VINGIS: Managing Hungary's vineyards with Open Source

In Hungary, wine-growing is an important sector with a long tradition. While the Ministry of Agriculture has documented vineyards and crops for more than 20 years, this documentation was previously not up to EU standards. When Hungary became an EU Member State in 2004, the wine sector had to start providing standardized documentation in order to be eligible for funding under the EU's Common Agricultural Policy (CAP). For this reason, the state-owned company FÖMI developed the national vineyard register VINGIS. It opted to base its solution on open source software in order to keep the system flexible and costs low. Although the development proved difficult, the final product is benefiting approximately 200.000 people between public bodies and wine-growers.

| Quick facts	
Name	VINGIS
Sector	Public sector: Wine production
Start date	2000
End date	ongoing
Objectives	Development of a standards-based vineyard register system in the form of a GIS
Target group	Public administrations in wine-growing regions
Scope	National. Approx. 200.000 users
Budget	Approx. ¬230.000 (2008)
Funding	national
Achievements	Setting up a a standards-based authoritative GIS database on wine growers

Table of Contents

Introduction

Growing wine has a long tradition in Hungary, and wines such as the Tokaji are known well beyond the nation's borders. When Hungary became an EU Member State in 2004,his had a large impact on the country's economy, as many aspects and regulations had to be adapted to European standards. At the same time, accession opened up new opportunities, and EU funding helped facilitate rapid economic growth of the country. For the wine sector to receive funding as part of the EU's Common Agricultural Policy (CAP), the development of a GIS that would capture the sector's output and provide data on land use became necessary.

Organisation and political background

The Ministry of Agriculture and Rural Development (MARD) is in charge of the coordination of the wine sector in Hungary. It keeps track of all relevant records, such as output or structural changes, and provides detailed information about the distinct regions. As an EU member state from 2004, Hungary became eligible for subsidies for agriculture under the CAP), including for the wine sector.
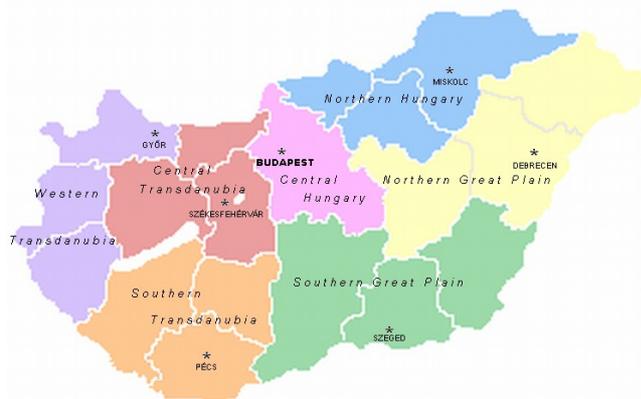
The Hungarian Regions

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Though Hungary had systematically gathered data on its wine sector for more than 20 years, this documentation previously was not up to EU standards. As stated in the Council Regulation (EC) No1593/2000, Member States have to provide clear documentation of the agricultural parcels in a standardised output format of a geographical information system. Hence, in order to receive the EU funding, the Hungarian regions had to adopt such a standardised system and make use of the GIS software.

For the development of this software, the MARD contracted the state-owned Institute of Cartography Geodesy and Remote Sensing (FÖMI by its initials in Hungarian). Its expertise with the use of GIS made it an obvious choice for the Ministry. After a pilot phase for a GIS in 1998, the FÖMI eventually developed VINGIS, which was implemented in several steps beginning in 2000.

FÖMI's task was to develop the required GIS to document the wine sector, and to administer it once it became fully functional. Of the 300 people working at FÖMI, 15 were dedicated to the VINGIS project, as FÖMI's IT expert Dr. Attila Molnár, who specialised in GIS systems, explains. From the

beginning, the project was led by Dr. László Martinovich. To answer the question how can we capture our vineyards with remote sensing? , the team designed a pilot in 1998, before launching the first of three phase of VINGIS in 2000. They needed to develop a good system that would allow for successfully managing and allocating the EU subsidies for the vineyards, Martinovich explains.

