# Adaptation of the European Crop Growth Monitoring System to the Belgian Conditions

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The aim of the Belgian Crop Growth Monitoring System (B-CGMS) is the elaboration of an integrated information system predicting reliable, timely and objective estimates of crop yields and monitoring calamity sites at regional scales. Seven major crops are concerned by the project: winter wheat, winter barley, fodder maize, winter rape seed, potatoes, sugar beet and permanent meadow. The main tasks in the adaptation of the European model come down to the completion and the improvement of the databases to specify the local conditions and particularities of Belgium., to modify the scale of the forecasting system, to incorporate satellite information and to develop a web-based mapping interface.

This poster gives an overview of the adaptation of the Crop Growth Monitoring System (CGMS) to the Belgian Conditions and focuses on new particularities compared with the European monitoring system.

Adaptations of CGMS model
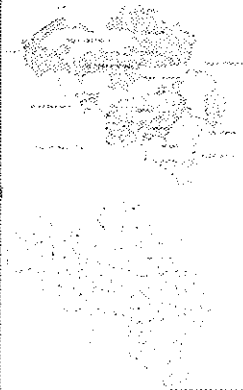
Scaling work

The B-CMS system provides a renewed and enhanced tool for the prediction and estimation of crop yields at a national and regional scale (country and agricultural regions) and provides the ability to monitor calamity sites at circumscription level.

*At Belgian level more detailed information (e.g. soil map, weather station network) is available. For that reason it was decided to adjust the basic grid size (50*50km in CGMS) to:*

- *10*10 km grid size (country level)*
- *5*5 km grid size (agricultural regions)*
- *1*1 km grid size (circumscription level)*

The Belgian circumscriptions

Meteorological database

Selected data come from up to 150 meteorological stations at a daily time step for the last ten years, plus two years (1983 and 1984) with exceptional meteorological conditions.

Crop database

Four types of crop data were collected :
- Raw yield data on test plots for the period 1988-1997.
- Agricultural and phenological data in the different agricultural regions.
- Statistics on surfaces and crop yields at circumscription level for a period of 30 years.
- Agricultural land use coverage (per year) from the Integrated Administration and Control System (IACS) of the Ministry of Small Enterprises, Traders and Agriculture.

Meteorological stations network in Belgium

Soil database

The Belgium territory was divided into 17 pedological zones. From this division, a new soil mapping unit was defined and called "Association Pédologique Régionale" (APR) based on the 1:500,000 soil map.

In order to have reliable data, a representative soil profile for soils under cultivation was determined together with its associated physical and chemical data. Most of this information come from the soil profile database AARDWERK (about 13,000 soil profiles).

Four pedotransfer functions were selected to predict the hydraulic properties of the B-CGMS soil database.

Differences and new features

| Differences between CGMS and B-CGMS	CGMS	B-CGMS
Administrative zones	NUTS (Nomenclature of Statistical Territorial Units)	per agricultural zone (14) and per circumscription (27)
Grid	50 x 50 km	5 different levels: 1 x 1 km, 5 x 5 km and 10 x 10 km
Soil data	1 : 1 000 000 and 1 : 5 000 000	1 : 500 000 and Aardwerk database of soil profiles
Suitability	based on soil types	additional use of land use data (IACS)
Soil mapping unit	consists of one or more soil types	contains only one soil type
EMU =NUTS ∩ Soil Mapping Unit ∩ Grid	1 EMU consists of more than one simulation unit	1 EMU corresponds to one simulation unit

Land use coverage

In CGMS, simulations are built around the concept of a simulation unit, which defines for each crop whether a soil is suitable for the cultivation of the specified crop. At the European scale the simulation units are only defined by means of the soil conditions. This methodology doesn't take into account new agricultural practices and thus only represents potential production.

In the Belgian context, simulation units can be defined based on the soil properties and additionally with IACS land use data. Yearly about 600,000 parcels all over the national territory are covered. Land use of a new campaign is estimated using Markov chain model properties and matrix of transition probabilities. The land use information database is updated by IACS at regular time intervals to increase the transition matrix accuracy.

Web-based mapping application

One particularity of this integrated system is the link of the Crop Modelling System with a Geographic Information System (GIS) Database through a Web-based mapping application.

All Crop Modelling System data and GIS information are available in real-time on Internet by customers and end-users. For scientific users the direct access is very useful during calibration and validation phases. Moreover they require an access to the most recent data available. For end-users, contents depend on their own needs and data must be easily accessible.

Customers and end-users — Web-based Mapping application — GIS Database
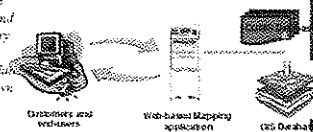
Remote sensing

Crop growth is determined by a complex interplay of numerous factors. An agrometeorological model therefore can't take all interacting factors into account.

For B-CGMS the direct integration of satellite data into the model is evaluated. A possibility here is the use of LAI or fAPAR time series derived from satellite images, as input for CGMS. The definition of this remote sensing based methodology is a major objective in our research project.

The satellite images are historical NOAA-AVHRR archive of the JRC and SPOT-VEGETATION images (1 km resolution). The impact of the transition of one sensor to another will be evaluated. The land use data per parcel from the IACS are used to deduce the specific crop reflectance for each pixel.