4,628€	Researcher Hoek / 0.82 PM	
WP71	Personnel costs	5,052€	Researcher Wijngaart / 0.91 PM	
WP22	Personnel costs	682€	Researcher Wijngaart / 0.12 PM	
WP23	Personnel costs	682€	Researcher Wijngaart / 0.12 PM	
WP71	Personnel costs	5,714€	Researcher de Wit / 0.91 PM	
WP22	Personnel costs	3,657€	Researcher de Wit / 0.58 PM	
WP23	Personnel costs	3,743€	Researcher de Wit / 0.60 PM	
WP22	Personnel costs	615€	Researcher Franke / 0.11 PM	
WP61	Personnel costs	4,521€	Researcher de Wit / 0.71 PM	
WP62	Personnel costs	2,351€	Researcher Hoek / 0.44 PM	
WP22	Other direct cost	159€	Travel 24/3-25/3 2011 Wijngaart Belgium	
WP71	Other direct cost	1,675€	Travel 1/11-5/11 2011 Wijngaart China	
WP62	Other direct cost	967€	Travel 11/10-15/10 2011 Hoek Morocco	
WP71	Other direct cost	1,753€	Travel 31/10-06/11 2011 de Wit China	
	Other direct cost	380€	Travel 21/11-23/11 2011 de Wit Italy	
	Indirect costs	21,736€		
	TOTAL COSTS	62,895€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 3 for the period. UNIVERSITA DEGLI STUDI DI MILANO				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP31	Personnel costs	419€	Senior Researcher	0.1mm
WP34	Personnel costs	9,410€	Senior Researcher	2.9mm

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Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 3 for the period. UNIVERSITA DEGLI STUDI DI MILANO				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP31	Personnel costs	407€	Junior Researcher	0.3mm
WP32	Personnel costs	33,154€	Junior Researcher (2p)	20mm
WP31 WP32 WP33 WP34	Other direct cost	292€	KO meeting, Mol, 2p	23/3/2011 - 24/03/2011(lunch & travel)
WP31 WP32 WP34	Other direct cost	111€	Progress meeting, Ispra, 2p	23/11/2011 (lunch & travel)
WP34	Other direct cost	52€	meeting with JRC	6/12/2011 (lunch & travel)
WP34	Other direct cost	78€	meeting with JRC	21/12/2011 (lunch & travel
WP32 WP34	Other direct cost	1,118€	Hardware/50% project-related/7 months depreciation	3 laptop, 5 dekstop, 1 projector
	Indirect costs	27,024€		
	TOTAL COSTS	72,065€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 4 for the period. JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP32 WP34 WP71	Personnel costs	39,190€	Researcher 2p	0.46 + 6.71 mm
	Other direct cost	1,107€	Mission 523191	Kick off Meeting
WP32 WP34 WP71	Personnel costs	3,783€	Researcher 1p	0.57mm
WP71	Other direct cost	1,274€	Missions 566024, 582854	E-Agri Workshop
	Indirect costs	27,212€		
	TOTAL COSTS	72,566€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 5 for the period. INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP25	Personnel costs	7,200€	2 researchers, 0.6PM	
WP31	Personnel costs	10,080€	1 researcher, 1.7PM	
WP43	Personnel costs	17,280€	2 researchers, 1.5PM	
WP54	Personnel costs	37,260€	5 researchers, 1.4PM	
WP62	Personnel costs	1,800€	1 researchers, 0.3PM	
	Other direct cost	1,033€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 5 for the period. INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
			KO meeting, Mol, 1 person	24/03/2012 - 25/03/2012
WP25	Other direct cost	857€	training MARSOP and CST tools	
WP43	Other direct cost	7,050€	workshop : crop yield forecast with RS	
	Indirect costs	49,536€		
	TOTAL COSTS	132,096€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 6 for the period. Institute of Agricultural Resources and Regional Planning CAAS				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
~~WP71~~ WP51	Personnel costs	24,000€	1600 hrs	junior researcher
WP51 WP52	Other direct cost	1,929€	KO meeting, Mol, 1 person	21/03/2011 - 28/03/2011
WP51 WP52	Other direct cost	2,741€	Progress Meeting, Ispra, 1 person	13/11/2011 - 26/11/2011
WP51 WP52	Other direct cost	534€	Annual Progress meeting, Beijing, 10 persons	31/10/2011 - 31/10/2011
WP51	Other direct cost	7,877€	Field Survey	
WP52	Other direct cost	84€	Removable HD (depreciation)	
WP52	Other direct cost	72€	Portable Computer (depreciation)	
WP52	Other direct cost	5,370€	Alos/SPOT5/Landsat TM Images	
WP52	Other direct cost	114€	GPS (depreciation)	
	Subcontracting	504€	workshop catering	
WP52	Personnel costs	17,600€	880 hrs	exp researcher
WP71	Personnel costs	6,000€	200 hrs	senior researcher
	Indirect costs	39,792€		
	TOTAL COSTS	106,617€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 7 for the period. Anhui Institution for Economic Research				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP21	Personnel costs	15,120€	3 persons, 2.4 PM	senior researchers
WP21	Other direct cost	4,193€	Travel, KO meeting	21/03/2011 27/03/2011

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 7 for the period. Anhui Institution for Economic Research				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP21	Other direct cost	3,257€	Ground data, survey	
WP21	Other direct cost	659€	GPS, laptop for field survey	
WP71	Personnel costs	4,200€	4 persons, 1PM	junior researchers
	Other direct cost	6,862€	Workshop Heifei	
	Indirect costs	3,864€		
	TOTAL COSTS	38,155€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 8 for the period. JIANGSU ACADEMY OF AGRICULTURAL SCIENCES*JAAS				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
WP31	Personnel costs	15,120€	senior researcher	504 hrs
WP31	Personnel costs	4,200€	junior researcher	210 hrs
WP31	Other direct cost	1,902€	KO meeting, mol, 1 person	21/03/2011-28/03/2011
WP31	Other direct cost	2,075€	ground data acquisition cost	
WP31	Other direct cost	721€	Equipment (LAI-2200)	Plant Canopy Analyzer /depreciation
WP31	Other direct cost	179€	DHL, supplies for data acquisition	
	Indirect costs	4,839€		
	TOTAL COSTS	29,036€		

Table 3.1 Personnel, subcontracting and other Major cost items for beneficiary 9 for the period. MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES				
Work Package	**Item description**	**Amount in €**	**Explanation**	**Free Text**
	Indirect costs	0€		
	TOTAL COSTS	0€		

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PROJECT PERIODIC REPORT 2

Grant Agreement number:	**270351**
Project acronym:	**E-AGRI**
Project title:	**Crop Monitoring as an E-agriculture tool in developing countries**
Funding Scheme:	**Collaborative project – International collaboration project (STREP/SICA)**
Date of latest version of Annex I against which the assessment will be made:	**2013-05-10**
Periodic report:	**2nd (V1.4)**
Period covered:	**2012-02-01 to 2013-01-31**
Name, title and organisation of the project's coordinator	**Dr. Qinghan Dong** **VLAAMS INSTELLING VOOR TECHNOLOGISH ONDERZOEK** **Tel: +32-14-336856** **Fax: +32-14-322795** **E-mail: qinghan.dong@vito.be**
Project website:	**http://www.e-agri.info**

Declaration by the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [3]:

  ☐ has fully achieved its objectives and technical goals for the period;

  ☐ **X** has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ☐ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable

  X is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: ...Qinghan Dor .....

Date: .....10...../ ....05...../ ....2013.....

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism.

[3] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

3. Publishable Summary

3.1. Introduction

Agriculture is one of the most important domains to which the European Union (EU) exercises the direct competence via its Common Agricultural Policy (CAP) and dedicates an important part of its resources.

Throughout the participation of different programmes for establishing the monitoring capabilities of CAP implementation, VITO and other collaborative institutions have been developing series of technologies for assessing the crop yield as well as for estimating the crop acreage.
The technologies have essentially been developed in **three domains:**

4. Crop monitoring using space based information to monitor the crop growth status and predict the crop yield. The approach takes advantage of the earth observation information provided by satellite sensors.
5. Crop monitoring can also be carried out by agro-meteorological modelling. The system CGMS (for Crop Growth Monitoring System) was developed following this approach. It allows accurate and timely crop yield forecasts for the 27 member states and other strategic areas of the world. More recently, simulation capacities in terms of models and components have been extended to a multi-model platform BioMA which has extra capability of simulating rice cropping system, for example.
6. In terms of crop area estimates, test pilot approaches using area frame sampling and remote sensing has been developed in Europe. VITO and its partners are still developing and validating the methodologies in the selected developing countries.

3.2. Objectives and structure of the project E-AGRI:

The project ahs the following objectives:

- **To transfer, adapt and demonstrate the European MARS Crop Yield Forecasting system for *wheat* cropping monitoring in HUAIBEI/Jianghuai plains of China and Morocco.**
- **To transfer, adapt and demonstrate the European BioMA platform , using the ensemble of models for *rice* cropping monitoring in Jianghuai plain (Jiangsu province, China) and *wheat* monitoring in Morocco.**
- **To assess the crop acreage using area frame sampling and remote sensing in HUAIBEI Plain and in Morocco.**
- **Creating a network for potential users of CGMS and BioMA platforms to obtain valuable feedback on system applicability.**
- **To liaise other European crop monitoring activities such as GMFS, and contribute to strengthen European agricultural intelligence at world-wide level.**

The project entails a research and development (RTD) component and a demonstration (DEMO) component. The RD tasks aim to adapt European technologies to local agro-environmental conditions and to develop and integrate additional peripheral components if the local stakeholders' needs arise. The DEMO activities will measure locally the effectiveness of the transferred technologies through an establishment of users' networks. Finally a capacity building activity specifically designed for East Africa will be organized in Kenya, to pave the way for a further technological transfer.

3.3. Expected achievement

The implementation and achievement of the project should allow the local partner organization to build up their own knowledge and experience on using European crop monitoring technologies. Practically, at the end of the implementation, the local partners would acquire the know-how, on the piloting level, on the key crop monitoring components (for example, CGMS or BioMA platform) that are transferred by the European partners. That means, once the availability of local input (most importantly, the real time weather data) can be maintained by the local experts, the operation of these crop monitoring systems will be sustained. The success of the project will be reflected by the locally adapted versions of European crop monitoring technologies.

Based on the acquisition of these ITC knowledge, the local experts would be able to advise more adequately the local agriculture policy makers on the issue of food security and the agro-commodity trading.

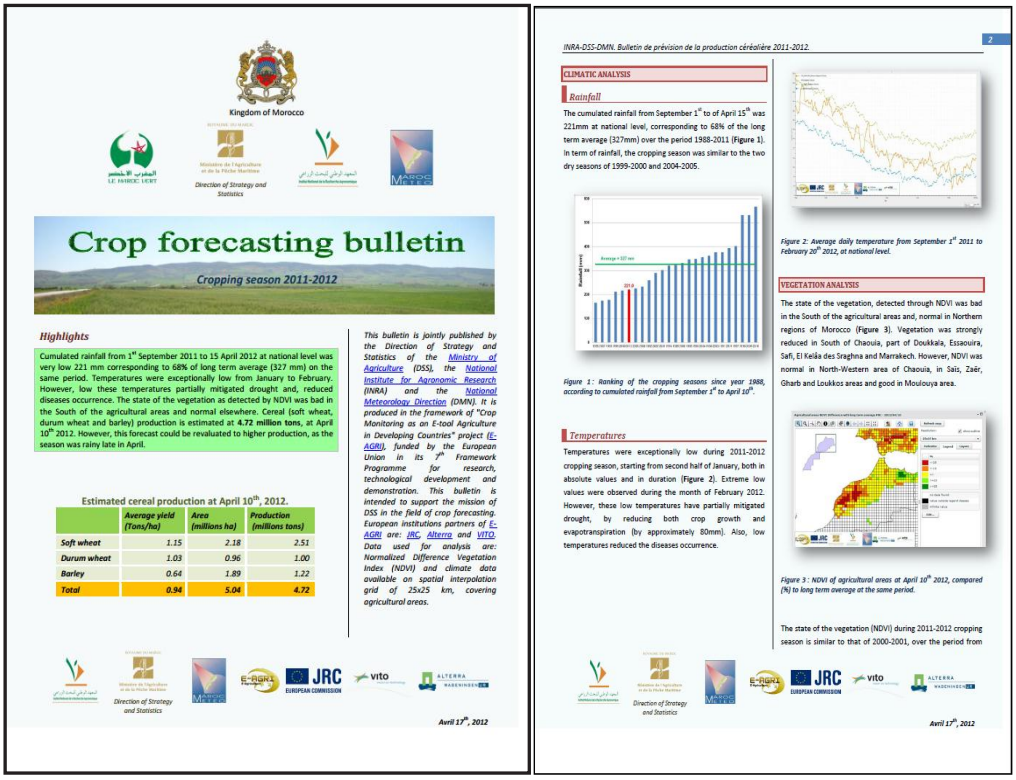

Figure 1: First crop yield forecasting bulletin for Morocco based on E-AGRI methodologies.

On the other hand, the feedback of European technological transfer will with no doubt, improve the applicability and robustness of these technologies. In the special case of the rice, although this staple food is consumed by half of world population, the rice production monitoring is not closely followed by European institutions. the research results from this project can be readily disseminated and fill the gap at the European level.

3.4. Project's web-site

The project established three web sites. The general site (http://www.e-agri.info) has objective of disseminating the project outcome (Figure 2). The web site has been updated regularly. A major update occurred in February 2013.

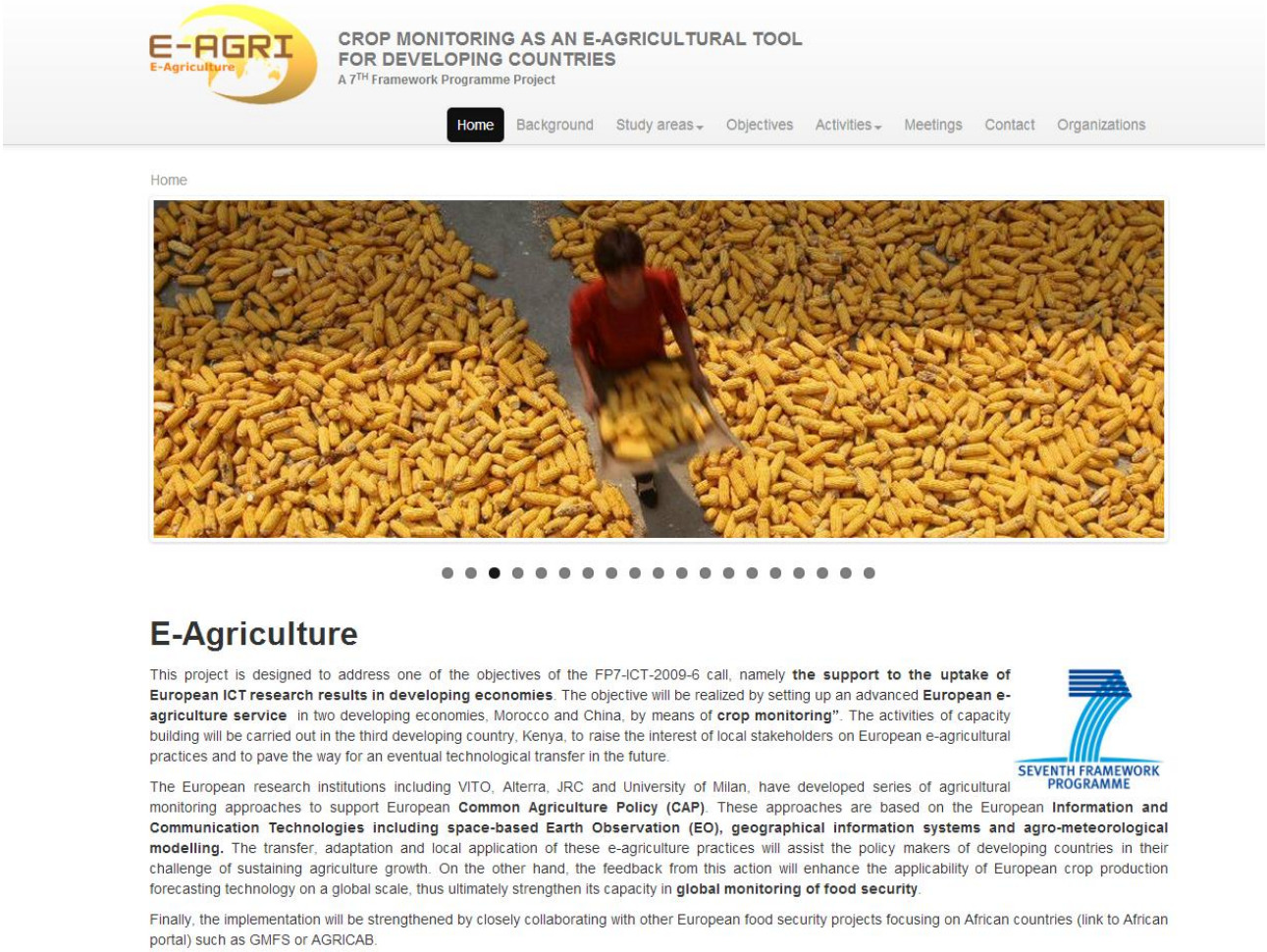

Figure 2: Project's web site (www.e-agri.info) screen capture

4. Objectives, work progress and project management

4.1. Project objectives for the period

The objective of this second implementation year is to further deploy the transfer and adaptation of European crop monitoring technologies. For the component of the CGMS monitoring system (WP2), the objective was to achieve the implementation of level 1 and start to implement the level 2. Regarding the implementation of the BioMA platform (WP3), the goal was to complete the construction of the databases for the situ variables in Jianghuai Plain (rice) and in Morocco (wheat), to complete also the calibration process for three principal models contained in the BioMA platform. On the domain of crop monitoring and yield forecasting using remote sensing indices, while the first empirical models were established during the first year, the objective of this second year was to improve the predictive model at the prefecture, and agro-ecological zones level. New predictors will be tested especially for the Huaibei plain, where the prediction models were not very robust. Regarding the crop area estimation the goal was to improve the estimation using satellite imagery for the study region of Morocco and improve the efficiency of area frame sampling in Huaibei Plain. Improving the suitability of the CGMS statistical Toolbox to different operational systems was the objective for the WP6. The dissemination activities (WP7) were to be developed especially orienting to the general public, academic world, the stake holder community and collaborative projects. The dissemination activities are reported especially in a dedicated deliverable D71.5, updated prior to each periodic review.

4.2. Work progress and achievements during the period

The implementation of the project was further carried out according to the Description Of Work (DOW). Moreover new activities (not scheduled in DOW) have been added to ensure the completeness of the research and to improve the user friendly aspect of the transferred technologies.

Most tangible achievements are summarized below:

- Develop a CGMS system (CGMS_MAROC) adapted to the Moroccan local conditions:
    - INRA Morocco and SDLO have successfully managed to bring the local meteorological agency (DMN) on board for the project implementation, although it does not officially take part of the E-AGRI consortium. The joined effort from the local meteorological scientists offered the possibility to use the real-time meteorological data from local ground stations, instead of the simulated climatic data, planed initially. The spatial interpolation of the meteorological grid took also advantage of the local adapted algorithms.

- The most important ”mismatches“ between the European model and local agricultural conditions, which led to the underperformance of the European CGMS in Morocco, are identified. New parameterization (at levels of phenology, water balance and soil distribution) allows a much better performance of the simulation. At the end of the second implementation year, the CGMS_MAROC achieved its Level2 deployment.
- SDLO developed a new E-AGRI web viewer which allows the end-users to monitor the crop conditions at daily basis.

- Extensive collection of ground *in situ* data in JiangHuai Plain (China) enabled to achieve the calibration of BioMA platform for rice growth simulation using its three embedded models. The platform for rice monitoring is transferred to the local partner for further evaluation The collection of the ground *in situ* parameters for wheat started later, but the field experiment, meticulously planned, enabled to collect a wide range of physiological and phenological data. The first calibrations were achieved. A new algorithm simulating the interaction between the wheat and pathogens was developed following the request of local partners. This activity was not planed in the DOW.
- The most important driver for wheat yield trend on Huaibei Plain is identified as the increasing use of chemical fertilizer. This factor is incorporated into the yield prediction model based on remote sensing indices. The resulted prediction models achieves validation with a high accuracy.
- A combination of area frame sampling in combination with satellite data are shown to be the best approach for crop area estimation. The added value for using remote sensing is particular pronounced in Morocco.
- The statistical tool box (CST) is adapted for whole Morocco, running on the different operation systems (Windows XP, WIN 7)
- The activities in Kenya have started, by co-organizing a Kenyan National Workshop in Nairobi (Fig. 3).

Fig. 3 The Capacity Building workshop was held between 25-29 in Nairobi, Kenya

- The coordination of the project accepted an invitation from EURONEWS to produce an episode of documentary TV series reflecting European ICT research. Unfortunately, the plan was dropped in the very last minutes. The coordinator has also responded the invitation of DG-AGRI of the Commission in January 2013 to brief the progress of project and agreed to give a more comprehensive lecture on crop monitoring in May 2013.

The following tables provide more details on the progress realised within each work-package.

WP 21: Ground observations and data collection	
Summary of objectives and progress	The objective of this work-package is to collect and build datasets needed for the calibration /implementation of CGMS at level 1&2. The official statistical data in terms of yield, acreage or production at the regional level are needed to be updated. The main progress can be summarized as following: For both Morocco and Anhui regional statistics have been collected showing the yield variability over the last 10 years. Experiment data suitable for crop model calibration have been provided by the partner INRA. These datasets consist of phenological observations, yield and crop height for several cultivars of soft-wheat and durum-wheat for the 2001, 2002, 2003 and 2004 growing seasons. These datasets have been processed by SDLO and used as input in the deliverable D22.2. Furthermore, time-series of measurements on wheat cultivars for the 2012 growing season collected in the frame of WP31 will help to improve the CGMS calibration in Morocco. Experiment data for crop model calibration in Anhui have so far been limited to phenological observations made at crop experimental stations made available by partner AIFER.
Second year objectives • Updating the official statistics in both study regions • Updating the ground meteorological data collection • Updating the ground phenological and other agronomic datasets for monitored crop, eventually identify the most relevant drivers for crop yield	**Significant results** • Regional statistics are updated for the test sites in Morocco and Anhui (INRA and AIFER) • Meteorological data are updated in Morocco thanks to the involvement of National Meteorological Department (INRA). • Climatic data are updated from the 15 ground stations homologated by the WMO for Huaibei Plain (AIFER). • An alternative by using NOAA-GSOD real-time data has been investigated (SDLO) • The agronomic and especially phenological data in Morocco are updated using newly collected field data • New phenological data have been collected with by establishing a new partnership with a local research organisation in Huaibei area (AIFER)
Deviations from DOW and impact	• The real-time meteorological data are not accessible for Huaibei Plain, an alternative of using NOAA-GSOD is investigated, with success. • Phenological data collection for the Huaibei site has so far been limited

Reasons for failing to achieve critical objectives	Although China has an excellent network of agro-meteorological stations the reason why this data is difficult to obtain (even for Chinese researchers) is often unclear. This has been observed before already in other projects with Chinese partners.
Use of resources	Person-months actual / planned: see Form C • INRA: 3.5/ 3 man-months • AIFER: 6/9 man-months
Corrective actions	AIFER has established a new partnership with a local agricultural research institute to collect the more advanced data.
Planning for the 3rd year	Collection of both meteorological and agronomic data will be continued in the third year. This will improve calibration of CGMS system in the WPs 22 and 23.