Budget and Funding

While Hungary still had some way to go towards EU membership when the VINGIS project started in 1998, the negotiations for accession made it clear that VINGIS would eventually have to implement certain standards. At its start in 1998, the project was funded by the EU until it was fully operational in 2003. According to a document published by the FÖMI itself (see Links), the funding for the years 2001 to 2006 was as follows:

●in 2001: 10 million Ft (approx. ¬ 33.400) (source: MARD- ANP/VIII/A/6 EU Harmonisation programme)

●in 2002: 25 million Ft (approx. ¬ 83.507) (source: MARD- ANP/I/A/5 EU Harmonisation programme)

●in 2003-2004: 25 million Ft (approx. ¬ 83.507) (FÖMI had to finance the project by its general budget))

●in 2005-2006: 130 million Ft (approx. ¬ 434.317) (source: MARD- National Council of Wine Communities)

From 2004, the funding for VINGIS was not covered by the EU any more, so FÖMI had to finance the project from its own budget. In recent years, from 2005 until today MARD has been funding the project. Although initially the budget dedicated to VINGIS was lower, in 2008 it reached about 70 million Hungarian forint, which is approximately ¬ 234.000. As VINGIS is also likely to be needed in the future, its funding appears to be relatively secure. The use of open source software for the development of the software also helped to keep costs at a minimum, which was especially necessary in the early phase of the project when the budget was very small.

Dr. Attila Molnár , IT expert of the VINGIS team

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Technical issues

Since FÖMI is specialized in GIS and similar technologies, the company and its staff are familiar with the IT infrastructure needed to develop and run a system like VINGIS. Nonetheless, FÖMI is not specialized in the development of applications, and under normal circumstances contracts other

parties to develop software if needed. As the budget for VINGIS was very low, ways had to be found that allowed for the development of an application without a third party at minimum costs. The actual development was thus one of the most problematic steps, because the skills necessary to do so first had to be acquired, and people who already had experience with similar tasks had to be found. For Molnár getting on top of the development requirements was a bit easier than for most, since I had already worked on other applications for my thesis, so it was relatively easy for me to get into things , as he explains.

The team started to develop the solution from scratch. The basic idea behind VINGIS was from the beginning to develop a GIS-based application that would allow the administration of the vineyards to easily fill in data, which in turn could be viewed and accessed easily. The information provided by the administrators of the different wine growing regions can be analysed quickly and shown on maps, which are based on orthophotographs and vector layers. This in turn greatly facilitates the process of allocating EU subsidies, as it can be updated very quickly, while being easily understandable through the map-view. To make this possible, the team mainly relied on Open Source software for the development of most VINGIS' components.

Apache was used as a web server, which serves both static and dynamic Web pages. Due to its common use on the Internet and as well as its nature as being free software, it was the most likely choice for the FÖMI team. As it was necessary to develop an interface in which the wine administrators could easily enter data on a daily basis, PHP offered the perfect solution for the application server. By using this scripting language, FÖMI was able to develop a dynamic Web application that that could be used without much technical understanding on the side of the wine administrators. In order to guarantee the secure transmission of information on the Internet, FÖMI used the OpenSSL protocol, which is freely available in many languages and further provides certified security under the FIPS 140-2 computer security standard.

For the development of the actual GIS application the team relied heavily on the MapServer WebGIS engine, which is a development environment used for many spatially-enabled GIS applications. Here again, the priority was to make use of tools that were functioning well and were freely available on the Web. As Molnár explains   MapServer WebGIS is only an engine, and we needed to build our own business logic to solve our special requirements .

To read the input of the software and to give a easily understandable output the team included the Geospatial Data Abstraction Library (GDAL) in VINGIS. GDAL has been used for quite some time with popular applications such as Google Earth, and also functions with MapServer. Furthermore it is also freely available, which again made it a good choice for FÖMI.

