

FREE SOFTWARE GIS: ITS USEFULNESS IN IRRIGATION MANAGEMENT

Geographic Information Systems (GIS, according to its acronym in English) are a set of **computer science software used to edit and disseminate maps**, organized in geographic layers that contain homogeneous spatial and thematic information, referred to the same type of elements.

Information management is **a strategic aspect in any productive sector** in general and the agriculture sector in particular. Moreover, **most of the information of irrigated agriculture has a spatial character** (plots, infrastructures, etc.), **being of great interest its representation on the territory**. That is why GIS is of great value.

What is a GIS?

GIS is the acronym, in English, of the term **Geographical Information System**. A GIS is a set of computer software used to edit and disseminate maps.

These maps are not only made up of pictures and symbols, but rather behind them there may be thematic information linked to each one of those pictures and symbols. For example, we can imagine a map where the drawings are the plots and whose thematic information are the data, cadastral references, crops, soil type, etc. or of any other type, of each one of those plots.

Characteristics and complexity of Geographical Information Systems

A very interesting feature of **GIS** is the way they organize the cartography. This organization is **based on geographic layers**, that is, in “submaps” that contain spatial information and homogeneous topic, referring to the same type of elements. In an agronomic context, for example, we could speak of plots layer, irrigation pipes layer, water intakes layer, etc. These layers, **when they are integrated into a single map with the appropriate overlay, achieve an important synergistic effect** that generates information of high added value.

The degree of complexity of GIS is varied. They can range from a simple desktop application, for personal use, that can be used to view and modify geographic layers individually (SHP format, for example), up to a spatial data infrastructure involving geographic databases with multitude of layers and map services usable by thousands of users with their personal computers, tablets, or mobile phones.



GIS viewers

In the latter case, there is **a chain of technical elements** (hardware, software, and data) **and human resources** (not just IT technicians, but also from many other disciplines, depending on the subject) whose last link is usually a specifically designed web application that allows accessing the layers of a map through a browser with internet access. This type of web application is called “GIS viewer”.

In the image shown in this page, you can see an example of a GIS viewer for the Baix Priorat Irrigation Community, which shows thematic information associated with an irrigation intake.

Free or proprietary software?

An aspect related to the software used in GIS and that, without a doubt, we must emphasize, is that both for its development and for its final consumption, **we have two alternatives: proprietary software (paid) and free software (free)**.

Which one should I choose then? Although there are valid solutions, efficient and easy to use, for both nowadays the most successful option is free software, not only because it is free, but also because it is offered with its source code, which makes it feasible to take advantage of the existing work carried out by other programmers, expanding it, or adapting it to the requirements of each possible situation.



The **GOINNOWATER** project has envisaged the creation of a management system that includes a **GIS viewer** developed in free software, **which allows optimizing the water and energy consumption**, improving the quality of production. It can be accessed from the web at www.goinnowater.org.

- ▶ Area and longitudinal **measurements**
- ▶ **Calculation of routes and obtention of topographic profiles**
- ▶ **Preparation of maps and designs**
- ▶ **Geolocation** of the user's field
- ▶ **Integration of variables from different sensors** to monitor in real time: flows served and inlet to the system, pressures in the network, energy consumption, etc.

Along with free software, we must also **emphasize the great benefit of publishing maps via standardized map services**, that is, endorsed by an ISO standard.

GIS in the GOINNOWATER project

This feature greatly facilitates the consumption of maps over the Internet by part of different GIS programs, which can interpret these map services (WMS, WFS, WCS services, etc.).

The **GOINNOWATER** project has contemplated the creation of a system management topic that includes a GIS viewer developed in software free to optimize water and energy consumption, improving with this the quality of crop production.

Practical applications of Geographical Information Systems in the Irrigation Communities

This GIS viewer is already operational and **has been integrated into the website of the GOINNOWATER project**, which can be accessed from the address www.goinnowater.org.

Within the scope of the irrigation communities and irrigated agriculture, some of the **possible utilities of the GIS**, materialized in the viewers or in other desktop GIS applications would be the following:

The information that can be accessed through this GIS viewer is related to the plot (plots, codes, cadastre, plots and SIGPAC enclosures ...), general infrastructures and pressurized irrigation items (catchments, ponds, pumps, buildings). All these layers can be overlaid on Google maps, OpenStreetMap (OSM), CARTO, even in the different updates of the National Plan for Aerial Orthophotography (PNOA) between 2004 and 2017, to mention only some examples.

- ▶ **Plot consultation.** This includes information about the plot's owners, existing crops, areas, etc.
- ▶ **Consultation of the infrastructure inventory**, which in turn can be divided into specific aspects such as pipes, hydrants, reservoirs, pumping...