WP 22: CGMS adaptation Morocco	
Summary progress and objectives	The objectives of this WP is to adapt and implement the Crop Growth Monitoring System for Morocco. At the end of the project CGMS should be available for operationally monitoring the growth of soft-wheat and durum-wheat in Morocco and provide indicators that can be used for forecasting of the final crop yield. The adaptation and implementation of the CGMS for Morocco (MA_CGMS) is progressing well. An implementation of CGMS has been realized at the Direction de la Météorologie Nationale. This institute is cooperating with the Institut National de la Recherche Agronomique (partner INRA) and the Moroccan Statistical Office. Currently the CGMS level 1 (weather data collection) is fully operational and is two to three days behind real-time. The CGMS level 2 (crop simulation) is now fully implemented in MA_CGMS and the crop simulation results are currently being evaluated for consistency.
Second year objectives • Operational implementation of the CGMS level1 which includes: 1. The ingestion and quality control of meteorological data in the CGMS database 2. Deriving of the coefficients for estimating global radiation from ancillary meteorological variables. 3. Interpolation of observed weather data to a gridded product as defined by the CGMS grid. • Set up of the CGMS level 2 (crop simulation) including : 1. Calibration and improvement of the WOFOST crop simulation model for	**Significant results** • The algorithms for deriving global radiation for the level 1 have been calibrated using reference radiation values from LandSAF. The latter provides are high quality radiation estimates derived from Meteosat Second Generation (see: http://landsaf.meteo.pt/) • MA_CGMS level 1 is fully operational which includes daily ingestion of incoming weather data, quality control and interpolation to the MA_CGMS grid. • The CGMS Strategy report (deliverable D22.2) has been used to define the CGMS level 2 implementation in Morocco, with considerable improvements in the correlations with reported yield at regional level.

Moroccan wheat varieties (D22.2). 2. Definition of the cropping calendars for Morocco • Start the design and implementation of the E-Agri viewers with demo for Morocco	• The soil map and associated soil parameters have been provided by the Moroccan partners for the most important agricultural areas of Morocco. This soil map has been merged with the European soil map in order to provide complete coverage for Morocco. • The CGMS level 2 (crop simulation) is now fully implemented in MA_CGMS and the crop simulation results are currently being evaluated for consistency. • First prototype of the E-Agri viewer for Morocco is available.
Deviations from DOW and impact	None, after delivering the delayed strategy report the work has been picked up and is on schedule. Beyond the work described in the DoW, work on the E-Agri viewers was started resulting in a first prototype of the system.
Reasons for failing to achieve critical objectives	None
Use of resources	Person-months actual / planned : see Form C SDLO: 7.3/9 Man-Months
Corrective actions	None
Planning for the 3rd year	***April/May***: Consistency checks of the CGMS level 2 and final implementation to run operationally [INRA, SDLO] ***June/July***: Implementation of the aggregation schemes for aggregating indicators to regional level (districts, provinces, agrozones). This is needed for preparation of the CGMS level3 (WP6). [INRA] **July**: Tested and semi-operational E-Agri viewer for visualising meteorological data. [SDLO] **July-January**: Piloting phase for Morocco CGMS (WP2.5) [INRA, SDLO]

WP 23: CGMS adaptation Anhui, China	
Summary of objectives and progress	Objectives of the WP2.3 are to evaluate the usability of CGMS for Anhui (China) and to assist in setting up and adapting CGMS for Anhui in cooperation with partner AIFER. Finally, the CGMS for Anhui must be evaluated. Progress in the implementation of CGMS for Anhui (China) is relatively slow compared to the Moroccan test site. In the CGMS usability report (D23.1) it was already noticed that the lack of real-time meteorological data is a show-stopper for application of CGMS in Anhui. To tackle this problem SDLO provided scripts that obtain real-time meteorological data from the NOAA Global Summary of the Day (GSOD[4]) service. These scripts have been tested

[4] https://www.ncdc.noaa.gov/cgi-bin/res40.pl?page=gsod.html

	at the CGMS Anhui database at SDLO and demonstrated to work well. So far these scripts have not been implemented for operationalizing the CGMS level 1 at AIFER due to technical constraints in the ICT environment at AIFER. The CGMS strategy report for Anhui has been delivered demonstrating that winter-wheat yield variability, yield level and yield trend in Anhui province are the results of a complex, often interrelated set of factors including weather, disease, pests, cultivar changes and crop management. Particularly the factors related to disease, pests and cultivar changes are difficult to take into account in a biophysical model and with limited data. Therefore the prospect of reproducing the historic yield variability with CGMS is not very good due to missing limiting factors. Given the already slow progress in CGMS implementation it was concluded that less attention should be paid to getting the best possible CGMS crop simulations. Instead, agro-meteorological indicators must be defined to estimate the impact of disease and pests and implement these in the E-Agri viewers and the CGMS level 3. Moreover, remote sensing based indicators in the CGMS level3 tool may be relevant as these indicators may better reflect the actual situation at the field and may thus better quantify the impact. In terms of setting up the CGMS level 2, a preliminary calibration of the winter-wheat cultivars in Anhui has been accomplished by adjusting the WOFOST parameters to reproduce the observed phenological stages and by adjusting parameters related to assimilation and temperature. Moreover, the spatial distribution of the sowing dates for the Huaibei plain has been defined based on observed sowing dates at several agro-experimental stations in Anhui.

Second year objectives	**Significant results**
• Complete the CGMS level1 (weather data processing) for Anhui: 1. Provide a solution for the availability of station weather data in Anhui. 2.Allow semi-operational weather data processing and interpolation to the grid • Assess the main drivers of yield variability in Anhui and provide recommendations for CGMS application in Anhui (CGMS strategy report). • Implementation of the CGMS level2 using simple calibration of phenology allowing to reproduce the main phenological stages	• A solution has been found and for the lack of near-real-time weather data. Scripts have been written to automate this process, but this has not yet been implemented in the CGMS at AIFER. This means that the CGMS level 1 could be run operationally, although this has not yet been accomplished. • Bell Zhang has visited SDLO for one week and was trained in the use of CGMS, MySQL database and calibration of the WOFOST crop simulation model. • The CGMS strategy report for Anhui, China has been delivered including recommendations for CGMS application in Anhui. • Limited progress has been accomplished regarding the CGMS level 2: only a limited

	calibration and the spatial distribution of sowing dates have been defined by AIFER (e.g. the crop calendar)
Deviations from DOW and impact	Implementation of CGMS Anhui has been delayed in general which makes the time left for the piloting phase critically short. SDLO proposes some corrective actions to achieve the CGMS implementation in the remaining project duration. As the implementation of CGMS in the two test sites is completely independent, there is no impact of the delay on the activities in Morocco.
Reasons for failing to achieve critical objectives	• Work on CGMS strategy report for Morocco was given priority in order to speed up implementation of CGMS Morocco. Personnel availability at SDLO with suitable skills is limited: therefore work on CGMS Anhui and Morocco could not be executed in parallel. • Limited funding and personnel availability with partner AIFER. There is only one person involved at AIFER who has to balance work on E-Agri and other projects he is involved in. • Designing and implementing the questionnaires for Anhui took more time than expected, moreover distributing them among and receiving them from Chinese researchers takes time.
Use of resources	Person-months actual / planned: see Form C. SDLO : 3.15/9 Man-Months
Corrective actions	• Project and WP leader will discuss with AIFER the schedule the final year of the E-Agri project in order to speed up and meet the final project objectives. • SDLO will put additional man power in the implementation of CGMS for Anhui . Preferably, this will be a Chinese colleague working at SDLO. This should improve overall communication with AIFER and speed up the implementation of the project in Anhui. • Details of the implementation of CGMS-Anhui will be done by SDLO directly and transferred to Anhui in order to speed up the implementation of the CGMS-Anhui using the new data gathered by AIFER.
Planning for third year	**April/May**: Finalize implementation of CGMS level 1 (weather data processing) for Anhui [SDLO, AIFER] **June/July:** Finalize calibration and implementation of CGMS Level2 (crop simulations) [SDLO, AIFER] **August – January**: Piloting phase for CGMS-Anhui [AIFER, SDLO]

WP 26: Development of E-AGRI viewers (Additional WP – not described in DoW)

Summary progress	Within e-Agri the need for developing viewers that can help monitoring the agricultural campaign has been clearly expressed by the users of the results, and in particular by the Moroccan partners. As the implementation of CGMS in Morocco has been relatively smooth
Significant results	• The main interface has been developed and is mostly functional. Some minor interface details still have to be fixed. These include labelling, responsiveness of buttons and removal of superfluous elements • The REST server and the Web Mapping Server are operational, tested and are generally working well. • The E-AGRI database has been designed and filled with data from the Moroccan CGMS for the tables GRID, REGIONS, GRID_WEATHER_INDICATORS and REGION_WEATHER_INDICATORS. • The data-server has been designed and tested for retrieving grid and SLD data from the GRID_WEATHER_INDICATORS and REGION_WEATHER_INDICATORS tables. Some deficiencies have been noted and these will be corrected in the near future.
Deviations from DOW and impact	This activity was not foreseen in the Description of Work but has been integrated into the WP2 on request from the Moroccan and Chinese users of CGMS results.
Reasons for failing to achieve critical objectives	None
Use of resources	Person-months actual / planned: see Form C. Persons months are part of the WP2.2
Corrective actions	None
Planning for third year	**July**: Semi-operational and tested E-Agri viewers operating on the Morocco database for visualisation weather data. [SDLO] **November**: Semi-operational and tested E-Agri viewers operating on the Morocco database for visualising crop indicators. [SDLO] **December**: E-Agri viewers operating on the Anhui database. [SDLO]

WP 31: Ground data collection for BioMA	
Summary of objectives and progress	The objective of this work package is the collection of data for calibrating the parameters of the BioMA models (WARM, CropSyst and WOFOST for rice; CropSyst and WOFOST for wheat) for properly reproducing growth and development of rice in Jianghuai Plain and winter wheat in Morocco. Dedicated field experiments have been set up since specific information needs to be collected to properly calibrate crop model parameters, and - in most of the cases - such information needs to be collected on plants growing under specific management conditions.

	The progress includes: - [Rice in Jianghuai Plain] (JAAS) Collection of data from the second year of experiments in the nine experimental sites for which data were already collected during the first year experiments. Variables measured include main phenological stages, aboveground biomass, leaf area index, plant density. - [Soft and durum wheat in Morocco] (INRA) Collection of data from the first and second year of E-AGRI experiments in three sites, for both potential and water limited production levels. Variables measured include main phenological stages, aboveground biomass, leaf area index, soil water content (for water limiting conditions).

Second year objectives	**Significant results**
Objectives are the same for activities carried out for rice in Jianghuai Plain, and for wheat in Morocco. • Management of the second year field experiments, according to the shared protocol. • Collection of variables (relevant for crop model parameters calibration) related to crop growth and development, to crop management, and to soil moisture. • Collection of weather data representative of the conditions explored by the crop in the experimental stations. • Discussion of experimental data with responsible for WP32 (UMIL) and WP34 (JRC).	• High quality databases of variables related to plant growth and development, to crop management and to soil moisture (the latter only for wheat in Morocco, since rice is grown under paddy conditions in Jianghuai Plain) have been collected, as integration to the first versions of the databases collected during the first year of project. The importance of such data is demonstrated by the results already achieved in terms of model calibration (see WP 32 and WP 34) (JAAS & INRA). • Weather data for the experimental stations have been collected, quality checked and integrated when necessary (JAAS & INRA).

Deviations from DOW and impact	Some slight delays in the preparation of data, mainly due to post-processing of rough measurements, caused a shift in transferring the data from the second seasons of experiments to WPs involved in calibration and evaluation activities at field level. In any case, the delay is already being recovered, thus, no problems are expected for the correct proceeding of the project.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : • INRA: 3.4 / 3 • JAAS: 9.08 / 6 • UMIL: 0.54 / 1

Corrective actions	Not applicable.
Planning for the 3rd year	• All the data will be analysed and discussed (in case of unexpected values) (JAAS, INRA & UMIL). • Organization of all the data collected - and of all related metadata - in dedicated databases, that will be delivered before month 30 (JAAS, INRA & UMIL).

WP 32: Adaptation of BioMA for multi-model rice monitoring on Jianghuai plan	
Summary of objectives and progress	The aims of this work package are (i) the adaptation – via proper parameterization/calibration activities of the BioMA models for rice simulations in the Jianghuai Plain and (ii) the adaptation of the BioMA platform for multi-model rice monitoring in the region. The progress during the second year of project refers to: • Improvement of the calibration of the parameters of the BioMA models by using the data from the second year of field experiments carried out within WP 31 (UMIL). • Evaluation of the BioMA models for the simulation of rice in Jianghuai Plain at field level (UMIL). • The first large-area evaluation of the multi-model BioMA platform for rice simulations in Jianghuai Plain (UMIL & JRC).
Second year objectives • Refinement of the calibration of the BioMA models for rice in Jianghuai Plain using data from the second year of field experiments carried out within WP31. • Evaluation of the BioMA models for rice in Jianghuai Plain at field level and for large-area simulations.	**Significant results** • Second version of the parameter sets for the models CropSyst, WARM and WOFOST for rice simulations in Jianghuai Plain (UMIL). • Successful evaluation of the BioMA models at field level (UMIL) and for large area simulations. Results of the evaluation at field level allows considering all the three models suitable for multi-model monitoring of rice in the region for direct seeded rice; the algorithm for transplanting (the one adopted for Oryza2000 was used) can be probably improved, to increase its suitability for the high level of mechanization that characterizes transplanting in China (UMIL & JRC).
Deviations from DOW and impact	The calibration/validation activities using the second year of field data have been completed with some weeks delay, because of the slight delay in receiving field experimental results from WP 31. This delay has been completely recovered.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : • UMIL: 28.16 / 9

	• JRC: 0.76 / 1
Corrective actions	Not applicable.
Planning for the 3rd year	• Improving the algorithm for rice transplanting, since the one used (from Oryza2000) - although it is considered the best among those available - presented some problems in case of high seedbed densities. • Completing the evaluation of the BioMA models for large area simulations of rice in Jianghuai Plain.

WP 34: Adaptation of BioMA for multi-model wheat monitoring in Morocco	
Summary of objectives and progress	This work package is aimed (i) at adapting the two generic crop simulators implemented in BioMA (i.e., CropSyst and WOFOST) for wheat in Morocco, via parameterization/calibration activities performed by using data from the field experiments carried out within WP 31; (ii) at adapting the BioMA platform for wheat simulations in the region. The progress includes: • The calibration and validation of the parameters of CropSyst and WOFOST for soft and durum wheat in Morocco, for both potential and water limiting conditions (JRC & UMIL). • The first evaluation of CropSyst and WOFOST for soft and durum wheat large-area simulations in Morocco (JRC). • The large area simulation of the interaction between wheat and pathogens (this task was not included in the DOW) (UMIL & JRC). • Scientific output: one paper published in addition to those published during the first project year (UMIL).
Second year objectives • Refinement of the calibration of the BioMA models for potential and water limited simulations of durum and soft wheat in Morocco using data from the second year of field experiments carried out within WP31. • Evaluation of the BioMA models for durum and soft wheat in Morocco at field level and for large-area simulations.	**Significant results** • Second version of the parameter sets for the models CropSyst and WOFOST for durum and soft wheat simulations in Morocco (JRC & UMIL). • Successful evaluation of the BioMA models at field level (JRC & UMIL) and for large area simulations. Results of the evaluation at field level allows considering all the two models suitable for multi-model monitoring of wheat in the region (UMIL & JRC). • First evaluation of BioMA for crop monitoring and yield forecasting by using a fungal disease model coupled to crop growth ones. This was not included in the DOW and - according to our knowledge - represents the first time the simulation of diseases is included in a crop yield forecasting system. This first test can be considered a very successful one,

	since the disease model allowed to significantly increase the amount of yearly variability in yields explained by the forecasting system (UMIL & JRC).
Deviations from DOW and impact	The calibration activities performed using the second year of field data have been completed with a slight delay, because of the slight delay in receiving field observations from WP 31. This delay has been completely recovered.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : • UMIL: 9.1 / 1 • JRC: 7.4 / 12
Corrective actions	Not applicable.
Planning for the 3rd year	• Refining the calibration using the field observations from the second year experiments. • Completing the evaluation of the BioMA models for large area simulations of soft and durum wheat in Morocco.

WP 42: Crop biomass derived from remote sensing	
Summary objectives and progress	This work package aims to compute the main biophysical variables NDVI, fAPAR and DMP derived from SPOT-VEGETATION sensor and used for crop growth monitoring. The Description of Work planned to produced the time series between 2000 to 2009. However these vegetation monitoring products have been continuously generated, to 2013. The databases for Regional Unmixed Means have also been continuously established. The progress includes: • The 10 daily composites of SPOT-VGT Normalized Difference Vegetation Indices (NDVI) were extracted for two study areas and for the time series 2010-2013 (non planned in DOW). • missing data are filled using a smoothing method. • The crop mask GLCropV2 was used to identify the arable land pixels. • Five biophysical variables were extracted to assimilate crop growth in the study regions: NDVI (i), NDVI smoothed (k), fAPAR (a), FAPAR smoothed (b)and DMP smoothed (y). • The databases of "Regional Unmixed Mean" (RUM) for these five variables were extended.
Second year objectives: • Pre-processing and smoothing the newly produced vegetation index NDVI • Calculating the biophysical variables including fAPAR and DMP • Constructing the databases for Regional Unmixed Means.	**Significant results:** • New times series are pre-processed and smoothed (VITO) • Five biophysical variables are continuously derived to assimilate crop growth (VITO) • Databases for regional Unmixed Means were setup for construct empirical models aiming crop yield forecasting (VITO).
Deviations from DOW and impact	The yield statistics and RUM databases were also collected or generated for the prefectures outside of the six prefectures initially planned.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: VITO: 5/5 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	Continuing to generate the five biophysical variables and calculating the corresponding RUM databases. In case of extending this activity beyond the term of the project, a Memorandum of Understanding between the concerned parties will be signed (VITO).

<table>
<tr><th colspan="3">WP 43: Wheat yield estimation using Remote sensing in Morocco</th></tr>
<tr><td>Summary objectives and progress</td><td colspan="2">This work package aims to establish empirical models using biophysical variables derived from remote sensing at levels of province, agro-climatic zone or country.
The progress includes:
Compare cereal forecasting models for soft wheat, durum wheat and barley, based NDVI derived from three sensors (SPOT-Vegetation, MODIS and NOAA), at the levels of the country, agro-zones and provinces of Morocco ;
INRA provided training to a scientist from AIFER wheat yield estimation based on remote sensing for HUAIBEI Plain in China.</td></tr>
<tr><td colspan="2">Objectives for the second year:
Extracting the vegetation indices beyond 2009 as planned in the DOW. Extending the databases containing the NDVI or DMP and wheat yield statistics.
Making forecasting on different periods of growth seasons</td><td>Significant results
Fine tuning the models at province, agro-ecological zones and nationals levels.
Analysis the length of time series on the accuracy of prediction. Determining the earliest period when a forecasting is possible (INRA).
Analysing the accuracy of the cereal yield prediction based on NDVI derived from three sensors (SPOT-Vegetation, MODIS and NOAA). Results show that SPOT-Vegetation and MODIS best perform for the prediction of cereal yields in Morocco, in the “favourable” and intermediary” agro-ecological zones (INRA).
extending the monitored crop to barley (INRA).</td></tr>
<tr><td>Deviations from DOW and impact</td><td colspan="2">Not applicable</td></tr>
<tr><td>Reasons for failing to achieve critical objectives</td><td colspan="2">Not applicable</td></tr>
<tr><td>Use of resources</td><td colspan="2">Person-months actual / planned :
INRA: 8.0/ 6.0 man-months</td></tr>
<tr><td>Corrective actions</td><td colspan="2">Not applicable.</td></tr>
<tr><td>Planning for the 3rd year</td><td colspan="2">The empirical prediction models mainly based on the remote sensing variables will be continuously fine-tuned after input of new time series data. If this activity will be sustained beyond the project implementation period, an agreement with the concerned parties on data usage should be hammed out (INRA, VITO).</td></tr>
</table>

WP 44: Wheat yield estimation using Remote sensing on Huaibei Plain	
Summary objectives progress	This work package aims to establish new empirical models including the driving factor for yield trend on Huaibei Plain. The progress includes: - Establishing models to simulate more accurately wheat yield including the main factor driving the technological trend for wheat yield. - Back-validation of the new models using the yield data from 1990 till 2011.
Objectives for the second implementation year • Extending the RUM databases at the district level beyond the planned year 2009. • Fine-tuning and improve the prediction model at these administrative level.	**Significant results** • Established new yield forecasting models including all factors involved in wheat yield: technological trends, and phenological status and climatic conditions (VITO, AIFER, INRA).
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : see Form C.
Corrective actions	Not applicable.
Planning for the 3rd year	The empirical prediction models will be continuously fine-tuned after input of new time series data. A first bulletin for the regional yield forecasting dedicated for decision-makers will be issued. If this activity will be sustained beyond the project implementation period, an agreement with the concerned parties on data usage should be made (AIFER, VITO).

WP 51: Ground sampling and data collection on Huaibei Plain	
Summary objectives and progress	This work package aims to adapt, compare and design segment sampling method and to establish area estimation model for the study region and background data collection. The progress in 2012 includes: • Updated background data collection based the work of 2011. • Tested two technique to retrieve the crop phenology from remote sensed data. • Compared three estimators (simple estimator, ratio estimator and regression estimator) to estimate crop area, combining the samples data from ground survey and those from remote sensing. • Designed a new sampling scheme (sampling circles) integrating remote sensing imager *in situ* investigation, adapted to the cropping

	pattern on Huaibei Plain • Study with 194 sampling points for winter wheat and maize/soy season respectively in Guoyang county to test sampling techniques and evaluate the crop acreage accuracy from remote sensed data.

Objectives for the second year:	**Significant results:**
• Review the sampling scheme of last year and testing possible improvement and conducting the sampling by field survey. • Retrieval the crop phenology based on remote sensing	• Review and set up new crop spatial sampling scheme combining in-situ investigation and remote sensing according to the experience of JRC (CAAS). Clarified the suitability of estimators for crop acreage estimation in the study area (CAAS) Conducting the field sampling (CAAS, VITO) • Retrieval of crop phenology by remote sensing using MODIS NDVI data (CAAS)

Deviations from DOW and impact	The sampling approach was adapted by CAAS, JRC and VITO to take into account of the cropping patterns in the study area. The impact will be an improvement of accuracy for estimation.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : CAAS: 12.3/9 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	Investigating further improvement of the sampling methodology with more cost efficiency (CAAS, VITO). Using remote sensing method to retrieve the annual crop phenology (CAAS)

WP 52: Crop area estimation on Huaibei Plain	
Summary objectives and progress	This work package aims to compare and adapt image classification methods and generate crop area estimates using both best suitable classifier and statistical regression. The progress in the second implementation year includes: - Comparing image classification algorithms for winter wheat and maize/soy crop seasons, including: Spectral Angle Mapper, Neural Network, Maximum Likelihood, Mahalanobis Distance, Spectral Information Divergence, Parallepiped, Minimum Distance. - Image classification on RapidEye images to estimate the winter-

	wheat and maize acreage in the pilot county of Guoyang. - Sub-pixel classification for crop acreage using EOS-MODIS LAI time series data in the pilot study area.