In order to cope with the large amounts of information that flow into VINGIS on a daily basis, the

development team made use of PostGIS, which is an addition to the data management system PostGreSQL. PostGIS specialises in storing geographical information. It lies behind many other GIS applications and runs on nearly all operating systems. In addition, it is also freely available under BSD-style license, which imposes very few duties regarding further distribution..

The code used for VINGIS was fully developed by FÖMI without building on previously existing GIS software. Although additional training was necessary for the development, keeping the work in-house made it possible for the team to keep the costs at an absolute minimum, while at the same time producing a functional and flexible software. Up to this moment, the code for VINGIS has not been published and belongs solely to FÖMI. Although the FÖMI team is clearly attracted to the open source philosophy, the reason for not publishing VINGIS is mainly related to a shortage in resources. VINGIS is adapted specifically to the needs of the Hungarian vineyards, and each component has a specific purpose. According to Mólnar, publishing it therefore would mean that additional resources would have to be dedicated for the publication of each component, in order to make it an application that people could actually use. It is thus not animosity towards the Open Source philosophy that keeps FÖMI from releasing their code, but rather the problem of not having enough staff and financial means to do so.

Change management

Before the use of VINGIS, no digital vineyard register was employed in the wine-growing regions. In the daily work, paper maps provided insights about the characteristics of certain regions, which very difficult to update. The introduction of VINGIS was therefore widely welcomed.

As it was not possible to introduce the system nation-wide from the start, FÖMI took a three-phase approach, which allowed for continuous adaptation of the system. Molnár explains: In the first four years from 2000 to 2004 we laid the methodological ground for VINGIS , by constantly collecting data and spreading its use across the regions. In the aforementioned document published by FÖMI, the three phases are illustrated as follows:

Designation	Phase 1 (2000-2002)	Phase 2 (2002-2003)	Phase 3 (2003-2004)
Wine growing regions	Eger Matraalja Villany	Etyek-Buda Balatonboglar Sapron Somla Badacsony	Csongrad Hajos-Baja Kunsag Aszar-Neszmely Balatonfelvidek Mor Mecsekalja Tokaj Balatonmellek
Degree of Completion	20%	45%	100%

Molnár argues that the real start of the project took place only fours years after the official start:

   Since 2004 it's an official database, which contains all the vineyard data of Hungary. So I think that VINGIS started in 2004   . Today, the VINGIS database is over 1,5 Terabyte in size and it still growing.

To public administrators in the wine-growing regions, FÖMI not only provides software, but also assists them in using it. Here, training was necessary especially in the beginning, as many users were not familiar with the use of a GIS and its functions. These trainings still continue, and FÖMI is advising users whenever necessary. A mailing list allows for direct exchange between users and the FÖMI team. The mailing list also functions as a tool to notify the users of new regulations and changes to the system. At the same time it is an avenue for FÖMI to obtain user feedback, which is in turn used to constantly improve the software.

Effect on government services

For the administration of the wine-growing regions, VINGIS facilitates updates to maps and the processing of data. The software has replaced paper maps as the main tool for daily work, and the efficiency gains are correspondingly large. It also offers functions that were difficult or impossible to perform with paper, making the administration more effective. It is currently used by approximately 200.000 users, which use the system directly or are affected by it indirectly.

The wine growers benefit from this development as well. With the introduction of VINGIS, the process of allocating EU subsidies became much faster. Considering the amount of nearly 2 billion Hungarian forint (approx. ¬ 6,5 million) that is being distributed, it becomes evident that a fast allocation can substantially benefit the whole wine production process. The farmers can thus make better use of the subsidies, especially in an agricultural sector where each season can bring wildly

different results.

Cooperation with other public bodies

For the development of VINGIS, the FÖMI team was working closely with many partners, both from the private and the public sector. As the software can be applied in numerous settings, it was necessary to get the information of the various potential application fields. As FÖMI itself had no specialised knowledge about wine growing, being in close contact with their partners enabled the team to get a good picture of the current situation of the Hungarian vineyards. The expertise of these partners was key to the creation of a highly functional system. Ultimately, this input provided the orientation in the development process with regard to what functions had to be included. According to Martinovich, the partners were:

From the public sector:
- Ministry of Agriculture and Rural Development
- Agricultural & Rural Development Office
- Viticultural & Oenological Research Institute
- Central Agricultural Office
- National Council of Wine Communities
- Wine Communities

From the private sector:
- wine growers
- wine traders

While some of the partners mainly gave consultancy assistance in the development phase, others are still in close contact with FÖMI. Cooperation is especially close with MARD, which manages the wine-growing regions.

