

How GIS Technology Can Answer Information Needs on Agricultural New Open Markets

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ABSTRACT: Governments require efficient information and forecast systems to manage food and agriculture policies. New geospatial information technology can help improve these systems. The Crop Information System (CIS) of the Government of Romania, and the Agricultural Land Information System (ALIS) of the Government of Egypt are two examples given where this technology has been implemented. A tool named CRISS (CRop Information System and Statistics) which has been developed by GEOSYS in order to meet the special demands for operational agricultural information systems is described.

1. Introduction

Governments can only manage food and agriculture if they have an efficient information and forecast system. This is particularly true for governments that are entering the free market economy and that previously had non-adapted enumerative methods or biased statistics. The transition from a centralized economy to an open market is a long and delicate task which requires structural, organizational and technical changes.

New geospatial information technology can help them move forward more easily and faster. Efficient systems making use of GIS, Remote Sensing and RDBMS have been set up. The approach is fully operational, based on commitments upon results and respecting time constraints. Agricultural information can be produced starting the first year.

The systems are conceived according to a non-destructive approach, based as much as possible on the integration of existing organization and skills, and according to the budget of the country. The use of these technologies allows the setting up and maintenance of an area frame sampling design at a reasonable cost. All the data collection and information processing steps are integrated in only one system, from the sampling scheme design to the map presentation of the results. The stability of a simplified sampling program is ensured as far as human resources and surveying equipment can be financed. The geospatial information provides more accurate acreage measurements and is more adapted to the various needs coming from final users, thanks to its cartographic basis which can easily be maintained and updated. In addition, it can now be controlled more efficiently with modern information technologies.

The use of these technologies not only facilitates the implementation of the agricultural information system itself but also the organization of the services in charge. A maximum integration of local personnel is targeted so that the transfer of know-how can be fully effective, and the project can benefit from a strong awareness of responsibilities and a satisfactory local operational control.

This technology has proved its efficiency in new agricultural information systems, but one must be careful not to put too much emphasis on this technology transfer which should only be considered as a means and not a goal in itself. Other key factors of success persist, such as a thorough needs analysis, the good organization of the recipient services and the dissemination policy which drives the project.

Efficient support from final users is necessary. The services which require agricultural information must have sufficient resources to maintain the system. It is thus very important to mobilize all the team's strengths and to find a suitable technical and organizational adaptation to the current methods to improve the work of each actor while keeping the system economically viable.

Two examples illustrate this approach: the Crop Information System (CIS) of the Government of Romania, and the Agricultural Land Information System (ALIS) of the Government of Egypt.

2. Crop Information System in Romania

The Crop Information System in Romania has been implemented within the scope of the European Union PHARE program, on the basis of a series of tests and studies carried out by the CRUTA (*Centre Roumain d'Utilisation de la Télédétection en Agriculture*) and based on Joint Research Center MARS EU technologies. CIS has been initiated upon the demand of the Romanian Ministry of Agriculture who had to adapt their production of agricultural statistics since the initial 5,000 state farms have been split into more than 5,000,000 independent farms. CRUTA is empowered by the Ministry of Agriculture for providing strategic agricultural information and is currently the recipient body of CIS.

The first phase, CIS1, based on statistics for 17 *judets* (upon 41) in 1996, extended in-house up to 21 *judets* in 1997, enabled the foundations of a national system to be set up and CRUTA to be professionally equipped and trained for high quality technical work.

CIS Phase 2 is now under way, with the goal to disseminate and use the agricultural information on the whole country, and to strengthen the organization in charge. It is therefore a technical extension project with an increase in hardware and software, as well as consolidation of scientific and statistical skills. It is also a training project in terms of maintenance, management, marketing and sustainability of the organization in charge. CIS2 must provide "professionalisation" of the team as well as channels and procedures to make sure that information is disseminated and used. State public services and private operators are targeted.

The CIS outputs are the following:

- Data products: acreage estimates, production estimates, yield forecast, input/output and information on agricultural practices;
- Advisory messages: crop monitoring, land monitoring;
- Channels of dissemination for both institutional and private organizations;
- Strengthened organization of CRUTA and its contractual agreements with the Ministry of Agriculture; and
- Trained technical operators and managerial staff in all aspects of the business, with fully upgraded equipment.

The integration of a satellite-assisted vegetation status monitoring procedure within CIS2 will allow the system to develop a "crop analysis" expertise and sharpen the quality of yield potential assessment. One key factor of success is now the financial sustainability of CRUTA and its capacity to develop commercial activities.

3. Agricultural Land Information System in Egypt

Within a context of increasing demography and knowing that agricultural territories in Egypt are limited by desert boundaries, the Egyptian government needed to know and follow-up the evolution of agricultural acreage in order to ensure food self-sufficiency and to decide about their agricultural policy orientations. A system based on geospatial information has been set-up in order to provide and update agricultural statistics for all crops, per crop season and before harvest.

The Agricultural Land Information System project was signed in 1991 between the French Government and the Egyptian Ministry of Agriculture under SPOT Image coordination. GEOSYS here again defined the dedicated information system and organized the transfer of know-how. The Soil, Water and Environment Research Institute (SWERI) of the Ministry of Agriculture and Land Reclamation in Egypt is in charge of agricultural information production and received the system.

The entire Nile Valley from the Aswan dam to the Mediterranean sea (four million hectares of land) is being studied. The method is comparable to that used in European statistical programs, based on a 2 percent stratified sampling scheme associated with satellite image classification and the regression estimate method. Land use statistical inventories and mapping have been produced since the first year in France with the participation of Egyptian experts. A dedicated on-the-job training program for operational transfer of methods and tools enabled the system to be set up in SWERI facilities by the second year. Local SWERI teams have been operating the system for the last few years with punctual technical assistance and a complete up-grade in 1997/98.

4. Crop Information System and Statistics

In order to meet the special demands for operational agricultural information systems, GEOSYS designed and set up a dedicated tool which allows the production of agricultural statistics, production estimates and forecast of land use for the next campaign. This tool named CRISS (CRop Information System and Statistics) is the core of an operational agricultural information system. By concentrating on essential functionalities, CRISS is an easy to use but very efficient software tool which allows in five modules to cover all steps from information gathering to the mapping of statistical results.

CRISS Version 1 was developed in AML (Arc/Info macro language). The evolution of CRISS is based on Arc/Info and C developments, taking benefit from ORACLE tools and JAVA, a new language which allows notably a suitable portability and rapidity in adaptation developments. CRISS Version 2 is now a highly parametered and fully open tool. It allows to design suitable and adaptable sampling schemes, with or without satellite image integration. This is a guarantee for a good traceability of sampling devices and comparability from one year to the other.

Now when suitable tools allow the design of trustworthy and operational information systems in countries such as Egypt or Romania, one of the remaining key factors of success relies on the capacity of mobilization of local field teams.