Objectives for the second year:	**Significant results**
• Acquiring new satellite imagery and conducting the pre-processing	• Images of Rapid-Eye and LISS3 for the growth seasons were collected (CAAS).
• Conducting classification analysis using different approaches	• Image classification analysis using several different classifiers (Spectral Angle Mapper, Neural Network, Maximum Likelihood, Mahalanobis Distance, Spectral Information Divergence, Parallel-piped, Minimum Distance) were carried out (CAAS)
• Estimating the crop area using image and regression analyses	• Accuracy analyses for different image classification approaches (CAAS). • Estimating the crop areas using different statistical estimators including regression estimator (CAAS).

Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : CAAS: 12.3/9 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	Acquiring the 2013 satellite images for the study region and pre-processing (CAAS) Analysing the new images using different classification algorithms (CAAS) Deriving the cop areas from both ground sampling and remote sensing (CAAS)

WP 53: Ground sampling and data collection in Morocco	
Summary progress	This work package aims to adapt and design the segment sampling strategy in Morocco and elaborate an spatial extrapolation approach to estimate crop areas in pre-defined regions. The progress includes: • Sampling were carried out in Chaouia-Ouardigha and Meknes-Tafilalet regions, for a total area of 1.8 million hectares. Field surveys were conducted in Meknes-Tafilalet region as planned in the second

	period.
Objectives of the second year: • Collecting and updating samples in two study areas • Track segment samples collection as a complementary dataset.	**Significant results:** • The ground truth data were collected in two surveyed areas Chaouia-Ouardigha and Meknes-Tafilalet, which will help to identify the crop cover in the region. Both Frame samples and track samples are collected (INRA).
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned : INRA: 12.0 / 9.0.
Corrective actions	Not applicable.
Planning for the 3rd year	Extending the sampling by surveys (INRA)

WP 54: Crop area estimation in Morocco	
Summary objectives and progress	This Work package aims at collecting the remote sensing data in order to : • Pre-process and classify the satellite images ; • Select the best classification option in both spectral and temporal terms ; • Generate the area estimates using the ground sampling dataset ; • Generate the area estimate using best classification option ; • - Generate the area estimate combining regression and remote sensing
Objectives of the second year: • Collect the high resolution imagery for estimate the crop areas in the study regions. • Conducting the image classifications analysis • Deriving the crop acreage using field sampling and remote sensing.	**Significant results** • 13 scenes of Landsat 5 TM or Landsat 7 ETM+ were collected and pre-processed during the growth season 2011-2012 • Image classification analysis using Maximum likelihood algorithms was carried out • The crop acreages were derived using the field sampling and image classification for both study regions.
Deviations from DOW and impact	The LANDSAT TM and ETM+ image were collected instead of AWiFS or DMC images, as either the satellite was lost or image were not available. There is no impact on area estimation results.
Reasons for failing	Not applicable

to achieve critical objectives	
Use of resources	Resources have been used according to the information provided in the DOW. Person-months actual / planned : INRA: 4.0 / 4.5 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	Acquiring the 2013 satellite images for the study region and pre-processing (INRA) Classifying the new images (INRA) Testing the potential of sub-pixel classification (INRA, VITO) Deriving the cop areas from both ground sampling and remote sensing (INRA)

WP 71: Networking and Partnership in China and Morocco	

Summary objectives and progress	This work package aims to a general and global disseminate the European crop monitoring technology, establish an exchange network in the domain of crop modelling and application of remote sensing in agriculture, and carry out the capacity building (training) activities. The progress includes:
	• Organizing two workshops with the participation of stake holders or experts outside of the consortium: the workshop and training on use of statistical tool box in Kenitra, Morocco in February 2012 and the BIOMA workshop in Nanjing, China in December 2012.
	• Training of Dr. Zhang Beier at INRA Morocco, SDLO, The Netherlands and VITO, Belgium during the period of September – October 2012
	• Training of Mostafa Tahri in June 2012 at VITO, Belgium
	• Networking by visiting other organization in China :
	  ○ Anhui Agricultural University (by VITO 03/2012)
	  ○ China Agricultural University (by VITO in June 2012)

Objectives for the second year: • Organizing two thematic workshops with participation of researchers outside of the Consortium. • Organizing the trainings *ad hoc* to consolidate the technology transfer. • Carrying out the exchange and promotion activities with the organizations outside of	**Significant results:** • CGMS Statistical Tool Workshop held in Kenitra from Feb. 15-17, 2012 with participation of experts from National Meteorological Bureau, Ministry of Agriculture etc. (SDLO, INRA) • BioMA work shop held from Dec. 11-12, 2012, in Nanjing, China (JAAS, UMIL). • *Ad hoc* trainings for Mostafa Tahri and Dr. Zhang Beier. Throughout these training activities, the Moroccan and Chinese experts acquired the knowledge of the techniques and tools used in the crop monitoring using agro-meteorological models and satellite image analysis (AIFER,

the Consortium.	INRA, VITO, SDLO). • Exchange visits with other universities and research organizations to raise awareness of application potential of earth observation in the domain of agriculture, food security and environmental monitoring.
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: • VITO: 0.4/1.5 man-month • SDLO: 1/ 2 man-months • UMIL: 3/3 man-months • JRC: 0.6/2 man-months • INRA: 1/1 man-month • CAAS: 1/1 man-month • AIFER: 2/2 man-months • JAAS: 2/2 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	• Investigating the possibility of organizing national-wide dissemination event in Morocco at the end of the project with participation of Chinese stakeholders and/or decision makers (Chinese Ministry of Agriculture). This activity could be jointly organized with the final review meeting. The activity is not planned in the DoW and thus conditioned by the available resources of the consortium. • Participation of at least two international conferences or symposium in the domain of earth observations or food security. • *Ad hoc* training of Morocco and /or Chinese experts in the topic of BioMA and remote sensing.

WP 72: Capacity Building and Knowledge Transfer in Kenya	
Summary objectives and progress	This work package aims to organizing a workshop in Kenya to promote the European e-agricultural tools in the country and a training session to introduce the basic remote sensing and its applications in agricultural monitoring. The progress includes: • Organizing a workshop with the participation of stake holders or experts national wide to raise the awareness of potential of these e-agricultural tools.

	• Organise a training session for introducing basic remote sensing methodologies and its application on agricultural monitoring. • Establishing the collaboration with other European funded projects in this country to draw a maximum of synergy in knowledge transfer in view of implementing the WP56.
Objectives for the second year: • Organizing a national workshops to raise the awareness for decision-makers and stakeholders on the application potential of these European crop monitoring technologies. • Establishing collaborations with other European project to create synergy in knowledge transfer.	**Significant results:** • The Kenya National Workshop was held in Oct.25 2012 in Nairobi. With participation of 64 stakeholders and decision makers, the workshop provided the first glimpse of application of European ICT in agriculture sectors. (MEMR, VITO) • Collaboration with the European AGRICAB project has been official established with a detailed objectives and activities planning. The synergy between the two projects will allow the European institutions to provide more extensive demonstration of the European technology and allow Kenya experts to have more opportunity to acquire the related knowledge (VITO, MEMR).
Deviations from DOW and impact	The Workshop schedule is slightly advanced with no impact on the global implementation
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: • VITO: 0.5/1 man-month • MEMR: 1/3 man-months
Corrective actions	Not applicable.
Planning for the 3rd year	Organization the training sessions to introduce the methodologies applied in the WP56.

4.3. Contingency Plan

This section describes in case of major cross work-packages' deviation, how a contingency solution is proposed and applied. In our particular case, the unavailability of Anhui meteorological data at a real-

time basis constitutes one of major bottle neck for CGMS implementation in Anhui. SDLO proposes the following solution to overcome the problem and achieve the final objectives for this study region.

- the Consortium will draft a detailed the schedule for Anhui CGMS implementation in the final year in order to meet the final project objectives.
- details of the implementation of CGMS-Anhui will be performed by SDLO directly and transferred to AIFER. The CGMS level1 has already been implemented and can achieve full operational status when relying on the operational meteo data from the NOAA-GSOD service. The calibration of WOFOST for winter-wheat in Anhui will be carried out by SDLO in order to speed up the implementation of the CGMS level2 and level3. For the purpose SDLO will use the new data gathered by AIFER from the Agro-experimental station.
- SDLO will put additional man power to improve overall communication with AIFER and speed up the implementation. A Chinese colleague working at SDLO is proposed to help on this issue.

4.4. Project management during the period

The objectives of the project management are to:

- general coordination of the inter-institutional activities such as, data-sharing or expert trainings between two partner institutes
- preparing and coordinating the project events, including thematic workshops and progress meetings
- implementing the dissemination and networking activities towards organizations including scientific institutions outside of the project consortium and the European Commission
- reporting to the Commission the progress of the project implementation including periodic reporting: preparation, organization, the follow-up of the periodic review, as well as the implementation of the recommendation of reviewers

4.4.1. General management issues

In terms of organization, the project coordination is continuously assumed by VITO. At the Joint Research Centre, Mrs. Manola Bettio was replaced by Mr. Fabien Ramos as the contact person.

In terms of implementation, the project has been managed as research activities. Technical adaptation, in terms of contents as well as in terms of schedules was carried out in order to achieve the final goal in best way. The implementation of the activities on the CGMS Statistic Tool (WP61 and WP62) are almost accomplished, well in advance of the schedule.

The second year of implementation was characterized by few planned deliverable submissions. However, several deliverables have been advanced for submission and review. The new supplemented research content is always described by additional deliverable(s), although they had not been planned in the Description Of Work.

The second progress meeting was held:

- on 10 December 2012, in Nanjing, Organized jointly by JAAS and VITO and hosted by JAAS (report in annex 2).

Two thematic workshops including:

- CGMS statistical toolbox workshop organized by SDLO and hosted by INRA morocco on 15-17 February 2012
- BioMA workshop organized by UMI and JAAS and hosted by JAAS on 11-12 December 2012

Four training sessions organized for two local experts:

- 4-10 June 2012 for Mostafa Tahri by VITO
- 17-23 September 2012 by INRA for Zhang Bell
- 24- 30 September 2012 by SDLO for Zhang Bell
- 1-31 October 2012 by VITO for Zhang Bell

4.4.2. Dissemination activities

The coordinator of the project attended, during this second year of implementation, two scientific conferences:

- Dragon 2&3 symposium in Beijing organized by European Space Agency and delivered an oral presentation: "Crop Area Estimation using Regression Estimator"
- Agro-Geoinformatics 2012 organized by US Department of agriculture (USDA) and delivered an oral presentation on Crop Acreage Assessment in Mengcheng"

Two visits have been conducted to two institutions outside of the project to establish first contact: Anhui agricultural university in March 2012 and China Agricultural University in June 2012.

The dissemination in Kenya (WP 72) has been initiated in collaboration with the project AGRICAB. The resource polling could allow us to test the European crop monitoring methodology on larger study regions and more significant impact. In terms of training sessions, training content and training participants (report in annex 1).

Finally, the coordination of the project centralises the related scientific publications including a book on crop monitoring advances in Morocco.

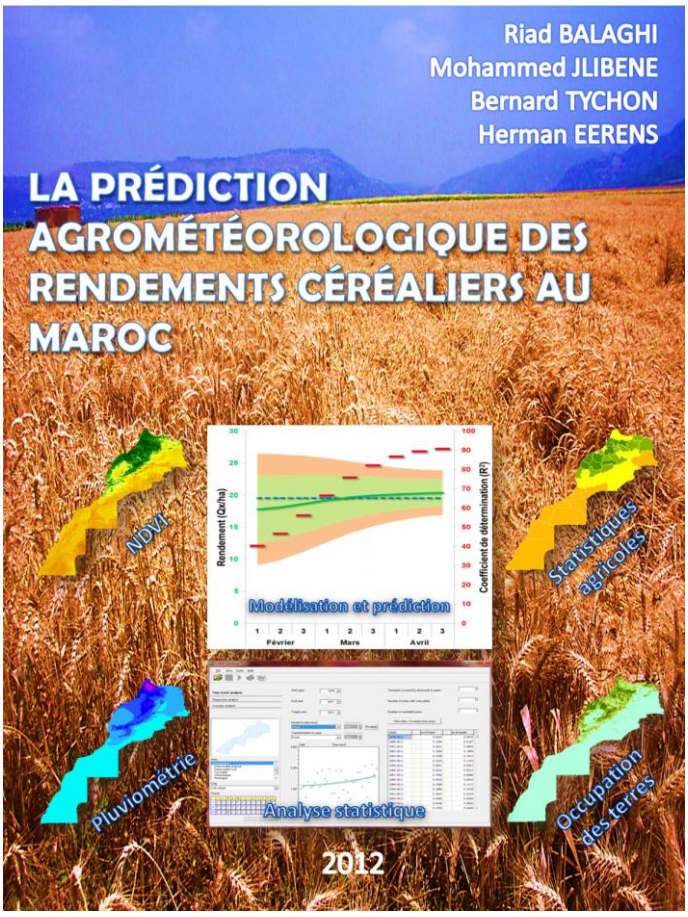

Fig.4 Book over the state of art of crop monitoring in Morocco (ISBN: 978-9954-06676-8)

4.4.3. Implementation of the recommendation of the Commission

The Consortium Implemented the recommendations described in its letter of August 10, 2012. The Consortium attaches highest importance to the content-oriented research and technological transfer in order to achieve in a best way the objectives of the project.

The table below describes the implementation of the Commission's recommendation for the period under review.

WP	Recommendations	Action or explanation
WP2	Re-submission: ○ D21.3 *Regional statistic database*: merging 2 parts ○ D23.1 Usability *Report for CGMS application for Anhui*: mitigating missing data, conclusion New submission (new deadlines): ○ *D22.1 Usability Report for CGMS application for Morocco* (30/09/2012) ○ *D22.2 Strategy report on CGMS adaptation for Morocco* (30/10/2012) ○ *D23.2 Strategy Report on CGMS adaptation for Anhui* (31/12/2012)	○ Submitted on 23/06/2012 ○ Submitted on 04/07/2012 ○ Submitted on 26/06/2012 ○ Submitted on 21/09/2012 ○ Submitted on 14/03/2013 (accompanied with a justification letter)
WP3	Re-submission: ○ D31.1 *Ground data collection Report* Submission of a justification letter for delay: ○ D32.1 *Sensitivity Analysis Report*	○ Submitted on 05/07/2012 ○ Submitted on 22/06/2012
WP7	New deliverable: ○ D71.5 Dissemination Plan	○ Submitted on 14/03/2013 and to be updated before each periodic review

The next table details the implementation of the reviewers recommendation for future work.

WP	Recommendations	Action or explanation
WP1	Strengthen the management of the project.	The Consortium looked for the available management course on the "market". Contact was taken with one of the course providers (InterfaceEurope). However, after

		detailed examination on their programme, it is found that these courses have pronounced commercial purposes and little practical relevance.
	Strictly follow the procedure described in the project proposal	The Consortium aims to achieve the objectives of the project in the best way by adding more developed or more cost efficient methodologies, by reshuffling the time schedule of the work-package implementation, this according to the needs of the local experts / scientists or stakeholders. The flexibility introduced in the implementation has one and unique goal, better achieving the technology transfer.
	Close liaise with EC personnel and project officers	The Consortium established frequent contacts with many DG's of the Commission such as DG AGRI, DG JRC, DG Enterprise, as well as with the Project Officer (DG Connect)
	Providing a table comparing the effort foreseen and spent	This has not been carried out for three reasons: ○ The project coordinator addresses the UOR issue by mail to the project officer and no feedback was obtained. ○ The project coordinator found afterwards the modified rules regarding providing UOR for Periodic Reporting, published by the Commission in a information letter and a new version of periodic report template compiled by the DG Connect. It is stated that the provision of these tables in the Periodic Report are not necessary anymore and will be generated automatically by the system (NEF) specially conceived for collecting these data. ○ At the time of the reporting, this tool (NEF portal) conceived by the Commission for all beneficiaries to input their spending is not yet open for the second PR. Now, the project coordinators will collect these data manually, one by one, and add this information in a upadted version of this report.
WP7	More dissemination or promotion is needed (including more social network and governmental	Much promotional work have been carried out since the start of the project. The first workshop in Morocco was attended by experts from universities, research institutions and even the central bank. More effort for

	body links)	promoting the project has been made: ○ by visiting specialized universities, ○ by inviting other experts to visit the Consortium ○ by attending scientific symposiums and conferences ○ by publishing different categories of scientific papers ○ by renewing the project web site ○ by visiting DG AGRI of the Commission and the Ministry of Agriculture of Morocco ○ by inviting other experts to attend the project's workshops or seminars Nevertheless the resources planned for the dissemination activities are limited and account only for 21.5 man /months or 11% of whole project. The dissemination activities are not core activities of the project, rather considered as supportive activities.

The table below details the new submission of the deliverable for preview or review:

WP	Deliverable Title	Status
WP2	○ D26.1: E-Agri Viewers for analysis and visualization of weather and crop indicators (new deliverable)	○ submitted
WP3	○ D32.4 *Evaluation Report On Rice Simulation on Large Area* ○ D34.3 *Evaluation Report On Wheat Simulation at Field Level*	○ To be updated ○ To be updated
WP6	○ D62.1 (CST) piloting and workshop report	○ Submitted
WP7	○ D71.2 Report on the BioMA workshop ○ D71.3 Report on the workshop over yield prediction based on RS ○ D71.5 Dissemination Plan	○ Submitted ○ Submitted ○ To be updated

5. Deliverables and milestones tables

5.1. Deliverables

TABLE DELIVERABLES											
No.	**Title**	**Version**	**WP**	**Lead benefit.**	**Nat.**	**Disssimin. level**[5]	**Expected Delivery (month)**	**Actual/ delivery**	**Delivery Status**	**Contrac-tual**	**Comment**
D22.1	*Usability reports for application of CGMS for Morocco*	*1.0*	*22*	*2*	*R*	*PP*	*9*	*22/06/ 2012*	*yes*	*yes*	
D22.2	*Strategy report on CGMS adaptation for Morocco*	*1.0*	*22*	*2*	*R*	*PP*	*12*	*21/09/ 2012*	*yes*	*yes*	
D23.2	*Strategy report on CGMS adaptation for Anhui, China*	*1.0*	*23*	*2*	*R*	*PP*	*12*	*14/03/ 2013*	*yes*	*yes*	*Justification letter*
D26.1	E-Agri Viewers for	1.0	22	2	R	PP		14/03/	yes	**NO**	

[5] **PU** = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).
Make sure that you are using the correct following label when your project has classified deliverables.
EU restricted = Classified with the mention of the classification level restricted "EU Restricted"
EU confidential = Classified with the mention of the classification level confidential " EU Confidential "
EU secret = Classified with the mention of the classification level secret "EU Secret "

	analysis and visualization of weather and crop indicators							2013			
D32.3	*Evaluation Report On Rice Simulation At Field Level*	0.0	32	3	R	PU	30		yes	yes	To be updated
D32.4	*Evaluation Report On Rice Simulation on Large Area*	0.0	32	3	R	PU	30		yes	yes	To be updated
D34.3	*Evaluation Report On Wheat Simulation at Field Level*	0.0	34	4	R	PU	30		yes	yes	To be updated
D62.1	(CST) piloting and workshop report	1.0	62	2	R	PU	36	22/02/ 2013	yes	yes	
D71.2	*Report on the BioMA workshop*	1.0	71	6	R	PU	36	19/03/ 2013	yes	yes	
D71.3	*Report on the workshop over yield prediction using RS*	1.0	71	5	R	PU	36	19/03/ 2013	yes	yes	
D71.5	Dissemination Plan and updating report	0.0	71, 72	1	R	PU	36			No	To be updated

5.2. Milestones

TABLE MILESTONES							
Milestone no.	**Milestone name**	**Work package no**	**Lead beneficiary**	**Delivery date from Annex I**	**Achieve Yes/No**	**Actual / Forecast achievement date**	**Comments**
MS1	Publication on the methodology on ground data sampling	WP21, WP31 WP51 WP53	1	24	Yes	30/06/ 2012	Published on the proceeding of ESA Dragon 2 symposium 2012 To be further published in a peer-review journal
MS2	Publication (submission) on adapted CGMS and /or BioMA platform	WP22 WP23 WP32 WP34	3	30		31/07/ 2013	
MS3	Implementation of CGMS and BioMA pilots	WP24 WP25 WP33 WP35 WP61	2	36		31/01/20 14	Using archived or real time meteo data depending on the availability
MS4	Publication of yield forecasting bulletin in Morocco using the RS indicators	WP43 WP44	1	36	Yes on 30/04/ 2012		
MS5	Publication (submission) on crop area estimation	WP52 WP54 WP55	5	36		31/12/20 13	
MS6	Publication in Press on the project and its impact in Morocco	WP71	4	36		31/01/20 14	

6. Use of the resources

The section of "Use of Resource" has been clustered into the Financial Reporting. All figures and tables are now generated by the EC FP7 Project Management Portal (NEF). The following table was manually compiled before the opening of the second periodic review session.

TABLE 4.1. PERSON-MONTH STATUS TABLE												
GRANT AGREEMENT NO: 270351		Partner - Person-months per Work-package										
ACRONYM: e-agri												
PERIOD: 1ST AND 2ND IMPLEMENTATION YEAR		VITO	SDLO	UMIL	JRC	INRA	CAAS	AIFER	JAAS	MEMR	TOTALS
WP 10: Coordination	Actual PM	7.1									*7.1*
	Planned PM	**6**									***6***
WP 21:Ground observation and Data collection	Actual PM					3.5		6			*9.5*
	Planned PM					**3**		**9**			***12***
WP 22: CGMS Adaptation - Morocco	Actual PM		7.3								*7.3*
	Planned PM		**9.5**								***9.5***
WP 23: CGMS Adaptation - Anhui, China	Actual PM		3.2					3			*6.2*
	Planned PM		**9.5**					**0**			***9.5***
WP 24: CGMS piloting – Anhui, China	Actual PM										*0*
	Planned PM		**3**					**1**			***4***
WP 25: CGMS piloting - Morocco	Actual PM					1					*1*
	Planned PM		**3**			**1**					***4***
WP 31: Ground data collection for BioMA	Actual PM			0.5		3.4			9.1		*13*
	Planned PM			**1**		**3**			**6**		***10***
WP 32: Adaptation of BioMA for multi-model rice monitoring in Jianghuai Area	Actual PM			28.2	0.8						*29*
	Planned PM			**9**	**1**						***10***
WP 33: BioMA piloting for multi-model rice monitoring and yield forecasting in JIANGHUAI Plain	Actual PM										*0*
	Planned PM			**7**					**3**		***10***
WP 34: Adaptation of BioMA for multi-model wheat monitoring in Morocco	Actual PM			9.1	7.4						*16.5*
	Planned PM			**1**	**12**						***13***
WP 35: BioMA piloting for multi-model wheat monitoring and yield forecasting in Morocco	Actual PM				0.9	1					*1.9*
	Planned PM				**8**	**1.5**					***9.5***
WP 41: Official statistic data collection	Actual PM										*0*
	Planned PM							**1**			***1***
WP 42: Crop biomass (wheat) derived from remote sensing	Actual PM	5									*5*
	Planned PM	**5**									***5***
WP 43: Yield estimation for wheat based on remote sensing in Morocco	Actual PM					8					*8*
	Planned PM					**6**					***6***

WP 44: Wheat Yield estimation based on remote sensing for HUAIBEI Plain	Actual PM	3.8						1			*4.8*
	Planned PM	**6**						**0**			***6***
WP 51: Ground sampling and data collection (HUAIBEI Plain, China)	Actual PM						12.3				*12.3*
	Planned PM						**9**				***9***
WP 52: Crop area estimation (HUAIBEI Plain, China)	Actual PM						12.3				*12.3*
	Planned PM						**9**				***9***
WP 53: Ground sampling and data collection (Morocco)	Actual PM					12					*12*
	Planned PM					**9**					***9***
WP 54: Crop Area estimation (Morocco)	Actual PM					4					*4*
	Planned PM					**4.5**					***4.5***
WP 55: Accuracy and cost-efficiency assessment	Actual PM	0.3									*0.3*
	Planned PM	**2**									***2***
WP 56: Cost efficiency study for crop mapping in East Africa	Actual PM									0.5	*0.5*
	Planned PM	**0.5**								**10**	***10.5***
WP 61: Statistical toolbox design	Actual PM		2.7								*2.7*
	Planned PM		**6.5**								***6.5***
WP 62: Statistical Toolbox Piloting/Workshop	Actual PM		2			3					*5*
	Planned PM		**1.5**			**3**					***4.5***
WP 71: Networking and Partnership in China and Morocco	Actual PM	0.4	1	3	0.6	1	1	2	2		*13.3*
	Planned PM	**1.5**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**0**	***14.5***
WP 72: Capacity building and knowledge transfer	Actual PM :	0.5								1	*1;5*
	Planned PM	**1**			**1**	**1**	**1**			**3**	***7***
Total Project Person-months	*Actual total:*	*17.1*	*16.2*	*40.8*	*9.6*	*36.5*	*25.6*	*12*	*11.2*	*1.5*	*170.5*
	Planned total:	***22***	***35***	***21***	***24***	***33***	***20***	***13***	***11***	***13***	***192***

It has been shown that the project budget is under-estimated, at least in the domain of human resources. At the end of the second year of implementation 89% of human resources for whole project have been used. However, some imbalance between the partners is observed. For example, UMIL is particularly under-resourced and JRC somehow presents “wealthy” situation. The overloading for UMIL occurs in the work-packages related to the BioMA platform. The first reason of this overload is the implementation of an algorithm for simulating ***rice transplanting,*** Oryza2000, in the BioMA models (WARM, CropSyst and WOFOST). This was not foreseen in the Description of Work, as transplanting is indirectly simulated - in most of crop models - by simply defining dedicated sets of model parameters. A direct consideration of the biophysical processes involved in this agro-management practice increases the robustness of models. The second reason of this budget overtaking can be found in the implementation of a module simulating the fungal diseases in the platform, which was not scheduled neither. The introduction of this module will help to increase the accuracy for crop yield forecasting. The results obtained so far are very encouraging and have been greatly appreciated by Moroccan and Chinese partners.

This activity will be further implemented during the third year of project. The wealthy situation of JRC is caused by departure of two key scientists from the MARS unit. But the planned activities will not be affected thanks to the coordination of UMIL.
Another source of underestimation comes from all activities related to field work (WPs 31, 51, 53). The work-load on data collection in the fields was not sufficiently evaluated from the beginning.
As we continuously generates the remote sensing indices beyond the year 2009 planned in the Description of Work, the resources foreseen for the work-package 42 will be overshot. The extension of this activity is performed in order to ensure the sustainability of the application beyond the end of the project.
Finally, more effort has been added to the dissemination and capacity building aspects as the needs of local partners emerges or new recommendation from the Commission appears. This is translated to an higher workload on the work-package 10 including tasks of communication, planning and joint execution, while initial dissemination / capacity building (DEMO) activities are the planned within the work-packages 71 and 72. The total DEMO and management activities have a share of 14% in terms of human resources in this project.

7. Planning of the final year

Heading to the last year of implementation, the CGMS built-up will be expected to achieve its built-up and operationally running on real-time basis in Morocco, as the system has already now a fully operational level 1 (weather data processing) and a nearly operational level 2 (crop simulation). The focus will be on set on the level 3 (statistical analysis), which is the most straightforward part of CGMS. Moreover, the Moroccan users already have experience with the level 3 software (the statistical toolbox) and therefore we expect a fairly smooth implementation. Finally, we will further develop and implement the CGMS Viewer for Morocco in the final year. An involvement of the Moroccan institutions other than those in the consortium, using their own local data, contribute largely to this achievement beyond the project scope. All credits for this "beyond the scope" progress go to SDLO, INRA, enabling to capture the capability and resources outside of the Consortium.
For the CGMS implementation in Anhui, the system status is less advanced as the level1 is fully implemented but not yet operational. The CGMS level2 is only partially implemented in the sense that the cropping calendars have been defined but the parameterisation of the crop itself still has to be done. A new partnership with a local institute has been established to collect more phenological, physiological and biophysical data (AIFER). An additional support visit by SDLO can be planned to support the CGMS setup for Anhui and really make progress in the implementation of the system.
After the adaptation activities of the BioMA models and platform performed during the first two years of the E-AGRI project, the first tests for large area simulations and yield forecasting decidedly satisfied both the developer and the Chinese (JAAS) and Moroccan (INRA) partners. During the last year of the project, the activities involved with transferring BioMA – already started at the end of the second year – will be intensified, with two 1-week trainings organized in Jiangsu and Rabat, and possibly with 2/3-week periods of joint work at the university of Milan. Moreover, during the recent trainings, some issues were discussed with local partners, mainly involved with including in the platform the possibility of simulating the impact of diseases on crops productions in Morocco, although this activity was not foreseen in the project DOW. Interesting results were achieved with some preliminary tests performed with yellow, brown and black rusts. This activities will be further investigated, together with the additional simulation of the interaction between wheat and *Septoria* pathogens, indicated by local partners as having a relevant impact on wheat yields in Morocco.
Regarding the crop area assessment, the sampling methodology will be continuously improved toward its costs efficiency. A more simplified sample method will allow to increase the sample size per survey day (CAAS). The cost efficiency by incorporating remote sensing data will be further investigated. A peer-review publication will be submitted to a specialized journal.

Collaboration with other European crop monitoring project will continue, especially for Kenya, where a workshop on best practice for crop mapping will be organized in collaboration with AGRICAB project.
The dissemination among the stake-holders, especially, the DG AGRI and /or DG AIDCO of the Commission will be briefed on the progress and achievement of the project.
Finally, at the two thirds of the project run, all partners of the Consortium are confident that every objective of the project will be accomplished and the sustainability of application will be secured.

Annexe 1: Kenya National Workshop Report

FIRST NATIONAL WORKSHOP ON USE OF REMOTE SENSING FOR CROP PRODUCTION MONITORING IN KENYA

HELD AT THE REDCOURT HOTEL NAIROBI, KENYA ON 23-10-2012

Introduction of the Projects:

Capacity building on crop production monitoring (AGRICAB) is a project in the seventh framework program (FP7) under the European Research & Development project mainly funded by the European Commission to enhance Earth Observation (E-O) capacity and better exploitation of satellite data available through GEONETCast for forest and agricultural management in Africa. The project aims at enhancing scientific & remote sensing capacity for African institutions to independently monitor their natural resources so as to adequately support management and policy actions and to sustainably improve data access, early warning, Agricultural & livestock monitoring and forest mapping.

E-AGRI project is another FP7 project on transfer of the ITC technology and more specifically the crop monitoring technology using remote sensing. It focuses mainly two study regions in Morocco and China. Kenya is a target country for its capacity building purposes, especially on crop mapping.

DRSRS, in collaboration with VITO, SDLO, and Consorzio ITA, organized a one day workshop on the Tuesday 23-10-2012. The main objectives of the workshop was to analyze the present agricultural statistical systems in Kenya, with a focus on crop monitoring and area estimates, and to define user needs and possible linkages with the estimate of crop yields and early warning. The proposed output of the analysis will be well-defined user requirements and options for improvement on the present systems in terms of quality of the estimates, cost reduction and enhance the role of remote sensing in crop production monitoring in Kenya.

Workshop Agenda

1. Opening session
2. Self-Introduction
3. Opening speech
4. Overview of DRSRS/AGRICAB/E-AGRI collaboration
5. Presentations
6. Discussion and wrap-up

List of participants

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54.	Cpt.Godwin Wahira	DRSRS	47146-00100,Nairobi		
55.	Laban Ojiambo	DRSRS	47146-00100,Nairobi		
56.	Joseph Gathua	DRSRS	47146-00100,Nairobi		
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Minutes of the Workshop

Morning session

OPENING SESSION

The Chair Mr.Charles Situma after reiterating the importance of this workshop, welcomed all members present to make self-introduction. The Director DRSRS, in His opening remarks invited participants from various institutions and especially Vito(Belgium), SDLO(The Netherlands) and ITA, Consortia (Italy) thanking them for sparing time to travel all the way to Kenya to attend this important workshop . He then gave a presentation introducing the activities of DRSRS stating the mission, vision and mandate of the department. While stating the objectives of the department, he emphasized that DRSRS had since 1984 been monitoring crop production in Kenya and this workshop and the AGRICAB/E-AGRI projects at large had come at the opportune time in enabling the Department embrace use of Remote sensing for crop production monitoring.

On DRSRS methodology for resource data acquisition, he informed the participants that the department used a multisampling concept of remote sensing, Aerial surveys and Ground measurements/surveys to undertake it's activities. The Director took through the participants on how DRSRS undertakes Crop forecasting (Maize & wheat) particularly using aerial photography as a remote Sensing technique clearly outlining Capabilities and constraints of the Department.

After His presentation, He declared the workshop officially opened.

Overview of DRSRS AGRICAB/E-AGRI Collaboration

Presenter: Mr.Henry Roimen & Mr.John Njogu, DRSRS

Title: use of remote sensing for crop production monitoring.

Mr. Roimen gave an overview on this stating the three main components of the project and the role of DRSRS in AGRICAB & E-AGRI projects.

He presented further on the Objective of the workshop, Outcome of AGRICAB & E-AGRI, Basis of user case, Objectives of the user case, Methods and the use of data and Results. Finally he illustrated the planning process and how future work will be done.

Mr.John Njogu, DRSRS further took through the participants on the African Monitoring of Environment for sustainable Development(AMESD) project at DRSRS outlining the proposed usefulness of this programme within the AGRICAB/E-AGRI context. The AMSED project in general aims at *'helping African governments in designing, implementing, monitoring and evaluating their regional and continental policies towards sustainable development'.*

He on the other hand explained the expected outputs, application areas and challenges of the project.

Advanced use of remote sensing in agricultural monitoring
Presenter: Madam Carolien Tote, VITO

In her introduction, Mrs. Tote gave outline of her presentation as follows:

- To give visibility to the AGRICAB and E-AGRI projects
- To analyze needs / requirements / expectations of end-users and stakeholders
- To have a basis to develop the research use cases in Kenya

She further stated that the objectives of E-AGRI majorly focus on Demonstration, Dissemination, Providing added Values for EU funding and Collaboration.
Under project concept she further showed various use cases.
In the first use case: **Crop production systems** in monitoring crop production she talked of agricultural statistics, agro-meteorological modelling, early warning and crop mapping.
On Early warning she pointed out that basically what to be considered were; Food security, Crop phenology and **Time series analysis** using low resolution satellite imagery. In her presentation she also pointed out why and how crop mapping should be done.
The second use case: **Forest Systems** is used in South Africa and handles tree cover information and fire information.
Use case three: **Livestock systems** are used in Niger, Kenya and Senegal and basically looks at capacity building, Livestock productivity and Training on methods for pasture monitoring.

Reactions

- One of the participants from ICIPE indicated that there is a lot of work that can be done to provide more information to all the stakeholders.
- As a response the participant was told that it will be harder to use this monitoring process for pests. It might only be possible if they occur in large scale.
- The other participant from ILRI, Mr Mohamed pointed out that there are several stakeholders that do a lot in early warning yet had been left out and could be instrumental in establishing good crop statistics and providing good information to the policy makers. He therefore suggested to AGRICAB/E-AGRI to form a small steering team to customize this information and disseminate the outputs. It will be necessary to have a group to handle the information so that it can reach the end users.

- A participant from the University of Nairobi (UON) asked whether the organizers were able to initiate further awareness seminars so that other majority and specifically University students can participate?
- Another pertinent issue raised during the reactions was how remote sensing methods can be improved to predict food security at the local community level and application of climatic modelling at the same level.

- ❖ Madam Tote's response to this was that remote sensing is only good to show the status at national level .At local level however, field verification was necessary although good indicators from remote sensing could be applied .

Agricultural statistics: a geo-referenced sampling approach
Presenter: Mr. David Remotti, Consortia, ITA-ITALY

Mr.Remotti stated the objectives of His presentation as follows:

- » To introduce rigorous sampling methods to achieve reliable crop area estimates, with known accuracy, for all major crops in Kenya.
- » To assess the feasibility of a geo-referenced sampling approach to agricultural statistics, in the Kenyan.
- » To startup a capacity building process in this field.

He then gave an introduction to Consorzio-ITA and the current activities in area sampling. He also elaborated on how random sampling can be used in food security assessment. He then stated the activities of 2013 where he said that 3 approaches will be addressed including:

- Aerial photo interpretation and ground data for bias correction
- Integration of satellite images and aerial photos
- Point frame ground survey with satellite images to achieve better accuracy

Finally he gave a brief on the project schedule explaining the sampling techniques and also pointing out that there will be a follow-up workshop specifically to train DRSRS staff involved.

Reactions

- ❖ One participant pointed out that it will be expensive using commercial images for crop forecasting in all the areas to be covered by DRSRS in crop monitoring.
- ❖ As a response, Mr.Remotti advised that the potential data that will be got from the images compared with other methods, it will be wise to use the images and later on revert to other cheaper methods.

Another participant sought response to the following issues;

- » Using estimates relying on administrative data originating from administrators how will this be factored in the model for the agriculture situation?
- » On the agricultural data, climate change has become a challenge. Are the models flexible or how will it cater for the un-predictable factors.
- » Local farmers mostly practice mixed cropping what are the mitigating factors in place to capture these?
- » What are the measures provided for area measurements at the administrative level?

The response was;

- » Subjective and objective information are different and farmers mostly give information and data based on subjective information rendering extrapolation difficult.
- » Geo-referencing approach will be able to get information on the small farmer and mixed cropping.
- » Surveyors are also given an option of registering more than one crop (even up to 6).

Crop yield forecasting in Kenya
Presenter: Mr.Hendrik Boogaard

Mr.Hendrik Boogard gave a presentation on this giving the concept, rationale, AGRICAB/E-AGRI objectives, MARS services in weather and crop monitoring, remote sensing data and crop models, crop yield forecast in Kenya (DRSRS & MOA) training projects and other initiatives (GYGA & AGMIP).

Reactions
The participants pointed out that:

1. DRSRS need to change how they have been working so that training can be done to more dedicated people.
2. After the training the government should take up the new systems so that they can be used in planning to help the country.
3. MOA, KARI & DRSRS should sit down and chat the way forward on the discrepancies in their data.

Kenya's experience on crops data collection and management.

Presenter: Mr.Clement Muyesu

Mr. Clement Muyesu gave a presentation on this highlighting basically the types of data collected by MoA, Sources of the data, Agricultural data management in MoA (collection, analysis, validation & archiving), Accessing stored agricultural data at MoA , Main challenges to data management and the improvement strategies in place.

Current Agricultural Data initiatives
This was a presentation on Country STAT by MoA stating that it is a web-based **tool** to support evidence-based decision making and facilitate informed policy making at **regional**, **national** and **sub national** levels.
He also explained what country STAT does and how it works.

Agricultural statistics in KARI, an overview of current status

Presenter: Mr.Lucas Tanui

Mr Tanui presented on this giving a brief introduction on how they carry out maize suitability mapping, their procedure, the assumption, and conversions methods, He further highlighted on the gaps in their methodology and the way forward.

Reactions

- A participant raised an issue saying that most of the technologies used by KARI are too old and the information got might not be so accurate. He also said that KARI should look into working with other relevant stakeholders like ICRAF.
- Response was that that they were working with them in some projects.
- Another participant gave a suggestion saying that there should be absorption & utilization of technology and communication of information to the relevant stakeholders. Improved technology should also be used to get accurate data.
- He also pointed out that there is need for scientists to improve on how they communicate the information to the other Kenyans especially the policy makers. They also need to harmonize their methodologies to get the relevant data.
- A participant sought to know how KARI has used the knowledge on maize suitability mapping in Kenya.
- As a response he was told that it is used in advising the relevant stakeholders especially during the National Irrigation Policy.
- The other question was to know if the suitability maps for maize growing areas in the county levels have been produced.
- As a response he was told that when the counties will be operational, they will chip in so that mapping can be done using high resolution imagery.

Afternoon session

Chair: Mr. Hendrik Boogaard

Role of RCMRD in national food security initiatives

Presenter, Byron Anangwe – RCMRD

RCMRD comprises of 18-African member countries and soon they are expecting South Sudan to join making the number of countries to be 19.

The presenter talked of significant role of RCMRD in:-

- Promoting Awareness on Application of EO Science
- Project Implementation & Building Capacity
- Formulation of data policies
- Creation synergies and partnerships

- Earliest Activities at the RCMRD include Qualitative analysis of CCD for food security assessment in the IGAD countries. Funded by the Japanese Govt. through FAO in the project GCPS/RAF/231/PJN.[1988-1993]
- Qualitative analysis of CCD and NDVI in the IGAD countries and Rwanda and Burundi. Funded by the French Govt. through FAO in the project GCP/RAF/310/FRA [1996-1997]
- Qualitative end of season crop yield forecasting and environmental analysis in the IGAD countries using ET data derived from Meteosat satellite. Co-executed by RCMRD and EARS and funded by the Dutch Govt. In the REFEWS Project.[1995-2000]

Other Activities in Sustenance Management include:-

- Food Security and environmental monitoring (USGS/Fewsnet, ICPAC, DLCO, WFP, ILRI, LEWIS, GMFS)
- Flood modelling and prediction (USGS)
- Disease Modelling and Prediction- Rift Valley Fever (WRI, AU-IBAR, UoN, USGS) ,Mapping of HIV/AIDS on the Mombasa – Kampala highway (Manitoba University, UoN)
- Land degradation mapping and monitoring -Deforestation (Mau Forest),Land use / Land cover change (Kordofan Region, South Sudan)
- Capacity building - Training in the use of modern Geo-information technologies in early warning and food security, disease mapping, land degradation, disaster risk management

Project Activities are:-

- Predicting Disease Outbreaks: Rift Valley Fever in GHA
- Food Security: Identification of hot spots
- Tsetse Mapping, Swaziland
- Agriculture Statistics - USGS/RLCM
- Mapping of Gums & Resins
- Water Quality Mapping:-Mapping to support Fishing in Lake Victoria For proper management and planning in the use of water resources

Presenter talked of SERVIR- Regional visualization and monitoring System [Early Warning System for East Africa] it is for strengthening the capacity of governments and other key stakeholders to integrate Earth observations into decision-making.

SERVIR Applications have several dependencies:

- NASA Applied Science Program- Agriculture, air quality, climate, disasters, biodiversity, public health, water resources
- GEO -Agriculture, biodiversity, climate, disaster, ecosystems, and human health
- USAID-Climate change adaptation, carbon tracking and GEO focus areas
- Regional Needs Assessment

On-going Projects are:-

- SERVIR-ROSES Flood forecasting using CREST Model , Coupled Routing and Excess Storage, or CREST, water balance model
- Assessing and Visualizing Biodiversity Vulnerability of Kenyan Flora and Fauna to Climate Change
- Coral Reef Tools
- African Ecosystem Classification
- GHG Inventory- LULUCF mapping
- Customization of GIS Flooding Tool for Food Security
- Forest Fires Monitoring

Towards a Bioenergy Atlas for Africa, 2010-2015

Overall objectives

- Contribute to the sustainable utilization of bio-energy resources for Africa‘s development

Specific objective

- The bio-energy atlas for Africa provides information (on quantity, distribution, usage, quality) to facilitate informed decision making for the sustainable use of bioenergy resources.

Results

- Existing products and initiatives are assessed and gaps evaluated
- Concept for the Atlas developed

- The interactive platform is established
- The Atlas is firmly linked to GEO/GEOSS and other regional/international initiatives

The issues for operationalization of systems:

- there is need for aggressive and sustained awareness creation among decision makers
- creation of awareness
- Capacity at a national level
- Development of a variety of space technology applications on food security
- Research and Development in space technology applications for food security
- Support of national and regional initiatives

Tertiary Education and Industry Linkages
Presenters last words were:-

- There is a rapidly growing demand for efficient online access to fundamental spatial data
- There is need for technologists to stop talking to themselves and understand the speech of the policy makers/citizenry

FOOD SECURITY ASSESSMENT APPROACH: THE KENYA FOOD SECURITY STEERING GROUP (KFSSG)
Presenter: George Odingo
The KFSSG approach

- Is a government driven process-KFSSG leads.
- KFSSG is a national team: helps put together data from various sectors –data usually district based- socio-economic
- Information is collected over a period of 3 weeks, analyzed by multi-stakeholders & projections-forecasts made.
- Geographical extent and focus areas targeted for information collection- are generalized livelihood zones- the classification makes areas as homogenized as possible.

Some Organizations Involved are:-

- GoK, FEWSNET, UN Agencies, FAO, OCHA, UNICEF, WFP, WVI-world vision inter.

Local & International NGOs

- CARE,SCUK- save the children UK,OXFAM,KRC- Kenya red cross ,Islamic Relief, CRS- catholic relief, GAA- German agro action ,Action AID,FH- food for the hungry, COOPI- Italian NGO,WASDA,VSF: Swiss, Belgium & Germany ,ACTED, CORDAID,ACF- Action against hunger

The approach seeks to take into account:

- Role of assessment teams
- Overall food security situation
- Agro climatic information analysis
- Sampling methods and field data collection
- Integrated food security classification
- Sect oral checklists, guides and reporting formats
- Estimation of population affected and in need
- District report writing

Field Assessment process.

- Pre-assessment- by District team
- Review of existing data
- KFSSG Field data collection on various sectors eg.
    - Agriculture, health & nutrition, livestock, water, sanitation and health etc

Data collected on:

- Households, livestock
- Market, accessibility
- Water , sanitation, health etc
- DSG Briefings

Assessment Tools

- **Sect oral checklists**

- District data collection and Rapid assessments
- Semi – structured interviews:
  - ✓ with officials and experts at district level,
  - ✓ Key informant and community interviews
  - ✓ Market Interviews: to Traders, Buyers, Sellers, Middlemen
- Household questionnaires

➢ Database reviews

➢ Visual inspection techniques

➢ Report writing

Review of existing data and reference material

➢ District maps, IPC maps, Population data, Livelihood zone data, Coping strategies index, Food consumption scores Price data ,Historical beneficiary data ,NDMA bulletins, Food security update ,RFE and NDVI, Nutrition survey reports and data.

Initial DSG Briefings

➢ To explain the objectives and methodology of the assessment and obtain impressions and information on the current situation.

➢ Teams will refer to the checklist of the indicators provided and collect all available and relevant data at the district level.

➢ The teams and the technical DSG will perform a thorough analysis of the data collected to verify and obtain impressions on the performance of the long rains season.

Community Interviews

➢ Community interviews are the key tool for a rapid food security assessment.

➢ They are a quick way of gathering qualitative information.

➢ Takes a small sample of people from the area in question and entails a semi-structured discussion.

➢ For more detailed and scientific surveys, household interviews are the main tool for data gathering.

Market Interviews

- Normally take place in main markets on market days.
- Purpose is to understand the current market conditions and prospects for prices, supply and demand.
- Understanding markets helps identify changes in household income and in access to food.
- Useful in gaining insights on how the market works.

Visual inspection techniques

- Crop conditions
- Pasture and browse conditions
- Livestock inspection
- Water quantity and quality
- Health status of children

Agriculture checklist
Agricultural related

- Rainfall
- Crop Production (Availability**)**
- Food stocks (access and availability)
- Food requirements (stability)
- Agriculture community

Interventions

- Current interventions
- Recommended interventions

DSG debriefing

- Presentation of findings
- Collect any additional information
- Identify appropriate response options

- Incorporate comments and suggestions by the district officials

Remarks

- The approach is pretty subjective.
- Crop yields and livestock visual observations may not be very accurate
- Cultural behaviours- may affect data accuracy.
- More factual & scientific methods are needed.
- FAO keen on application of remote sensing to food security forecasting process– cost usually prohibitive
- Monitoring of water towers important.
- Also of interest to FAO & GoK are the farmer censors- for more accurate data bases.

USE OF REMOTE SENSING FOR CROP PRODUCTION MONITORING IN KENYA
A PRESENTATION BY THE UNIVERSITY OF NAIROBI
Prof. Gideon Nyamasyo
The benefits of crop production monitoring:

- To plan for food security by accurately estimating yields.
- To predict crop yield and prepare mitigation measures.
- Predict bumper harvest and prepare the management strategy to minimize the post-harvest losses.
- To come up with an early warning mechanisms for crop failure.

The six revolutions in agricultural development

- Mechanical revolution (Ploughs, planters, harvesters).
- Introduction of hybrid maize- 1930s.
- Increased fertilizers use (Nitrogen based fertilizers).
- Increased use of herbicides, insecticides and herbicides.
- The biotechnology revolution.

- Precision agriculture (Use of computers, software and remote sensing to enhance data and facts guided agriculture).

Degree programmes Relating to Agricultural production and natural resources

- Environmental Sciences (conservation, Planning, Natural resource management, wildlife management).
- Conventional agriculture (Crop production, Livestock production).
- Biotechnology.
- ICT

Bridging the disconnect (Leap-Frog strategy)

There is a need to:

- Revise all degree programmes to include the use of ICT- based techniques.
- Survey for capacity building needs.
- Identify institutional partnership needs.
- Develop partnership programmes.
- Ensure proper deployment of available technical manpower.

Proposed ICT integration with crop production monitoring

- Migrant pests (Locusts, armyworms, wheat aphids).
- Distribution of maize stalk borers & other pests.
- Distribution of pesticides applications.
- Climate matching to predict potential pest outbreaks.
- IPM country wide programmes.

Develop an interactive website on:

- Geographic distribution of crops.
- The pests, diseases and weeds.
- Wild crops.

Matching crops production media characteristics with yield parameters

Precision farming

A lot of data exists on:

- Crop yields from specific locations.
- Soil fertility.
- Crop varieties i.e. cultural practices.
- Use of pesticides.
- Pest species identification.

Conclusion

- The benefits are on what you do with the available information.
- There is need to accurately estimate food production.
- Avoid unnecessary cultivation.
- Develop strategic management of crop yields eg. Cash crops estimation to match industrial needs (sugarcane)
- Utilize agricultural land sustainably.

Questions, General discussions [Summary]

Prof. Nyamasyo, asked whether RCMRD have partnerships/MOU's with local institutions i.e. Universities?

Response-RCMRD has signed MOU'S with JKUAT, KU and are willing if invited by institution to do the same. Currently RCMRD has a project known as MYCO-i.e. My Communities which they are funding, and are looking forward on expanding. AGRICAB is on capacity building and soon RCMRD will be organizing regional trainings.

Dr, Said from ILRI insisted on capacity building at University level and even great need in research work and adoption of new technologies. Also there is need to develop curricula targeting thematic areas where students are taking courses.

Mr, J. Ngatia from FAO advised KSFG to put more emphasize on food security monitoring in high potential areas apart from the 22 ASAL areas. He stressed on working together and adoption of new technologies.

Mr. C. Situma from DRSRS said the Department was once a member of food steering committee, but when KFSG slowed down, DRSRS also slowed down.

There is need to form a small committee to discuss the various methodologies in crop yield assessment ,data sharing and exchange, capacity building at national and regional levels.

Collaboration with DRSRS and other stakeholders in data sharing for decision makers, planners and policy formulators. Also Mr. Situma said we should NOT repeat the same stories now and then, we need to reach out to our data users.

Issue of crop yield assessment requires instruments to be calibrated more often for purpose of accuracy level. Depts. with competences should come together, especially in quantifying the crop yield.
Mr, Omullo from DRSRS suggested that, the way forward is for MOA to take up the action as required in their mandate.
Prof. Nyamasyo, said that we should not have data which is lying idle in archives.
Mr., Situma from DRSRS gave vote of thanks on every one and every organization which participated, and shared information on new technologies in crop yield assessment. He also thanked the AGRICAB/E-AGRI and the EU for sponsoring the workshop. Mr, Hendrick Boogaard thanked DRSRS for organizing the workshop. Mr., Situma from DRSRS declared the workshop closed.

Annexe 2: E-AGRI Second Progress Meeting Report

Date:	10-12-2012
Location:	Nanjing, China
Organizers:	**JAAS, UMI and VITO**

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Fig. 5: Main participants of the 2nd progress meeting

AGENDA

09:15: WELCOME SPEACH by the director of Institute of agricultural Economics and Information

09.30 – 10.30: General presentation on the periodic review (Qinghan Dong)

10.30 – 12.00: Presentations from WP leaders (WP2 to WP4) on:

- activities carried out after the first progress meeting
- status of the WP activities and deliverables
- actions for the next year

12.00 – 13.30: Lunch

13.30 – 15:00: Presentations from WP leaders continued (WP5 to WP7)

15.00 – 16.00: Discussion on weakness underlined by the reviewers during the first periodic review and specific remediation actions

16.00 – 18.00: Discussion on:

- action list
- interaction between work-packages, between partners / countries
- improvable aspects/problems (e.g., communication, delays, etc.) and proposed solutions

WORK PACKAGE PRESENTATIONs and DISCUSSION

The second progress meeting was warmly welcomed by Prof ***Sun Ling***, director of Institute of Agricultural Economics and Information, Jiangsu Academy of Agricultural Sciences (JAAS).

The following sections summarized the presentations from each work package.

WP1 –Management (and First Periodic Review)

In first presentation Dr Dong (VITO) showed the summary of the first Periodic Review held in Brussels on 16th May 2012. The speech focused on the recommendations and the corrective actions proposed by EC. Specific remediation are mostly full-finished and new actions are proposed for the aftermath (see Section 4).

In particular, the reviewers stressed on low promotional activities, e.g. dissemination by general press publications in Internet. Prof Chen (CAAS) suggested that CAAS partners can publish on their institute journal. Moreover, he proposed to ask for special issue supplement in a popular scientific journal. Dr Confalonieri (UMI) pointed out that the breeder is not the target of our project, implying that the popular publications are not the most suitable divulgation vehicles for our project. He also proposed to publish the results on Jiangsu study area on International Rice Research Institute Notes, which is a generic but scientific journal focused on development of improved technology for rice-based cropping systems. Lastly he highlighted, in agreement with Dr Dong, that workshops can be effective tools to fulfil the dissemination task. In this context, with the aim to further develop the

dissemination activities, Dr Dong invited partners to send proceedings of conferences or institute meetings where the project is acknowledged.
Dr Dong recommended the partners to submit the abstracts (half or one pages) for the remaining deliverables before the next Periodic Review (i.e., 09***, April 2013***). Dr Confalonieri replayed that, since each year the same work procedure will be adopted using different field experimental data, it will be possible to submit the whole report early and gradually update it with new parameters, new results and so on. Dr Dong agreed.
About the management part, Dr De Wit (SDLO) pointed out that the use of resources (UOR) is now under the financial issue and no longer under the management one.
Lastly, two dates are proposed for the BioMA training combined with a short progress meeting, hosted by INRA in Rabat:

- 26th – 29th of March
- 1st – 5th of April

The final decision will be determined after a further survey with the partners not participant to this meeting[6].
In the second presentation, Dr Dong summarized the achievements and *state of art* of all E-AGRI activities, further detailed in the following presentations.

WP2 – CGMS

Dr De Wit presented the first results achieved by CGMS adaptations to Morocco winter wheat, the issues encountered and the actions carried out to ride out them.
Dr Confalonieri confirmed the availability to support WP2 with the results that will be achieved by WP3 calibration of WOFOST using Moroccan field data. INRA stressed the necessity to use a rule for sowing day (e.g., based on rainfall), since the variability of Moroccan winter wheat sowing date spans about one month (November) and so far the spatially distributed simulations ran using a single date (1st of December). UMI replied that is possible to model this rule and give its availability to support INRA during the development of it.
In the second part, Dr De Wit described the data collection useful to estimate wheat variability in Anhui province. AIER confirmed the availability of the first results about questionnaire survey.
Lastly, Dr De Wit presented a possible choice for the E-AGRI viewer, i.e., the based Luigi framework, similar to MARS viewers. INRA proposed to use Luigi framework with the aim to increase the dissemination work (e.g., end-users could visualize the E-AGRI data).

WP3 – BioMA

Dr Confalonieri presented the status of calibration and validation work for the three models applied in Jiangsu paddy rice fields.
JAAS 2011 field observations showed an unexpected large value for aboveground biomass close to maturity phase, registered in each dataset. UMI and INRA agreed on the possibility

[6] due to the requirement of EURONEWS reportage, the training/ workshop/ field visit/ TV filming are scheduled in the week of March 11.

to ignore this issue in the light of the yield forecast, without undermine the quality of the prevision. However UMI ask JAAS to examine more in depth the possible cause for it. About meteorological station data, an anomaly was found in global solar radiation datasets. Dr De Wit suggested the possibility that the radiation is indirectly derived on the basis of field observations.
At the end of the presentation Dr Confalonieri move for an additional progress meeting – the last – to be hold 1 or 2 month before the end of the project. December 2013 was the date proposed for it.

WP4 – Yield estimation with remote sensing

Two presentations reported the status of WP4. The first one by AIER (Dr B. Zhang) and the second one by INRA (Dr Balaghi).
Dr B. Zhang presented the results of prediction of wheat yields using multiple linear regression models in the Huaibei Plain of China and the suggestions for further develop this study. The high light of this presentation is the incorporation of use of chemical fertiliser as a co-variable in the simulation.
Dr Balaghi presented some statistics about Moroccan wheat yield prediction and he showed the first crop forecasting bulletin for the season 2011-2012 obtained within the E-AGRI project in collaboration with SDLO and VITO.
Dr Balaghi also presented the 2011 field data collected for the BioMA calibration (WP3). Dr De Wit and Dr Confalonieri debates about the experimental data shown by Dr Balaghi, stressing that the aboveground biomass values collected are surprisingly high compared to the leaf area index values. Dr Balaghi replied that Moroccan wheat varieties are particularly adapted to drought stress conditions, e. g. limiting the water transpiration from the canopy layers.

WP5 – Area estimation with remote sensing

Prof Chen illustrated the activities of the ground sampling and data collection (WP51) and the crop area estimation (WP52) in the Huaibei Plain of China during 2012. The methodology and the results were presented with a high level of detail. At the end of his speech a specific action list for 2013 was pointed out (see section 4).

WP6 – Statistical toolbox

A dedicated presentation on the statistical toolbox software was planned in the third day of E-AGRI meeting, at the end of BioMA training session. In the present phase only some brief considerations were pointed out as suggestions to improve the statistical toolbox.
Dr Confalonieri, with a view to possible future developments, noted that it would be useful to include in the tool the ability to perform the similarity analysis based on multiple decades choice (instead of single one), as it is in the statistical Control Board (CoBo) developed by Joint Research Council (JRC). Dr Balaghi, according to his own experience, agreed with Dr Confalonieri that the knowledge of the history of more decades will make the forecasting system more accurate. Dr De Wit agreed with these remarks.

SUMMARY OF ACTIONS IN 2013

The final part of the meeting focused on the discussion for the planning of the specific actions relative to the third year of the E-AGRI project. Partners were first grouped according to work packages, and specific 'action lists' were compiled based on the actual work package status. WPs partners were later combined where crossed cooperation can be useful to fulfil specific achievements.
The table below describes the list of action agreed in the group discussion.

Work Package	Task	Partner Institutes	Action/Implementation
All	Bring forward the content of the deliverables and provide dissemination information to VITO (***February 2013).*** The aim is to inform the reviewers of the Second Periodic Review	All	Send to VITO: 1. 1 or 2 pages of abstract for each remaining deliverable to be delivered on the 30th (or 36th)month 2. The list of conferences and symposiums attended and title of presentations or the first page of proceedings 3. The list of the specialized organizations visited and mission summaries 4. The list of publications (scientific and journalistic)
WP1	Management	VITO	1. FP7 Reporting Knowledge (Period review) 2. Biannual Reporting
WP1	Promotional Work	all partners	1. Liaise with Government bodies (Local ministries, DG-AGRI) 2. List of conferences and symposiums attended and title of presentations or the first page of proceedings 3. Attending more specialized symposiums (e.g., Dragon symposium, USDA conference) 4. Exchange with other teams in the field and provide for mission summaries (e.g., visited: Anhui agricultural University on March 2012, China Agriculture University on June 2012, Moroccan centre of remote sensing CRTS; planned: Zhejiang University) 5. Publications: scientific and journalistic

WP2	CGMS Adaptation – piloting Morocco	INRA, SDLO	1. Set up the real-time processing for CGMS-Morocco. Allard will ask Tarik if he needs support in setting this up. 2. Set up the CGMS level2 processing: • Use crop parameters from study in D23.2 • Update with crop parameters from UMI if reasonable and available in time • Soil data still not available: ○ Send email with problems found to Samira ○ if needed Samira sends the raw point data of soil profiles ○ otherwise fall back on European soil map 3. Setup the spatial aggregation of results: • use the SQL scripts available from CGMS • grid to province: use crop mask • province -> agrozone -> Morocco use yield statistics (AGGREGATION_AREAS) 4. Develop and set up the e-Agri viewers for Morocco: • Ask demo data from Tarik 5. Setup CST for Morocco: • Updating of CST schema in ORACLE database • Include indicator sum of rainfall since 1th October • Functionality to export CST data to Access DB must be made to be downloaded by others that want to use CST. Note: processing and delivery of satellite indicators for viewer/CST is outside the scope of WP2 in E-AGRI. Dr Balaghi will take action to get this done.
WP2	CGMS Adaptation/piloting - Anhui, China	AIFER, SDLO	1. Setup the real-time processing for Anhui: Allard will send Bell Zhang a script for updating the database with

			meteorological data from GTS (NOAA Global Summary of the day). 2. Setup CGMS for running the level 2 data: the CROP_CALENDAR table has been set by Bell Zhang 3. Calibration WOFOST for wheat in Anhui. a preliminary calibration was done for Anhui for running CGMS for wheat. Bell Zhang wants to extend this with 3 cultivars for Anhui 4. Set up E-AGRI viewers for Anhui 5. Bell Zhang will check with CAAS and other institutes for crop experimental for Anhui for deliverable D21.1/D21.2 6. Allard will investigate performance problems with CGMS and MySQL
WP3	Ground data collection for BioMA & Adaptation of BioMA for multi-model wheat monitoring in Morocco	INRA	1. Support UMI with the 2011 and 2012 (first part, since the wheat cycle will be complete in the first months of 2013) field observations; 2. INRA is available to discuss model results and in case refine calibration during the next progress meeting hosted by INRA.
WP3	Ground data collection for BioMA & Adaptation of BioMA for multi-model rice monitoring in Jianghuai Area	JAAS	1. Investigate reasons for anomalous 2011 field observations close to maturity (i.e., notably large values for AGB); 2. Support UMI with county sowing dates and crop mask for rice in Jiangsu; 3. Support UMI with 2012 field observations; 4. JAAS is available to meet with UMIL to discuss model results and in case refine the calibration of the three models. (on spring 2013?)
WP3	Adaptation of BioMA for multi-model rice monitoring in Jianghuai Area	UMI	In synch with JAAS: 1. Implement a new approach to simulate rice transplanting effect; 2. Perform the second calibration and validation of the three models based on

	& BioMA piloting for multi-model rice monitoring and yield forecasting in JIANGHUAI Plain Adaptation of BioMA for multi-model wheat monitoring in Morocco & BioMA piloting for multi-model wheat monitoring and yield forecasting in Morocco		JAAS 2012 field observations; 3. Perform spatially distributed simulations in Jiangsu province with parameter sets retrieved from 2012 calibration; 4. Produce the first version of D33.2 deliverable (Assessment report on multi-model approach for rice monitoring) within the second review meeting. The deliverable will be gradually updated until the 36th month. 5. UMI is available to meet with JAAS to discuss and refine the calibration /validation of the three models. In synch with INRA: 1. Perform a first calibration and validation of the two models based on INRA 2011 and 2012 (first part) field observations 2. UMI is available to discuss model results and refine model calibration during the next progress meeting hosted by INRA; 3. UMI is available to support INRA for the implementation of automatic management rules to be used in BioMA (e.g., rainfall based sowing)
WP5	Ground sampling and data collection (Huaibei Plain, China) & Crop area estimation (Huaibei Plain, China)	CAAS	1. Continue collecting and updating the statistical data and the remote sensed images in the study area 2. Field campaign in 2013 for winter wheat and maize 3. Based on the remote sensed crop distribution map, improve the crop area frame sampling scheme in the study area 4. Continue testing the accuracy and efficiency of different methods/ algorithms using new remotely sensed images in 2013 5. Apply remote sensing classification for Maize as well as wheat 6. Work with Kenya is planned in collaboration with AGRICAB project 7. Publication and final report

WP5	Ground sampling and data collection (Morocco) & Crop Area estimation (Morocco)	INRA	Area frame sampling in collaboration with DSS of the Ministry of Agriculture. Classification of remote sensing data
WP7	Deliverables on the thematic workshops	UMI SDLO Vito	1. Submit the D71.2, D71.3, D71.3 before the delivery date (may be before next Periodic Review)

PROJECT PERIODIC REPORT 3

Grant Agreement number:	**270351**
Project acronym:	**E-AGRI**
Project title:	**Crop Monitoring as an E-agriculture tool in developing countries**
Funding Scheme:	**Collaborative project – International collaboration project (STREP/SICA)**
Date of latest version of Annex I against which the assessment will be made:	**2014-01-31**
Periodic report:	
Period covered:	**2013-01-31 to 2014-01-31**
Name, title and organisation of the project's coordinator	**Dr. Qinghan Dong** **VLAAMS INSTELLING VOOR TECHNOLOGISH ONDERZOEK** **Tel: +32-14-336856** **Fax: +32-14-322795** **E-mail: qinghan.dong@vito.be**
Project website:	**http://www.e-agri.info**

Declaration by the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [7]:

  ☐ has fully achieved its objectives and technical goals for the period;

  ☐ **X** has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ☐ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable

  X is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: ...Qinghan Dor .....

Date: .....23...../ ....03...../ ....2014.....

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism.

[7] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

8. Publishable Summary

8.1. Introduction

The Directorate General CONNECT of the European Commission supports actively, through the EU's 7th Work Programme (FP7), the uptake of European ICT research results in developing countries. Under this scope, the "E-AGRI" project aims to set up an advanced European E-agriculture service in two developing economies, Morocco and China, by means of crop monitoring. 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.

8.2. Objectives and the technologies targeted in the project E-AGRI:

The project has the following objectives:

- ***Objective of DEMONSTRATION*** **: to transfer and adaptation of European agricultural monitoring technology in two developing countries.**
- ***Objective of DISSEMINATION*****: to establish networks of users on the crop monitoring technology across three continents in the world (Europe , Africa and Asia (China)).**
- ***Objective of providing ADDED VALUES for EU*****: to obtain the feedback and thus to improve for European expertise and know-how (ADDED VALUES for EU)**
- ***Objective of COLLABORATION*****: to create synergy with other European crop monitoring actions (MARS-Stat-Food, GMFS…)**

The project entails a research and development (RTD) component and a demonstration (DEMO) component. The RD tasks aim to adapt European technologies to local agro-environmental conditions and to develop and integrate additional peripheral components if the local stakeholders' needs arise. The DEMO activities will be carried out to prepare and train local experts so that the operation using the transferred technologies can be initiated or continued when operational conditions are met. Finally a capacity building activity specifically designed for East Africa will be organized in Kenya, to pave the way for an eventual technological transfer in the future.

The targeted technologies have essentially been developed in **three domains:**

- Crop monitoring by agro-meteorological modelling such as CGMS or an extended multi-model platform BioMA.

- Crop monitoring using vegetation variables derived from satellite imagery to monitor the crop growth status and predict the crop yield.
- Crop area assessment combining area frame sampling and satellite image analysis.

8.3. Achievement

The implementation and achievement of the project should allow the local partner organizations to build up their own knowledge and experience on using European crop monitoring technologies. Practically, at the end of the implementation, the local partners have acquired the know-how, on the pre-operational level, on the key crop monitoring components (for example, CGMS or BioMA platform) that are transferred by the European partners. That means, once local input data and institutional support are available, the operation of these crop monitoring systems will be sustained.

The success of the project, at the end of implementation, is reflected by the infrastructure set-up of locally adapted technologies and the knowledge and capability set-up for operating this infrastructure. In this regard, implementation of some key technologies went well beyond the frame set out in the Description of Work:

- the CGMs set up in Morocco is the best illustration of the progress. Thanks to the common effort from the European and local partners, particularly to the collaboration contributed by other two Moroccan organisations outside of E-AGRI consortium, the CGMS-MAROC has been set up and brought to operation, integrating both agro-meteorological and remote sensing indicators. The system has been further built up in the web viewer environmental allowing parallel and simultaneous analysis of crop growth status from different terminals
- the BIOMA platform has been further completed with a module for assessing the disease impact on the crops, which was not planned initially
- crop yield forecasting using remote sensing indicators has been further developed on the Huaibei Plain to include an indicators for yield technological trends, so that the forecasting performed with the same level of accuracy in Europe
- a new area frame sampling approach has been developed together with the Joint Research Centre with increased cost effectiveness and accuracy

On the other hand, the feedback of European technological transfer has improved the applicability and robustness of these technologies. The adaptation brought to the CGMS application in Morocco, helped to make progress the GLOBCAST system operation by the DG AGRI of the European Commission. In the case of the rice monitoring, although this staple food is consumed by half of world population, the rice production monitoring is not closely followed by European institutions. The results generated from this project can be readily disseminated and fill the gap at the European level.

Finally in the domain of a sustained local institutional set up, the local experts are able to advise adequately the agriculture policy makers on the issue of food security and the agro-commodity trading. In Morocco, the local partner publishes periodically the yield forecast

bulletins, while on the Huaibei Plain, the local experts from AIFER attend the policy advising meetings together with the meteorological department.

Kingdom of Morocco

Direction of Strategy and Statistics

National Direction of Meteorology

Agro-meteorological crop monitoring bulletin for the 2012-2013 cropping season

Crop Growth Monitoring System - Morocco

Highlights

During the 2012-2013 cropping season, cumulated rainfall was high, as compared to long term average (>30%), in most of the main agricultural areas. However, rainfall was average along the coast, in Essaouira, Safi, Agadir, Tangier and Tetouan provinces and, slightly lower than the average in Al Hoceima and Nador provinces. Cumulated rainfall at national level, from September 1st 2012 to April 30th 2013, was high (551mm), which is 61% more than the long term average. Temperatures during this cropping season were as average compared to historical data. The vegetation, as monitored by remote sensing (NDVI), was good in the main cereal (soft wheat, durum wheat and barley) growing areas. In the North of the country, in Tangier, Tetouan, Larache, Kénitra and Sidi Kacem provinces the vegetation was close to average. However, in Safi, El Kalâa des Sraghna, Chichaoua and Marrakech provinces, vegetation was below average. At national level, the total area of cereal was 5,129 million hectares, as estimated from field surveys.

*This bulletin is jointly published by the National Institute for Agronomic Research (INRA), the National Direction of Meteorology (DMN) and the Direction of Strategy and Statistics (DSS). It has been achieved thanks to the National crop monitoring and forecasting system, called « **CGMS-MAROC** » (www.cgms-maroc.ma). This system was initiated by INRA, in the framework of E-AGRI project (http://www.e-agri.info/). CGMS-MAROC is jointly managed by INRA, DMN and DSS.*

Balaghi R., Tahri M., El Hairech T.

Figure 1: 2012-2013 crop yield forecasting bulletin for Morocco based on E-AGRI methodologies.

8.4. Project's web-site

The project general site (http://www.e-agri.info) has been recently updated including the major deliverables and new links to the other related project or activity websites including CGMS-MAROC .

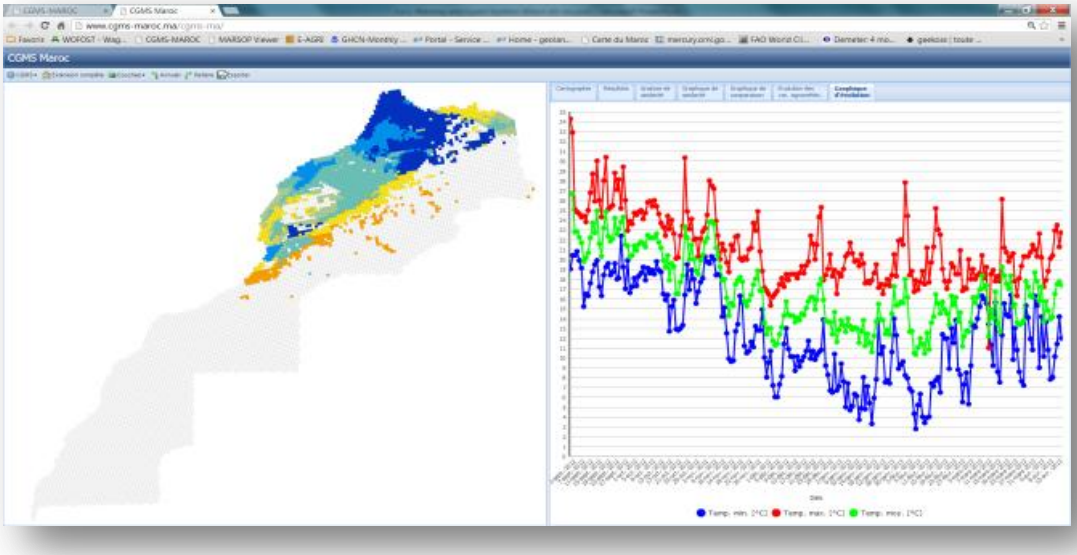

Figure 2: Project's web site (www.e-agri.info) screen capture

Figure 3: BioMA training workshop flyer

9. Objectives, work progress and project management

9.1. Project objectives for the period

The objective of this third implementation year was to finalize the transferred crop monitoring technologies at the demonstration or pre-operational level. That means the setup of the technological infrastructure had to be completed and fully demonstrated in the local partner institutes. The local partners will have acquired the full scale knowledge to operate these technologies. In case of resource availability and institutional support, the implementation could be extended to the operation level, exceeding therefore the initial goal of demonstration.

For the component of the CGMS monitoring system (WP2), the objective was to achieve the implementation of level 2 and conduct the demonstration (pilot) activities. The output of the pilot activities is to be evaluated using the official statistics of yield. Regarding the implementation of the BioMA platform (WP3), the third year goal was to perform a complete evaluation of the multi-model approach implemented in the BioMA platform against official yield statistics, identifying the conditions where each of the three models performs better than the others, with and without the assimilation of remote sensing information. For rice in Jiangsu, the most relevant conditions explored for the three BioMA rice models (WARM, WOFOST and CropSyst) were: the moment during the season when the forecasting event is triggered, the use of remote sensing information for using season- and site-specific sowing dates, and for updating simulated state variables using exogenous leaf area index values. For wheat in Morocco, the conditions explored for the two wheat BioMA models (WOFOST and CropSyst) were: soil and climate conditions explored in the different regions, the moment when the forecasting event is triggered, the use of remote sensing information to update simulated stat variables. These tests were aimed at defining workflows to be implemented in operational monitoring and forecasting systems in the two study areas.

On the domain of crop monitoring and yield forecasting using remote sensing indices, the times series of the biophysical variables are continuously to be generated for two study areas, exceeding therefore the planning of the Description of Work. The monitoring and the forecasting activities would be actually carried out at the operational level providing on near real time base the most recent forecasting. This operation would lead to an official bulletin of wheat yield prediction for Morocco for the growing season 2012-2013 and an internal /unofficial prediction for the Huaibei Plain. These objectives at operational level exceed the scoop of the Description of Work.

Regarding the area estimates using the ground survey and remote sensing, the goal was to extend the sampling areas in two study regions and continuously improve the efficiency of

area frame sampling in Huaibei Plain (number of frames surveyed per day). A slightly modified approach will be tested for its efficiency

The dissemination activities (WP7) aimed especially towards crop mapping activities in Kenya. The technical preparation for mapping would be carried out by CAAS. A workshop of crop mapping and satellite image classification had to be organized in November 2013 to transfer and build the basic knowledge of local partners in the domain.

9.2. Work progress and achievements during the period

The implementation of the project has been further carried out and finalised in the third year, in line with or exceeding sometimes the initial objectives of the Description of Work (DOW). The outcome of the project obtained in Morocco and on the Huaibei Plain of China, demonstrated that these two regions have the capacity to acquire, "digest" and operate the European crop monitoring technologies, through appropriate technological transfer and capacity building. However the gap for transferring these technologies to the third study region, Kenya, seems still quite large. More institutional support, built-up and capacity building are needed for further transfer and development in the domain of agricultural monitoring.

Most tangible achievements are summarized below:

- Development of a complete and advanced CGMS system (CGMS-MAROC) adapted to the Moroccan local conditions and the operational running at CGMS levels 1, 2 and 3:
    - New grid of CGMS-MAROC with 9,14km x 9,14km was adopted.
    - The 1:1,000,000 European soil map was combined with a more detailed soil map that was available only for the agriculture zone in the northern part of Morocco. Moreover, the soil hydraulic properties were estimated for the spatial units in the Moroccan soil map.
    - The land cover mask derived from the GlobCover project was updated with a crop mask established by the Department of Statistics and Strategy. From this new combined map, the classes related to arable land were derived in order to calculate the percentage of arable land per CGSM grid.
    - Meteorological data acquisition and spatial interpolation using local synoptic station data. The parameters including the daily mean vapor pressure, global radiation and evapo-transpiration are calculated and interpolated spatially.
    - The original CGMS parameterisation was updated according to local conditions: the crop calendar was updated with a fixed sowing date on the 1st of December and letting the model run up till maturity; The estimation of the initial soil water was updated by starting the simulation on the 1st of June with a completely dry soil profile.
    - The output of CGMs level 2 stored in ORACLE database is converted to MS ACCESS database and input for Level 3 statistical analysis.

- A dedicated web-site for CGMS MAROC (www.cgms-maroc.ma) has been set up and a viewer developed by Moroccan partners (INRA-DMN-DSS) has been incorporated and available for large public. It is fully operational for viewing meteo data and performing basic weather statistical analyses.

- The piloting activities for CGMS on Huaibei Plain has been has successfully been performed thanks to calibration based on the agronomic data from Fenqiu agro-experimental site. The problem of the meteo data availability could be resolved by using NOAA-GSOD data as real time data replacement. The CGMS level 1, 2 and 3 can be run using batch mode. The WEBGIS for operation use is under construction.
- The BioMA releases for rice in Jiangsu and wheat in Morocco were indeed developed and tested, from both the technological (e.g., bugs fixed) and scientific/operational point of view, i.e., their capability to produce reliable forecasts under different conditions. the potential of multi-model simulations for forecasting purposes was fully demonstrated, as well as the usefulness of using remote sensing information to feed crop models within large-area monitoring systems. Moreover, some activities, not foreseen in the DoW, were carried out: (i) implementation in the two BioMA-based monitoring systems of procedures for the simulation of the impact of diseases on yields, (ii) development of an improved algorithm for rice transplanting, (iii) collection of a third year of data for rice in Jiangsu. All these activities allowed increasing the forecasts' reliability.
- The remote sensing indices database have been consolidated and extended. Cereal yield forecasts for the growth season 2012 2013 based on NDVI and DMP are conducted the results are published in a bulletin available for decision makers. The evolution of these key indices can be visualized on the dedicated CGMS-MAROC web site.
- The ground sampling approach was greatly improved in collaboration with JRC the efficiency of sampling is more than doubled. The sampled area in Morocco has been extended including Meknes-Tafilalet region.
- As a capacity building activity, a workshop consisting training sessions was organized in Nairobi, Kenya so that the local experts can get acquaintance with the satellite image analysis techniques.
- The coordination of the project was invited by DG-AGRI of the Commission in July 2 2013 to present the progress and achievement of the E-AGRI project.
- The Coordination of the project was approached again in January 2014 by the DG AGRI due to their interests to the Chinese partnerships and network established within E-AGRI project. This is in the context of the new platform "EU-China Food, Agriculture and Biotechnology Flagship" (http://ec.europa.eu/programmes/horizon2020/en/news/towards-eu-china-food-agriculture-biotechnology-flagship).

The following tables provide more details on the progress realised within each work-package.

WP 21: Ground observations and data collection	
Summary of objectives and progress	The objective of this work-package is to collect and build datasets needed for the calibration /implementation of CGMS at level 1&2. The official statistical data in terms of yield, acreage or production at the regional level are needed to be updated after each year. Regarding the regional statistics, updates of the regional statistics for 2012 have been provided by partner INRA and these have been implemented in the database of the statistical toolbox by Alterra and shared with INRA/DMN. Moreover, a new dataset has been made available by partner AIFER containing phenological observations and experimental data. This dataset is currently was processed to update the calibration of WOFOST/CGMS for winter-wheat simulation in Anhui (WP23).

Third year objectives	**Significant results**
• Updating the official statistics in both study regions • Ongoing efforts for collecting experimental and phenological data for winter-wheat in Anhui.	• Regional statistics are updated for 2012 for the Morocco test site (INRA) • Regional statistics were updated for the Anhui site up till 2012 by partner AIFER. • A new data set has been acquired by partner AIFER containing long-term phenological observations for 11 stations. The dataset is being processed to fit the data structure that is needed for the Calibration Platform (CALPLAT). • An additional dataset of detailed data from the Fenqiu experimental site was acquired by partner AIFER that was suitable for calibration of WOFOST/CGMS • Datasets were described in Deliverable D21.1

Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: see Form C • INRA: 3/ 3 man-months • AIFER: 9/9 man-months
Corrective actions	The data requirements for the Anhui test-site have now been fulfilled and the previous data gap has been corrected by partner AIFER

WP 22: CGMS adaptation Morocco		
Summary progress and objectives	The objectives of this WP is to adapt and implement the Crop Growth Monitoring System for Morocco. At the end of the project CGMS should be available for operationally monitoring the growth of soft-wheat and durum-wheat in Morocco and provide indicators that can be used for forecasting of the final crop yield. The CGMS level 1 (weather) and level 2 (crop simulations) are running operational in the CGMS_MA database. The preparations have been carried out to connect the CGMS database to the statistical database containing the regional statistics. For this purpose, the algorithms have been implemented to aggregate output from CGMS at grid level towards regional level. Finally, the latest version CGMS Statistical Toolbox was established for Moroccan users with replication of data to end users.	
Third year objectives • Operational implementation of the CGMS level1, 2 and 3 • Aggregating CGMS simulation results at grid level towards the regional level for the E-Agri viewer and CGMS Statistical Toolbox. • Further develop and implement the E-Agri viewer for Morocco		**Significant results** • The CGMS level 1, level 2 and level 3 are fully operational for Morocco (SDLO & INRA) • The algorithms have been put in place to aggregate the CGMS results towards the regional level (district, provincial, zonal and national) based on crop area statistics and/or land cover statistics (SDLO). • Data from CGMS (and other indicators) can be inserted into the CST database schema for analysis with CST ((SDLO). • The Morocco implementation of the E-Agri viewer has been developed further which is now able to generate maps based on the meteorological variables available. In total the E-Agri viewer can now visualize maps of 16 meteorological indicators which can be modified by operators such as min/max/sum/avg when relevant. Moreover, the user interface has been improved including saving of favourites and generation of charts of variables. Nevertheless, work on E-Agri viewer has been progressed to an extent that the system has become usable for end-users. This is mainly due to problems

	with availability of qualified personnel working on the data server that is processing viewer requests (SDLO & INRA).
Deviations from DOW and impact	None
Reasons for failing to achieve critical objectives	None
Use of resources	Person-months actual / planned : SDLO: 9/9 Man-Months
Corrective actions	None

WP 23: CGMS adaptation Anhui, China	
Summary of objectives and progress	Objectives of the WP2.3 are to evaluate the usability of CGMS for Anhui (China) and to assist in setting up and adapting CGMS for Anhui in cooperation with partner AIFER. Finally, the CGMS for Anhui must be evaluated. Progress in the implementation of CGMS for Anhui (China) is relatively slow compared to the Moroccan test site. The CGMS Level 1 has been set up and can now run operational using data from the NOAA GSOD service which has a delay of 2 days with real-time. In terms of setting up the CGMS level 2, an extensive calibration of CGMS/WOFOST was carried out based on the data provided by partner AIFER. First, the phenology, biomass and LAI development of WOFOST will be calibrated using the detailed experimental data that were provided from the Fenqui experimental site. Next, The parameters governing phenological development of WOFOST model were calibrated on 11 stations with long time-series in Anhui. This was done using a spatial zonation which allowed to take into account the regional variability in the crop calendar and phenological parameters.
Third year objectives • Complete the CGMS levels 1,2 and 3 (weather data processing ,crop simulation and aggregation for regional yield forecasting) for Anhui: 1. Provide a solution for the availability of station weather data in Anhui. 2.Allow semi-operational weather data processing and interpolation to the grid • Calibration the crop simulations for	**Significant results** • The experimental data provided by partner AIFER have been processed into a database and used with the CGMS calibration platform (SDLO & AIFER). • Phenological development parameters in CGMS/WOFOST have been calibrated based on 11 phenological stations (SDLO & AIFER). • Regional crop calendars and spatial zoning has been defined based on 11 phenological stations. • Calibration of the biomass and LAI

level 2 based on regional phenological data and experimental data • Roll out the CGMS-Anhui to user AIFER for starting the piloting phase (WP24)	development based on data from Fenqiu site has been finalized and implemented in CGMS-Anhui (SDLO & AIFER) • Results from the calibration have been documented in deliverable D21.2 • The spatial schema was adapted because the administrative regions and coding in Anhui changed during project duration (SDLO & AIFER).
Deviations from DOW and impact	Implementation of CGMS Anhui has been delayed in general which makes the time left for the piloting phase critically short. SDLO carried out corrective actions to achieve the CGMS implementation in the remaining project duration. The implementation of CGMS-Anhui was achieved and was transferred to partner AIFER with a support visit from 3-9 november 2013. The support visit was done by Li Jia who is a native Chinese speaker which facilitated the communication and implementation of CGMS-Anhui.
Reasons for failing to achieve critical objectives	• Corrective actions were carried out successfully and the WP objectives were achieved.
Use of resources	Person-months actual / planned: see Form C. SDLO : 12/9 Man-Months
Corrective actions	• SDLO has invested additional man power in the implementation of CGMS for Anhui . This is a Chinese colleague working at SDLO which has improved communication with AIFER. • Details of the implementation of CGMS-Anhui have been done by SDLO directly and were transferred to Anhui in order to speed up the implementation of the CGMS-Anhui using the new data gathered by AIFER.

WP 24: CGMS piloting Anhui, China	
Summary of objectives and progress	Objectives of the WP2.4 are to implement the adapted CGMS for Anhui (China) at user premises, to run the CGMS-Anhui in a semi-operational way and to evaluate the CGMS output for crop yield prediction.
Third year objectives	**Significant results**
• Implement the adapted CGMS at partner AIFER for simulation of winter-wheat in Anhui, China. • Run CGMS-Anhui semi operational at AIFER in order to do crop monitoring . • Evaluate the prediction of CGMS	• Adapted CGMS implementation was transferred to AIFER in November for piloting (SDLO & AIFER) • CGMS Statistical Toolbox setup was transferred to AIFER and used for evaluation of CGMS-Anhui. • CGMS-Anhui was run operational for the

Anhui using reported yield statistics and other characteristics of the crop yield simulation. • Describe results in deliverable D24.1	piloting period (SDLO & AIFER). • Results were analysed with the CGMS Statistical Toolbox (SDLO & AIFER). • Results have been described in deliverable D24.1.
Deviations from DOW and impact	Implementation of CGMS Anhui has been delayed in general which makes the time left for the piloting phase critically short. SDLO carried out corrective actions to achieve the CGMS implementation and allow piloting in the remaining project duration. The implementation of CGMS-Anhui was transferred to partner AIFER in November and the evaluation result were reported.
Reasons for failing to achieve critical objectives	Corrective actions were successfully implemented and the original WP objectives were achieved.
Use of resources	Person-months actual / planned:. SDLO : 3/3 Man-Months AIFER: 1/1 Man-Months
Corrective actions	• SDLO has additional man power in the implementation of CGMS for Anhui . This is a Chinese colleague working at SDLO which has improved communication with AIFER. • Details of the implementation of CGMS-Anhui have been done by SDLO directly and will be transferred to Anhui in order to speed up the implementation of the CGMS-Anhui using the new data gathered by AIFER.

WP 25: CGMS piloting Morocco	
Summary of objectives and progress	Objectives of the WP2.5 are to implement the adapted CGMS for Morocco at user premises, to run the CGMS-Morocco in a semi-operational way and to evaluate the CGMS output for crop yield prediction.
Third year objectives • Fully Implement the adapted CGMS levels 1,2,3 in Morocco for simulation of winter-wheat and durum-wheat. • Run CGMS-Morocco operational in order to carry out real-time crop monitoring and yield prediction. • • Describe the results in the piloting	**Significant results** • CGMS-Morocco has been running fully operation during the piloting phase which has been described in deliverable D25.1 “Piloting report” (SDLO & INRA). • Output from the CGMS-Morocco is inserted in the CST database schema and replicated to other users of the CGMS Statistical Toolbox (SDLO & INRA). • Results from CGMS-Morocco are shared. between users DMN, INRA, DSS and are used

report.	operationally for crop yield prediction at national level in Morocco (SDLO & INRA).
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: SDLO : 3/3 Man-Months INRA: 1/1 Man-Months
Corrective actions	N/A

WP 31: Ground data collection for BioMA	
Summary of objectives and progress	The objective of WP31 was the collection all the information needed to adapt the models to the conditions explored by rice in Jiangsu (for the models WARM, WOFOST and CropSyst) and by wheat in Morocco (WOFOST and CropSyst). Dedicated field experiments were carried out because of the needs to collect data specific for the parameterization/calibration of the models. The progress includes: • [Rice in Jianghuai Plain] (JAAS). The database of field observations was updated with information about soil properties, management (fertilization and cultivation method), and all phenology variables from the third year experiments. The information collected - for both direct seeded and transplanting (manual and mechanical) – from nine experimental sites and three seasons, were discussed with the partners involved, and were considered as representing a high quality datasets for model calibration and validation purposes. • [Soft and durum wheat in Morocco] (INRA). The database was updated with data from the second year of E-AGRI experiments carried out in the three INRA experimental stations, for both potential and water limiting conditions. Variables measured include main phenological stages, aboveground biomass, leaf area index, soil water content (for water limiting conditions), as well as all the management information needed to properly configure simulations. • The databases of observed data and metadata for model calibration for rice in Jiangsu and wheat in Morocco was completed.

Third year objectives • Organization of all the data collected - and of all related metadata - in dedicated databases, to be delivered before month 30 • Analysis and discussion (in case of unexpected values) of all data and metadata.	**Significant results** • Specific, high quality databases (for rice in Jiangsu and wheat in Morocco) of variables related to plant growth and development (under potential and water limiting conditions for wheat in Morocco), to crop management and to soil properties were collected, as integration to the first version of the databases collected during the first and second year of project. The importance of such data is demonstrated by the results already achieved in terms of model calibration (see WP 32 and WP 34) (UMIL & INRA). • Direct discussion of data gathered by INRA was possible during the BioMA workshop held in the Moroccan Institute during Month 26 (see WP7) (UMIL & INRA). • The milestone MS1 was achieved coherently with the DOW scheduling.
Deviations from DOW and impact	No deviations.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person months actual/planned: • INRA: 4.6 / 3 (3rd year: 1.2) • JAAS: 11.98 / 6 (3rd year: 2.9) • UMIL: 1 / 1 (3rd year: 0.46)
Corrective actions	Not applicable.

WP 32: Adaptation of BioMA for multi-model rice monitoring on Jianghuai plain	
Summary of objectives and progress	This work package was aimed at (i) adapting – via proper parameterization/calibration activities the BioMA models WARM CropSyst and WOFOST for rice simulations in the Jianghuai Plain and (ii) the adaptation of the BioMA platform for multi-model rice monitoring in the region. The progress refers to: • Completion of the calibration and the evaluation of the three BioMA models by using the data from the second year of field experiments carried out within WP 31 (UMIL). • Successful validation of models parameterizations using data from the third year of field experiments (totally independent). • Development and test of a new algorithm for rice

	transplanting, capable to reproduce growth dynamics even in case of the high seed densities in the nursery used in mechanical transplanting (the original Oryza2000 algorithm failed under these conditions). • Large-area evaluation of the multi-model BioMA platform for rice simulations in Jianghuai Plain (UMIL & JRC).
Third year objectives • Improving the algorithm for rice transplanting, since the one used (from Oryza2000) - although it is considered the best among those available - presented some problems in case of high seedbed densities. • Complete the evaluation of the BioMA models for rice in Jianghuai Plain at field level and for large-area simulations.	**Significant results** • Completion and delivery of the database with the parameter sets for the models CropSyst, WARM and WOFOST for rice simulations in Jianghuai Plain (UMIL). • Completion and delivery of the reports presenting the evaluation of BioMA at field and regional levels. • Successful improvement of the BIOMA models WARM, CropSyst and FOFOST in reproducing the processes involved during the mechanical transplanting event (UMIL & JRC). • A release of the BioMA platform, successfully adapted to multi-model rice simulations in the Jianghuai Plain, is available since month 30 (Milestone MS2).
Deviations from DOW and impact	No deviations.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person months actual/planned: • UMIL: 29.16 / 9 (3rd year: 1) • JRC: 1 / 1 (3rd year: 0.24)
Corrective actions	Not applicable.

WP 33: BioMA piloting for multi-model rice monitoring and yield forecasting in Jianghuai plain	
Summary of objectives and progress	The aims of this work package were (i) testing the suitability of the BioMA platform for rice monitoring and yield forecasting in the JIANGHUAI Plain, (ii) evaluating the effectiveness of a multi-model approach for rice monitoring and yield forecasting, and (iii) evaluating the possible improvements of the rice forecasting system by forcing models with data estimated from RS.

	The progress includes: • Evaluation of the performances of the BioMA models WARM, WOFOST and CropSyst for crop yield forecast under different conditions (i.e., season, moment when the forecasting event is triggered). • Evaluation of the BioMA platform against official yield statistics. • Evaluation of the usefulness of remote sensing data assimilation for sowing dates and maximum leaf area index.
Third year objectives • Assess the suitability of the BioMA platform for rice monitoring and yield forecasting in the JIANGHUAI Plain • Evaluating the effectiveness of a multi-model approach for rice monitoring and yield forecasting • Evaluating possible improvements of a model-based rice monitoring and forecasting system when models are forced with exogenous leaf area index data derived from RS	**Significant results** • Identification of the conditions for which the different crop models implemented in BioMA appear to be more adequate than the others (UMIL). • The cross validation of the BioMA platform against the official statistics was completed (JAAS and UMIL). • The evaluation of the increase in forecast reliability due to the assimilation of remote sensing information was completed. • BioMA platform set up for rice yield forecasting (UMIL) is available.
Deviations from DOW and impact	No deviations.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person months actual/planned: • UMIL: 8.2 / 7 (3rd year: 8.2) • JAAS: 3 / 3 (3rd year: 3)
Corrective actions	Not applicable.

WP 34: Adaptation of BioMA for multi-model wheat monitoring in Morocco	
Summary of objectives and progress	The aims of WP 34 were (i) adapting the BioMA models CropSyst and WOFOST for wheat growth and development in Morocco via parameterization/calibration activities performed using the data collected within WP 31; (ii) adapting the BioMA platform for wheat

	simulations in the Country. The progress includes: • Completed the calibration and validation of CropSyst and WOFOST parameters for soft and durum wheat in Morocco, for both potential and water limiting conditions (JRC & UMIL in collaboration with INRA). • Evaluation (completed) of CropSyst and WOFOST for soft and durum wheat large-area simulations in Morocco (JRC). • Evaluation (completed) of the BioMA models forecasting capability against official yield statistics at regional and national scale. • Quantification (completed) of the increases in reliability that can be achieved by assimilating remote sensing information in the platform.
Third year objectives • Refining the calibration using the field observations from the second year experiments. • Completing the evaluation of the BioMA models for large area simulations of soft and durum wheat in Morocco.	**Significant results** • Completion and delivery of the database with the parameter sets for the models CropSyst and WOFOST for wheat simulations in Morocco (UMIL). • Completion and delivery of the reports presenting the evaluation of BioMA at field and regional levels. • Evaluation (completed) of simulation results and average official statistics in the four main wheat cropped regions of Morocco (NUTS 1 classification level). • A BioMA platform adapted to Morocco with different model solutions is available since month 30 (milestone MS2), as planned.
Deviations from DOW and impact	No deviations.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person months actual/planned: • UMIL: 13.09 / 1 (3rd year: 4) • JRC: 12 / 12 (3rd year: 4.59)
Corrective actions	Not applicable.

WP 35: BioMA piloting for multi-model wheat monitoring and yield forecasting in Morocco	
Summary of objectives and	This work package was aimed at (i) testing the suitability of the BioMA platform for wheat monitoring and yield forecasting in

progress	Morocco; (ii) evaluating the usefulness of a multi-model approach for wheat monitoring and yield forecasting; (iii) evaluating the possible improvements of the forecasting system by forcing models with data estimated from RS. The progress includes: • An extensive evaluation – again official yield statistics – of the platform for wheat simulation in Morocco was performed. • Conditions for which the different BioMA models resulted more adequate were identified, fully supporting the concept of multi-model approach. • Improvements achievable by integrating remote sensing data in the platform were quantified, at both national and regional level.

Third year objectives	**Significant results**
• Testing the suitability of the BioMA platform for wheat monitoring and yield forecasting in Morocco. • Evaluating the usefulness of a multi-model approach for wheat monitoring and yield forecasting. • Evaluating the possible improvements of a model-based wheat monitoring and forecasting system when models are forced with exogenous leaf area index data derived from RS	• The highest suitability of a specific modelling approach under the different conditions explored by wheat in Morocco were discussed (JRC & UMIL) • The usefulness of a multi-model approach for wheat monitoring and yield forecasting was proved by comparing model results with official statistics under different conditions (i.e., seasons, regions, moment when the forecasting event is triggered) (JRC & INRA & UMIL) • The improvements that can be achieved by assimilating exogenous leaf area index data into the platform were assessed and quantified at both national and regional levels.

Deviations from DOW and impact	No deviations.
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person months actual/planned: • UMIL: 1.10 / 0 (3rd year: 1.1) • JRC: 8 / 8 (3rd year: 8) • INRA: 1.8 / 1.5 (3rd year: 1.8)
Corrective actions	Not applicable.

WP 42: Crop biomass derived from remote sensing	
Summary objectives and progress	The aims of these activities are to compute the biophysical variables including NDVI, fAPAR and DMP from SPOT-VEGETATION imagery. The time series extended till the end of the growth season 2013, exceeding therefore the DoW's planning. The series are to be further extended to the growth season 2014 for both study regions to consolidate the sustainability of the operation (see D 71.4, the Operational Plans). The databases for Regional Unmixed Means have also been continuously consolidated (VITO). The progress includes (VITO): • The 10 daily composites of SPOT-VGT Normalized Difference Vegetation Indices (NDVI) were extracted for two study areas and for the time series 2010-2013. • missing data are filled using a smoothing method. • The crop mask GLCropV2 was used to identify the arable land pixels. • Five biophysical variables were extracted to assimilate crop growth in the study regions: NDVI (i), NDVI smoothed (k), fAPAR (a), FAPAR smoothed (b) and DMP smoothed (y). • The databases of "Regional Unmixed Mean" (RUM) for these five variables were consolidated.
Third year objectives: • Pre-processing and smoothing the newly produced vegetation index NDVI • Calculating the biophysical variables including fAPAR and DMP • Constructing the databases for Regional Unmixed Means.	**Significant results:** • New times series are pre-processed and smoothed (VITO) • Five biophysical variables are continuously derived to assimilate crop growth (VITO) • Databases for regional Unmixed Means were updated for empirical models aiming crop yield forecasting (VITO).
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	N/A.
Use of resources	Person-months actual / planned: VITO : 5/5 Man-Months
Corrective actions	N/A.
Planning for the	Continuing to generate the five biophysical variables and calculating

sustainable actions	the corresponding RUM databases for both study region are actions for sustaining the project outcome. Memorandum of Understanding between the concerned parties will be signed (VITO).

WP 43: Wheat yield estimation using remote sensing in Morocco	
Summary objectives and progress	**The objectives of this deliverable are to:** • Collect 10 days SPOT-VEGETATION NDVI or DMP from 1999 to 2009 ; • Define spatial extent of agricultural areas of Morocco based on GlobCover map ; • Extract 10 days SPOT-VEGETATION NDVI or DMP from 1999 to 2009, corresponding to agricultural areas of Morocco ; • Calculate mean NDVI or DMP values for agricultural areas of Morocco at national level and provincial level ; • Collect wheat area and production statistics at provincial level ; • Build database containing NDVI or DMP and wheat statistics ; • Establish empirical models to forecast wheat yield from NDVI or DMP, at both national and provincial levels. The objectives are achieved with the integration of indicators based on remote sensing in the last statistical level of CGMS-MAROC.
Objectives for the third year: • Consolidate remote sensing database; • Use of remote sensing indicators for operational cereal (soft wheat, durum wheat and barley) yield forecasting at national and province levels; • Production of a crop monitoring for 2012-2013 season.	**Significant results** • Cereal forecasts for 2012-2013 cropping season based on NDVI and DMP (VITO & INRA). • Regression models for 36 provinces with agriculture production are updated. R^2 higher than 0.62 were found in the south-west to north-east axis (Essaouira to Al Hoceima) of the country, where most of cereal areas are located. The relationship between cereal yields and NDVI are relatively lower in the Northern provinces (Tangier, Tetouan, Larache), eastern provinces (Nador and Oujda), mountainous provinces (Taza, Khenifra, Beni Mellal, Azilal) and in southern provinces (Marrakech, Chichaoua, Taroudant, Agadir, Tiznit) (INRA) • Remote sensing indicators made available for visualization and analyse on CGMS-MAROC viewer: www.cgms-maroc.ma. Together with other agro-

	meteorological indicators generated by CGMS (INRA) • The routine "SIMILI" was developed to identify the *year-analogue* (most similar year) in order to forecast the yield for the current year The best correlation is obtained for autumn cereals for a critical period defined from February till April using a basic SIMILI analysis (INRA) • The results are compiled in a yield forecasting bulletin (Fig. 1)
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: INRA : 6/6 Man-Months
Corrective actions	N/A.

WP 44: Wheat yield estimation using Remote sensing on Huaibei Plain	
Summary objectives and progress	This work package aims to establish empirical models including the driving factor for yield trend on Huaibei Plain. The progress includes: - Establishing models to simulate more accurately wheat yield including the main factor driving the technological trend for wheat yield. - Back-validation of the new models using the yield data from 1990 till 2012 (unofficial data for 2012).
Objectives for the second implementation year • Extending the RUM databases at the district level beyond the planned year 2009. • Fine-tuning and improve the prediction model at these administrative units. • Make an internal yield forecasting for local policy makers	**Significant results** • Established new yield forecasting models by considering separately the technological trends, phenological status and climatic conditions (AIFER & VITO). • Making the forecasts for the growth season 2012-2013 and report to the provincial decision makers (AIFER).
Deviations from DOW and impact	N/A
Reasons for	N/A.

failing to achieve critical objectives	
Use of resources	Person-months actual / planned: VITO : 6/6 Man-Months
Corrective actions	N/A
Planning for the next 6 months	The activities will be pursued with an objective of sustainability beyond the project implementation period and upgrading to operational level. That means the bulletins for the regional yield forecasting will be prepared and made available for decision makers. An agreement on data provision will be made between AIFER and VITO (using an memorandum of understanding).

WP 51: Ground sampling and data collection on Huaibei Plain	
Summary objectives and progress	This work package aims to adapt, compare and design segment sampling method and to establish area estimation model for the study region and background data collection. The progress in 2013 includes: • Updated background data collection based the work of 2011-12. • Retrieve the crop phenology from remote sensed data. • Improved the sampling scheme integrating remote sensing and *in situ* investigation. The improved scheme is more adapted to the cropping pattern on Huaibei Plain and Its efficiency is doubled. This work is a collaboration between CAAS, VITO and JRC. • Collected field data for 193 sampling plots for winter wheat and 203 x 2 sampling plots for maize/soybean (2 sampling schemes) respectively in Guoyang county. Study applied to test sampling techniques and evaluate the crop acreage accuracy from remote sensed data.
Objectives for the third year: • Review the sampling scheme of last year and testing possible improvement and conducting the sampling by field survey. • Retrieval the crop phenology based on remotely sensed data and/or data products	**Significant results:** • Improved the new crop spatial sampling scheme combining in-situ investigation and remote sensing according to the experience of JRC (CAAS and VITO). • Conducted the field sampling for maize and soybean (CAAS, VITO) • Retrieval of crop phenology by remote sensing using MODIS NDVI data (CAAS)

Deviations from DOW and impact	The sampling approach was improved by CAAS, JRC and VITO to take into account of the cropping patterns in the study area, based on the experiences in 2012. The impact will be an improvement of efficiency of survey and accuracy for estimation.
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: CAAS: 15,8/9 Man-Months
Corrective actions	N/A.

WP 52: Crop area estimation on Huaibei Plain	
Summary objectives and progress	This work package aims to compare and adapt image classification methods and generate crop area estimates using both best suitable classifier and statistical regression. The progress in the first half of 2013 includes: - Continue comparing image classification algorithms for winter wheat and maize/soybean crop season, including: Spectral Angle Mapper, Neural Network, Maximum Likelihood, Mahalanobis Distance, Spectral Information Divergence, Parallepiped and Minimum Distance. - New HR images of RapidEye and ZY-3 have been prepared for crop classification to estimate the winter-wheat and maize acreage in the county of Guoyang. - Improved sub-pixel classification for crop acreage using EOS-MODIS time series data in the pilot study area.
Objectives for the third year: • Acquiring new satellite imagery and conducting image pre-processing • Conducting classification analysis using different approaches • Estimating the crop area using image and regression analyses	**Significant results** • High-resolution remote sensing images of Rapid-Eye and ZY-3 for the 2013 growing season were collected (CAAS). • Accuracy analyses for different image classification approaches (CAAS). • Estimating the crop areas using different statistical estimators including regression estimator (CAAS).
Deviations from DOW and impact	N/A
Reasons for failing to achieve	N/A

critical objectives	
Use of resources	Person-months actual / planned: CAAS : 17,3/9 Man-Months
Corrective actions	N/A

WP 53: Ground sampling and data collection in Morocco		
Summary of objectives and progress	This work package aims to adapt and design the segment sampling strategy in Morocco and elaborate an spatial extrapolation approach to estimate crop areas in pre-defined regions. The progress includes: • Sampling in Chaouia-Ouardigha and Meknes-Tafilalet regions, for a total area of 1.8 million hectares. • Ground truthing in Meknes-Tafilalet region.	
Objectives of the third year (period Feb. 2012 to Jan 2013): • Collecting and updating samples in two study areas for 2012-2013 cropping season; • Track segment samples collection as a complementary dataset.		**Significant results:** • The ground truth data were collected in two surveyed areas Chaouia-Ouardigha and Meknes-Tafilalet, for the cropping season 2012-2013, which will help to identify the crop cover in the region. Both Frame samples and track samples were collected (INRA).
Deviations from DOW and impact	N/A	
Reasons for failing to achieve critical objectives	N/A	
Use of resources	Person-months actual / planned: INRA: 13/9 Man-Months	
Corrective actions	Not applicable.	

WP 54: Crop area estimation in Morocco		
Summary of objectives and progress	This work package aims at collecting the remote sensing data in order to : • Pre-process and classify the satellite images ; • Select the best classification option in both spectral and temporal terms ; • Generate the area estimates using the ground sampling dataset ; • Generate the area estimate using best classification option ; • Generate the area estimate combining regression and remote sensing	
Objectives of the third year (period Feb. 2012 to Jan 2013): • Collect the high resolution imagery for		**Significant results** • Image classification and stratification analysis, using Maximum likelihood

estimate the crop areas in the study regions. • Conducting the image classifications analysis • Deriving the crop acreage using field sampling and remote sensing.	algorithms was carried out, for the provinces of Meknes, Settat and Berrechid provinces (INRA). • The crop acreages were derived using the field sampling and image classification for both study regions (INRA). • Include the algorithms crop area estimation capability in CGMS-MAROC (www.gms-maroc.ma).
Deviations from DOW and impact	The LANDSAT TM and ETM+ images were collected instead of AWiFS or DMC images, as either the satellite cessed its operation (dead) or images were not available. There is no impact on area estimation results.
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: INRA : 6,9/4,5Man-Months
Corrective actions	N/A.

WP 55: Accuracy and cost efficiency assessment	
Summary objectives and progress	This work package aims to systematically analyse the accuracy of crop mapping and its cost efficiency : • Analysis of the accuracy of estimation using coarse resolution satellite imagery; • Analysis of the accuracy of estimation using high resolution imagery; • Analysis of the accuracy of estimation and cost-efficiency using area frame sampling and survey The results of the analysis show that although the remote sensing is a very valuable tool, a straightforward application of image classification, essentially a pixel counting process including sub pixel classification, while considering the ground data as a secondary role, produces results inaccurate enough for agricultural statistics application. Combining the exhaustive but sometimes inaccurate information from remote sensing with accurate information from area frame sampling is the most reliable way for application of remote sensing in crop area assessment.
Objectives of the third year: • Analysing the accuracy using image classification with coarse spatial resolution data • Analysing the accuracy of estimation using image classification with high	**Significant results** • Accuracy resulted from sub-pixel classification using coarse resolution imagery can only reach an average of accuracy about 60% (VITO). • The accuracy using high resolution imagery can reach around 70 to 80%,

resolution imagery. • Analysing the cost-efficiency analysis for three different approaches conducted on the Huaibei Plain.	covering less extended area (VITO). • The most cost-efficient and accurate way to estimate the crop areas is to combine the area frame sampling and remote sensing analysis. The case study on the Huaibei Plain show a relative efficiency of 2.6 (VITO)
Deviations from DOW and impact	N/A.
Reasons for failing to achieve critical objectives	N/A
Use of resources	Person-months actual / planned: VITO : 2/2 Man-Months
Corrective actions	N/A.

WP 56: Cost efficiency study for crop mapping in East Africa	
Summary of objectives and progress	This work package aims to produce: • Crop map at national level • Test the most adequate ground truth data collecting approach • Evaluate the mapping accuracy The progress includes: • The crop map at the national level has been produced using the most recent high resolution imagery LANDSAT OLI. • The field survey was carried out in the province of KAKAMEGA • The classification using very high resolution RapidEye imagery was carried out.
Objectives of the third year (period Feb. 2012 to Jan 2013): • Producing the national crop map for the year 2013; • Carrying out the field survey to collect the ground truth data • Evaluating the ground data collection approach • Using very high resolution to map the crop areas • Evaluate the mapping accuracy using the ground truth data • Elaborate the most costs efficient approach for crop mapping in the region.	**Significant results:** • The crop map for the whole nation was produced using 138 scenes of LANDSAT OLI imagery combining MODIS data (CAAS) • The filed survey was carried in in KAKAMEGA province (MEMR) • Rapid Eye Image classification (VITO)

Deviations from DOW and impact	There is some important delay in this work-package due to the incapacity of the local partner to analysing the raw data and to produce accordingly the corresponding reports or deliverables.
Reasons for failing to achieve critical objectives	The capability of local partner in the domain of reporting, paper drafting is limited.
Use of resources	Person-months actual / planned: CAAS: 3/0 man-months (National crop map using LANDSAT OLI) VITO: 3/0.5 man-month (introduction of image data collection and analysis) MEMR: 6/6 man-months for field work
Corrective actions	VITO proposes to complete the work of analysis and the deliverable D56.1 , started already by the partner CAAS

WP 61: Statistical toolbox design	
Summary objectives and progress	This work package aims to implement the CGMS Statistical Toolbox (CST) for crop yield prediction for Anhui China and for Morocco. This includes adapting the databases for Morocco and Anhui and providing them with the crop yield indicators derived from different systems such as crop simulation or remote sensing based approaches.

Objectives for the third year:
• Implement the CST for the two target regions
• Connect them to the operational CGMS chain in order to operate in a semi-operational way.
• Update CST database with latest regional statistics from INRA/AIFER
	Significant results:
	• In April/May 2013 the CST has been improved which has led to some changes in the database structure.
	• The new database schema has been communicated with partner INRA and implemented in Moroccan CGMS database.
	• Statistical data for Morocco have been updated in the CST database.
	• ORACLE Procedures have been implemented to:
	  ○ Get results from CGSM into the CST schema.
	  ○ Compute regional meteorological indicators for the CST schema (e.g. sum of rainfall per province)
	• Additional bug fixes have been made to the CST executable and the latest version has been provide to the Moroccan users.
	• CST Database have been updated for Anhui and connection with the CGMS executable has been established.

	• Procedure for inserting CGMS results in CST database has been implemented.
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: SDLO: 6.5/6.5 man-month
Corrective actions	Not applicable.

WP 71: Networking and Partnership in China and Morocco	
Summary objectives and progress	This work package aims to a general and global dissemination of the European crop monitoring technology, to establishing a network in the domain of crop modelling and application of remote sensing in agriculture, and carry out the capacity building (training) activities. The progress are detailed below.
Objectives for the second year: • Organizing *ad hoc* training sessions on the methodology of crop monitoring. • Presenting the results in scientific conference or symposium.	**Significant results:** • 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 • Presentation of the E-AGRI results at the

• Present and promote the project for the audience of the DG AGRI of the Commission. • organizing national-wide dissemination event in Morocco at the end of the project with participation of European stake-holders including the DG- AGRI of the European Commission and . This activity could be jointly organized with the final review meeting. The activity is not planned in the DoW and thus conditioned by the available resources of the consortium	2013 ESA DRAGON symposium held in Palermo from 3-7 June 2013 • Presentation of E-AGRI results at the second International Conference on Agro-Geo-informatics organized by US department of Agriculture and the University of George Mason (August 12-16, 2013) • Attending the Global Food security conference in Noordwijk, the Netherlands, 29 September - 2 October 2013, with a poster presentation on CGMA–Maroc. • Attending "4th AgMIP Annual Global Workshop" and presenting "Multi-model simulations for rice yield forecasts in Jiangsu (China)" 28-30 October 2013, in New York, USA. • **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)** • organizing national-wide dissemination event in Morocco on March 26, 2014 in Rabat, Morocco with participation of European stake-holders.
Deviations from DOW and impact	N/A
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: VITO: 1.50 SDLO: 2.00

	UMIL: 3.00 JRC: 2.00 INRA: 1.00 CAAS: 1.00 AIFER: 2.00 JAAS: 2.00
Corrective actions	Not applicable.

WP 72: Capacity Building and Knowledge Transfer in Kenya	
Summary of objectives and progress	This work package aims to promote the European e-agricultural tools in the country and organizing training sessions to introduce the basic applications of remote sensing on agricultural monitoring. The progress includes: • Organizing in collaboration with AGRICAB project the collection of ground truth data in the areas to be investigated using remote sensing. • Collecting the satellite imagery • Training local experts on the satellite images classifications using their collected ground data.
Objectives for the third year: • Organizing a workshop and training on crop mapping, satellite image classification in the test areas.	**Significant results:** • The workshop and training session were organized between 25-29th November 2013 in Nairobi, Kenya. • A evaluation of the workshop and training was carried out among the participants.
Deviations from DOW and impact	Not applicable
Reasons for failing to achieve critical objectives	Not applicable.
Use of resources	Person-months actual / planned: VITO: 2 / 1 man-month MEMR: 3 /3 man-month
Corrective actions	Not applicable.
Planning for next 6 months	Organization the Workshop and training sessions on crop mapping.

9.3. Outcome of the Contingency Plan

During the previous review periods, the Consortium reported a major technical obstacle for implementing CGMS in Huaibei Plain (Anhui Province) planned in the WP2. The difficulty was caused by the unavailability of the real time meteorological data in Anhui province. A detailed contingency plan was drafted and applied. The plan enabled us to find the alternatives solutions and overcome the difficulties. The final objectives for setting up a local CGMS are finally be met.

- The alternative of using NOAA Global Summary of the Day (GSOD) dataset allowed the consortium to bypass the data unavailability issue in Anhui province. A python script has been made to introduce this dataset.
- Furthermore, a new *in situ* dataset consisting of long-term phenological observations for 11 ground stations was made available by a research institute outside of Consortium. This contribution supports greatly the calibration of the system.

9.4. Project management and dissemination during the period

The objectives of the project management are to:

- general coordination of the inter-institutional activities such as, data-sharing or expert trainings and especially communication among the partner institutes
- preparing and coordinating the project events, including thematic workshops, seminars or training sessions.
- implementing the dissemination and networking activities towards organizations or policy making bodies such as the Directory Genera of Agriculture of the European Commission (**DG AGRI**), United Sates Agricultural Department (**USDA**) or **FAO** (UN).
- Coordinating the scientific publications and a publication on the Commission's RESEARCH-EU RESULTS magazine
- reporting to the Commission the progress of the project implementation including periodic reporting: preparation, organization, the follow-up of the periodic review, as well as the implementation of the recommendation from the Commission

9.4.1. Management

The management activities include:

- organization and review of last fifty **(50)** deliverables for the third Review Period
- organization or contribution of 5 workshops seminars or training sessions
- Promoting the project and results to main agricultural policy makers including DG AGRI, USDA and FAO.
- Disseminating project's results through publications dedicated to scientific community (3) or general public (1)
- Presenting the projects results in scientific conferences (2)
- Project reporting, including the organization of the review meeting and implementing, within available resources, the recommendation of the Commission
- Organising the collaboration with another FP7 project (AGRICAB) and ensuring the sustainability of the project outcome by actively seeking new projects

9.4.2. Dissemination activities

The activities of dissemination towards the general public consists of planning a publication on the Commission's Results Magazine, updating the web site and distribution of more than 100 flyers in total in the conferences such as the AFRICA GIS (November 4-8, 2013, Addis Ababa, Ethiopia), or Agro-geoinformatics (August 121-16, Fairfax, US).

The promotion and dissemination of the project results towards scientific community were carried out in various scientific congresses, especially during the 2013 Dragon symposium organized by European Space agency in Palermo Italy and the Second International Conference on Agro-Geoinfomatics by Department of Agriculture (USDA) and George Mason University in Fairfax, USA. During the last conference, two papers were presented to

introduce the crop yield estimation using remote sensing indicators and the CGMS morocco built-up. A general presentation of the E-AGRI project was given during the plenary session.

The promotion of the project towards major agricultural policy making instances including the Directory General of Agriculture of the European Commission. The coordinator of the project presented stressed during the presentation the project impact on the Commission's MARS operation. Another presentation to the FAO experts were given during a visit of FAO delegation in Antwerp.

For the second consecutive year, a bulletin on cereal yield forecasting for the season 2012 and 2013 was published for Morocco. It helps Moroccan decision makers, especially the Ministry of Agriculture in their agricultural support policy making and commodity trade. The web site of CGMS-Morocco from which the bulletin was generated was also incorporated into the web site of the Ministry of Agriculture.

Five *ad hoc* trainings or thematic workshops were organized to ensure the capacity building of the local experts.

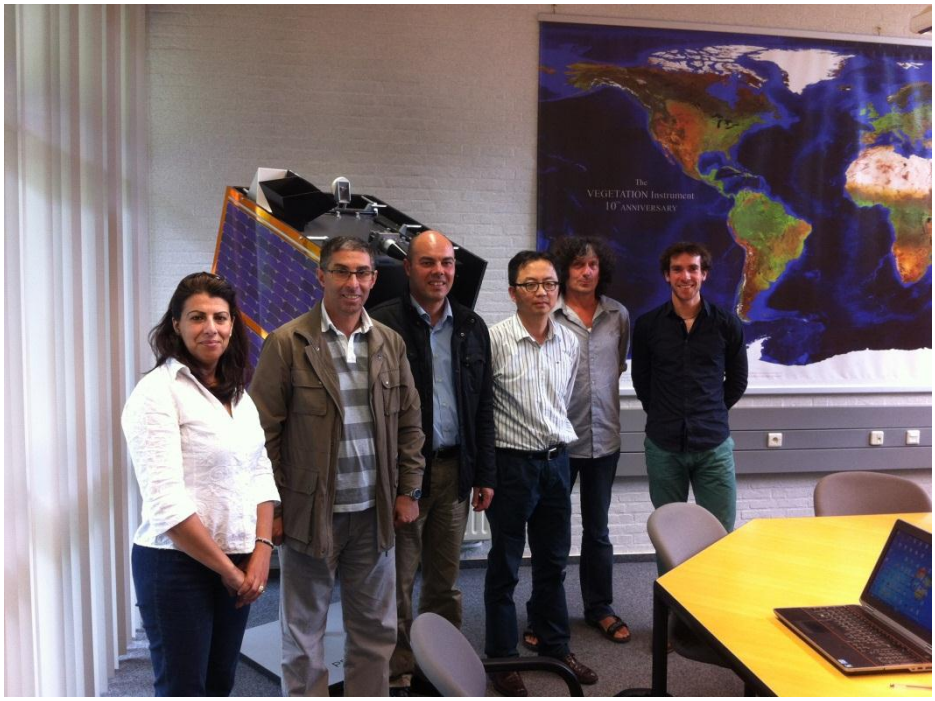

Figure 4:. Training on satellite image classification 24-28 June 2013, Mol, Belgium.

9.4.1. Collaboration with other European food security actions and the aspect of sustainability of the project

The collaboration with another FP7 project AGRICAB was established and carried out. This collaboration allows the Kenya partner to extend their study areas, join more often the networking and training activities conducted in Morocco and China.

The project has found its sustainability in funding of new projects, especially in the domain of agricultural insurance. INRA Morocco started a project funded by "Agence Francaise de Deveopment". VITO and AIFER are preparing a project on agricultural Insurance with support of SWISS-RE.

In the framework of "EU-CHINA Food Agriculture and Biotechnology Flagship", the Commission shows great interests to the partnership and network established within the E-AGRI project. On the other side, CAAS sets up plan to introduce the European monitoring system CGMS and BioMA in their institute with funding of Chinese government

Based on the knowledge acquired during E-AGRI, UMIL and CAAS teamed up with other institutes to get awarded a new FP7 project entitled "MODelling vegetation response to EXTREMe Events" (MODEXTREME) in the frame of the Call:" FP7-KBBE-2013-7-single-stage". There's also another FP7 project UMIL involved with that partly benefit from E-AGRI knowledge. The project " ERMES: An Earth obseRvation Model based RicE information Service"(ERMES) is awarded in the frame of the Call "FP7-SPACE-2013-1"

9.4.2. Implementation of the recommendation of the Commission

The Consortium Implemented most of recommendations of the Commission described in its letter of June 10, 2013. However, the Consortium keeps attention on the break-down in terms by activity type and accordingly the effort stated in the WT7 of DoW:

- RTD and innovation activities: 164.5/ 192 (PM) or 86 % of project effort
- Demonstration activities: 21.5/192 (PM) or 11% of project effort.
- Consortium management activities: 6/192 (PM) or 3% of the project effort

The Consortium attaches the highest priority to the main objective of the project: transfer of the crop monitoring technologies to the two study regions, and this by respecting as much as possible the equilibrium within the available resources of the project.

The table below describes the implementation of the Commission's recommendation for the period under review.

WP	Recommendations	Action or explanation
WP1	Including in the updated periodic Report 2 the following information: ○ Detailed information on the activities / performance of each partner in the period under review ○ A comparative table on the objectives described in DoW and the realized achievement ○ A comparative table on the previous	Submitted on 06/05/2013

	recommendations and their implementation ○ A contingency Plan Description of use of resources: ○ Table containing information on the effort (person/month) per partner per WP and between the planning and usage of the resources ○ Justification for use of resources within UMIL Declaration of each partner to commit and achieve the project objectives Progress Report on Month 30	Submitted on 06/05/2013 Not implemented due to the obsolete administrative constraint Submitted
WP7	Updating more frequently the web site: ○ Including the deliverable with public distribution character Dissemination Report: ○ New structure of two sections: dissemination plan and dissemination report	Web site updated: the PU distribution documents are gradually uploaded to the website by taking into account the scientific publication priority. Submitted on 06/05/2013

The additional recommendations were provided by the reviewers

WP	Recommendations	Implementation or Comments
WP1	○ A clear and convincing justification for the dramatically increased resources used by UMIL	The clarification made by UMIL in the updated RP2 report is clear: no additional resources will be requested from the Commission. And this increase is related to the development of disease modules and not related to the E-AGRI viewer.

	○ Dissemination activities in the 3rd year are not clearly defined	Implemented by • organizing a final dissemination event in Rabat Morocco; • publishing the RESEARCH*EU RESULTS magazine • by scientific publications and participation of conferences.
	○ Contribution of Chinese partners	Contribution of Chinese partners is very substantial, well beyond the stage of data collection, especially in developing their own yield forecasting models, their improved field survey approach. Their contribution will be further stressed in the final report.
	○ Strengthen the human resources in project management	Not implemented due to the very limited project resources allocated to the project management (3%)
	○ Final review meeting to be combined with an event in the Netherlands or a field trip in a targeted country.	Implemented
WP7	Dissemination: ○ Quantification of the dissemination effort	Partially implemented (> 100 flyers distributed) within available resources
	○ Use of social media	Not implemented, as major social media are not available in some targeted areas

10. Deliverables and milestones tables

10.1. Deliverables due for Month 30

Deliverable Number	Deliverable Title	WP	Responsible	Nature	Dissem. level	Delivery date	Status
D21.1	Experimental Database	21	AIFER / Alterra	R	PP	30	Submitted
D21.2	Database Report	21	AIFER / Alterra	R	PU	30	Submitted
D21.4	Statistical Report	21	Alterra	R	PU	30	Submitted
D31.2	Ground information database	31	JAAS/UMI	O	CO	30	Submitted
D32.2	Databases for model parameters	32	UMI	O	CO	30	Submitted
D32.3	Evaluation report on rice simulation at field level	32	UMI	R	PU	30	Submitted
D32.4	Evaluation report on rice simulation on large area	32	UMI	R	PU	30	Submitted
D34.2	Databases for parameterisation	34	JRC/UMI	O	CO	30	Submitted
D34.3	Evaluation Report on wheat simulation at field level in Morocco	34	JRC/UMI	R	PU	30	Submitted
D34.4	Evaluation report on wheat simulation at regional level in Morocco	34	JRC/UMI	R	PU	30	Submitted
D51.1	Segment sampling database (Huaibei)	51	CAAS	R	CO	30	Submitted
D51.2	Accuracy assessment report on the spatial extrapolation (Huaibei)	51	CAAS	R	PP	30	Submitted
D52.1	Databases on using different approaches (Huaibei)	52	CAAS	O	CO	30	Submitted
D52.2	Report on the best approach for crop acreage assessment (Huaibei)	52	CAAS	R	RE	30	Delayed
D53.1	Segment sampling database for Morocco	53	INRA	O	CO	30	Submitted

D53.2	Report on accuracy assessment for the spatial extrapolation for Morocco	53	INRA	R	PU	30	Submitted
D54.1	Datasets on area estimates using different approaches (Morocco)	54	INRA	O	CO	30	Submitted
D54.2	Report on best approach for crop acreage estimation in the region	54	INRA	R	RE	30	Submitted
D55.1	Accuracy and cost-efficiency report	55	VITO	R	PU	30	Submitted
D61.1	Report on CGMS statistical toolbox	61	Alterra	R	PU	30	Delayed

10.2. Deliverables due for Month 31-36

Deliverable	Title	Lead beneficiary	Nature	Dissem level	Delivery date	Status
D10.1	Minutes of the project meetings/ teleconferences	VITO	R	PU	36	Submitted
D10.2	Periodic activity reports and financial statements	VITO	R	PU	36	Submitted/ pending
D10.3	Final activity report	VITO	R	PU	36	pending
D10.4	Audit certificates(or Evaluation)	VITO	R	PU	36	pending
D22.3	Adapted CGMS model for regional application in Morocco	Alterra	P	PP	33	Delayed
D22.4	Report of CGMS adaptation in Morocco	Alterra	R	PU	33	Delayed
D23.3	Adapted CGMS model for regional application in Anhui, China	Alterra	P	PU	33	Delayed
D23.4	Report for CGMS adaptation in Morocco	Alterra	R	PU	33	Delayed
D24.1	Piloting report for Anhui, China	Alterra	R	PU	36	Submitted
D25.1	Piloting report for Morocco	INRA	R	PU	36	Submitted
D33.1	Assessment report on the BioMA platform for rice monitoring	UMIL	R	PU	33	Submitted
D33.2	Assessment report on multi-	UMIL	R	PU	36	Submitted

	model approach for rice monitoring					
D33.3	Evaluation report on integration of RS data	UMIL	R	PU	36	Submitted
D33.4	Guide of BioMA platform for local rice monitoring application	UMIL	O	PP	36	Submitted
D35.1	Assessment report on BioMA application in Morocco	JRC	R	PU	36	Submitted
D35.2	Assessment report on the multi-model approach for wheat monitoring and yield forecasting in Morocco	JRC	R	PU	36	Submitted
D35.3	Evaluation Report on the integration of RS data in BioMA models	JRC	R	PU	36	Submitted
D35.4	Guide of BioMA platform for local wheat monitoring application	JRC	O	PP	36	Submitted
D42.1	Databases of bio-physical variables NDVI, fAPAR, DMP (optionally VPI)	VITO	O	CO	34	Submitted
D42.2	RUM databases at county, district or province levels	VITO	O	CO	34	Submitted
D43.1	Database containing NDVI or DMP and wheat statistics	INRA	R	RE	36	Submitted
D43.2	Empirical models to forecast wheat yield from NDVI, at both national and provincial levels	VITO	P	RE	36	Submitted
D44.1	Wheat yield prediction models for each of six districts on the HUAIBEI plain	VITO	P	RE	36	Submitted
D56.1	Report on the best practice of crop area estimation in Kenya	DRSRS	R	PU	36	Delayed
D62.1	Piloting and workshop report	INRA	R	PU	36	Submitted
D71.1	Report on the CGMS workshop	INRA	R	PU	36	Submitted
D71.2	Report on the BioMA workshop	UMIL	R	PU	36	Submitted

D71.3	Report on the workshop over yield prediction based on RS	VITO	R	PU	36	Accepted
D71.4	Operational plans for two study regions	VITO	R	PU	36	Submitted
D72.1	Report on E agriculture workshop and training on remote sensing	VITO	R	PU	36	Submitted

10.3. Milestones

TABLE MILESTONES							
Milestone no.	**Milestone name**	**Work package no**	**Lead partner**	**Delivery date from Annex I**	**Achiev Yes/No**	**Actual / Forecast achievement date**	**Comments**
MS1	Publication on the methodology on ground data sampling	WP21, WP31 WP51 WP53	1	24	Yes	30/06/ 2012	Published on the proceeding of ESA Dragon 2 symposium 2012
MS2	Publication (submission) on adapted CGMS and /or BioMA platform	WP22 WP23 WP32 WP34	3	30	Yes	31/07/ 2013	**Published in the proceedings of Agro Geo-informatics Conference 2013**
MS3	Implementation of CGMS and BioMA pilots	WP24 WP25 WP33 WP35 WP61	2	36	Yes	31/01/20 14	Accomplished at pre-operational level or running at operational level
MS4	Publication of yield forecasting bulletin in Morocco using the RS indicators	WP43 WP44	1	36	Yes		**Publication of the book in 2013**
MS5	Publication (submission) on crop area estimation	WP52 WP54 WP55	5	36	Yes	31/12/20 13	**Publication in the proceedings of 35th International Symposium of Remote Sensing of Environment**

MS6	Publication in Press on the project and its impact in Morocco	WP71	4	36	Scheduled for May 2014	31/01/2014	**Submitted for publication in the issue of May 2014 "Research*EU Results Magazine"**

11. Use of the resources

The section of "Use of Resource" has been clustered into the Financial Reporting. All figures and tables are now generated by the EC FP7 Project Management Portal (NEF). The following table was manually compiled before the opening of the third periodic review session.

TABLE 4.1. PERSON-MONTH STATUS TABLE												
GRANT AGREEMENT NO: 270351		**Partner - Person-months per Work-package**										
ACRONYM: E-AGRI												
PERIOD: Whole period												
		VITO	SDLO	UMIL	JRC	INRA	CAAS	AIFER	JAAS	MEMR	**TOTALS**
WP 10: Coordination	Actual PM	10.2									*10.2*
	Planned PM	**6,0**									***6***
WP 21:Ground observation and Data collection	Actual PM					4,6		9,0			*13,6*
	Planned PM					**3,0**		**9,0**			***12***
WP 22: CGMS Adaptation - Morocco	Actual PM		11,0								*11*
	Planned PM		**9,5**								***9.5***
WP 23: CGMS Adaptation - Anhui, China	Actual PM		8,8					3,0			*11,8*
	Planned PM		**9,5**					**0,0**			***9.5***
WP 24: CGMS piloting – Anhui, China	Actual PM		4,2					3,0			*7,2*
	Planned PM		**3,0**					**1,0**			***4***
WP 25: CGMS piloting - Morocco	Actual PM		2,9			1,5					*4,4*
	Planned PM		**3,0**			**1,0**					***4***
WP 31: Ground data collection for BioMA	Actual PM			1,0		4,6			10,3		*15,9*
	Planned PM			**1,0**		**3,0**			**6,0**		***10***
WP 32: Adaptation of BioMA for multi-model rice monitoring in Jianghuai Area	Actual PM			29,2	1,3						*30,4*
	Planned PM			**9,0**	**1,0**						***10***
WP 33: BioMA piloting for multi-model rice monitoring and yield forecasting in JIANGHUAI Plain	Actual PM			8,2					3,0		*11,2*
	Planned PM			**7,0**					**3,0**		***10***
WP 34: Adaptation of BioMA for multi-model wheat monitoring in Morocco	Actual PM			13,1	13,1						*26,2*
	Planned PM			**1,0**	**12,0**						***13***
WP 35: BioMA piloting for multi-model wheat monitoring and yield forecasting in Morocco	Actual PM			1,1	9,6	3,3					*14,0*
	Planned PM				**8,0**	**1.5**					***9.5***
WP 41: Official statistic data collection	Actual PM							1,5			*1,5*
	Planned PM							**1,0**			***1***
WP 42: Crop biomass (wheat) derived from remote sensing	Actual PM	5,5									*5,5*
	Planned PM	**5,0**									***5***
WP 43: Yield estimation for wheat based on remote sensing in Morocco	Actual PM					8,6					*8,6*
	Planned PM					**6,0**					***6***

WP 44: Wheat Yield estimation based on remote sensing for HUAIBEI Plain	Actual PM	5,8						3,0			*8,8*
	Planned PM	**6,0**						**0,0**			***6***
WP 51: Ground sampling and data collection (HUAIBEI Plain, China)	Actual PM						15.8				*15.8*
	Planned PM						**9,0**				***9***
WP 52: Crop area estimation (HUAIBEI Plain, China)	Actual PM						17.3				*17.3*
	Planned PM						**9,0**				***9***
WP 53: Ground sampling and data collection (Morocco)	Actual PM					13,0					*13*
	Planned PM					**9,0**					***9***
WP 54: Crop Area estimation (Morocco)	Actual PM					6,9					*6,9*
	Planned PM					**4.5**					***4.5***
WP 55: Accuracy and cost-efficiency assessment	Actual PM	2,0									*2*
	Planned PM	**2,0**									***2***
WP 56: Cost efficiency study for crop mapping in East Africa	Actual PM	1,5					3,0			6,0	*10,5*
	Planned PM	**0.5**					**0,0**			**10,0**	***10.5***
WP 61: Statistical toolbox design	Actual PM		4,4								*4,4*
	Planned PM		**6.5**								***6.5***
WP 62: Statistical Toolbox Piloting/Workshop	Actual PM		2,0			3,0					*5*
	Planned PM		**1.5**			**3,0**					***4.5***
WP 71: Networking and Partnership in China and Morocco	Actual PM	2.4	1,8	12,3	2,1	1,0	1,2	2,0	2,0		*24,8*
	Planned PM	**1.5**	**2,0**	**3,0**	**2,0**	**1,0**	**1,0**	**2,0**	**2,0**		***14.5***
WP 72: Capacity building and knowledge transfer	Actual PM :	1.5			1,0	0,0				3,0	*5,5*
	Planned PM	**1,0**			**1,0**	**1,0**	**1,0**			**3,0**	***7***
Total Project Person-months	*Actual total:*	*28,9*	*35,1*	*64,9*	*27*	*46,5*	*37,3*	*21,5*	*15,3*	*9*	*285,4*
	Planned total:	***22***	***35***	***21***	***24***	***33***	***20***	***13***	***11***	***13***	***192***

In general, the resource planned at the beginning of the project showed clearly as an substantial underestimation. Moreover , some institutes decides to develop the research activities beyond the scope of the Description of Work, driven by the values of research and the sustainability of the actions. Finally the communication and activity coordination between the organizations with European, Chinese and African background were sometimes very challenging, effort-demanding.

The areas where the activities were expanded beyond the planning include:

- CGMS built-up and its **operations** under the similar infrastructural environment as the European monitoring system. The dedicated website (www.**cgms**-**maroc**.ma) offers an analysis in depth on crop growth status.
- Further development in BioMA platform. (i) implementation in the two BioMA-based monitoring systems of procedures for the simulation of the impact of diseases on yields, (ii) development of an improved algorithm for rice transplanting, (iii) collection of a third year of data for rice in Jiangsu. All these activities allowed increasing the forecasts' reliability

- Extension of production for the biophysical variables derived from satellite information for both test sites (Morocco and the Huaibei Plain)
- Development of new frame sampling method for crop area assessment
- Various dissemination and capacity building activities including a new deliverable, an important dissemination event in March 2014
- Huge networking activities which lead to new initiatives, projects and operations

12. Conclusions on the achievement of the objectives

As stated in the section 1.2, four specific objectives were formulated during the elaboration of the project proposal, including:

- ***Objective of DEMONSTRATION*: to transfer and adaptation of European agricultural monitoring technology in two developing countries.**
- ***Objective of DISSEMINATION*: to establish networks of users on the crop monitoring technology across three continents in the world (Europe, Africa and Asia (China)).**
- ***Objective of providing ADDED VALUES for EU*: to obtain the feedback and thus to improve for European expertise and know-how (ADDED VALUES for EU)**
- ***Objective of COLLABORATION*: to create synergy with other European crop monitoring actions (MARS-Stat-Food, GMFS…)**

The first objective of demonstration has clearly reached and most often surpassed: CGMS is operational running in Morocco with local institutional support and with knowledge and capability of local experts. The level of technical advances have exceeded the initial planning. The CGMS on the Huaibei plan is set-up at pre-operational level. The operation can be conducted with adequate institutional support in terms of data availability and human resources. The BioMA releases for rice Monitoring on Jianghuai Plain and wheat monitoring in Morocco were developed, from both the technological (e.g., bugs fixed) and scientific/operational point of view, i.e., their capability to produce reliable forecasts under different conditions. the potential of multi-model simulations for forecasting purposes was fully demonstrated, as well as the usefulness of using remote sensing information to feed crop models within large-area monitoring systems. Yield forecasting in two study regions using remote sensing based indices has fully illustrated the simplicity and powerfulness of the approach. The application has found a great potential on the agricultural insurance sector.

The objective of dissemination was achieved through establishment of networks among European Moroccan and Chinese institutions. The joint initiatives or new projects launched by E-AGRI partners demonstrate that productive character of these networks.

The added value for EU can be described in two aspects. Technically, the project has helped to strengthen the applicability or the robustness of European crop monitoring technology. For instance, the key adaptation on calibration and parameterization of CGMS, were found very useful and instructive for European MARS operation and valuable for the

new GLOBCAST system developed by the DG AGRI of the European Commission. Institutionally, as mentioned above, the scientific and technological networks built up by the project, are interested by the Commission in their new international collaboration initiatives.

Finally, collaboration with other European food security projects was carried out specially with the project AGRICAB. The knowledge and results acquired during this project led to the establishment of new international collaboration in the framework of FP7.