Evaluation

Achievements / Lessons learned

For a country like Hungary in the context of the EU accession there are certainly many challenges related in the initial stage of becoming a Member State. Yet even if the accession process is sometimes demanding, it also brings significant benefits, as is the case with VINGIS: the system helps Hungarian wine growers to gain access to EU subsidies for the sector. Its standardised GIS technology has also made the day-to-day work of public administrators much more efficient by replacing paper maps with current information technology.

By relying on Open Source software for the development of VINGIS, the FÖMI team was able to start working on the project without really having a budget especially in the pilot phase. For this it also proved to be important to have qualified people in-house who were able to take on the challenge.

Future plans

For the future, the FÖMI team has the goal of making the system more user friendly. Molnár states that we are not there yet, the environment of the project is changing with regard to user requirements and regulations . The team is constantly working to improve the software's functionality.

Conclusion

The case of the Hungarian vineyard register provides a good illustration of the challenges and benefits that come with a new EU membership. As the project's financial prospects initially were unclear, the VINGIS team had to find cost-effective solutions that were flexible enough for the system to remain useful in the future. For this, the open source approach seemed to be the only way to go, as it met both these requirements. The tools for the development were all freely available, but the team needed to learn how to use them. The problems of missing expertise were overcome by giving experienced staff at FÖMI the opportunity to acquire the necessary know-how. Clearly this was not an easy task, as many components of the software relied on different development environments. After all problems they faced initially, the team managed to develop a technology solution from scratch that fits their specific needs. This kept the costs to a minimum, while at the same time bringing large benefits for the project in the future. Eventually, it is no longer necessary for the team to turn to third-party developers for questions concerning the VINGIS project, as they have become acquainted with the development tools.

The approach of using Open Source software for the development of VINGIS not only helped to keep the costs low, but also ensures that the system will remain functional in the future. In addition, flexibility and openness were a high priority for VINGIS from the beginning onwards. As the director of the VINGIS team Martinovich explains: The requirements of the VINGIS project are changing [along with the regulations in both the EU and Hungary], and following of the requirements is easy with a flexible open source system.

Although working with open source software was largely beneficial for the FÖMI team, it also had its downside. The biggest problem with Open Source software [for VINGIS] is that we don't have enough experienced developers and it takes a lot of time and money to build up expertise Molnár

explains. Martinovich further underlines that the possibilities are very good, but the level of experience with open source software is low. The support for these solutions is very limited . Considering the sheer amount of different development applications and environments the team used, the difficulties that FÖMI initially faced become quite evident. For the VINGIS team, there is thus a clear downside to Open Source software, and proprietary software can sometimes have more and better functionality statesMolnár, looking back the development phase. Other institutions and public actors should therefore be aware of the limits of open source software, and weigh benefits and drawbacks of such solutions before starting a project.

After the initial development phase, the system was first put into use in 2000. Although it was constantly changed and improved, there are still a few shortcomings, mainly with regard to the user interface. Molnár says: I think the system is good, but we have to include more user friendly functions . This is one of the aspects that the team plans to improve in the future.

Publishing a solution like VINGIS in a way that makes it usable to others takes some effort, especially if the decision to publish is taken late in the development. While it would probably be beneficial for other administrations if FÖMI were to publish VINGIS as an open source application, resource constraints prevent the state-owned company from doing so, according to Mólnar. On the other hand, a release of the software into a community of interested government bodies with similar needs might in the long run distribute the development load more widely, benefiting the original developers.

Links

FÖMI Case Study Hungarian vineyard register (VINGIS)

Updating the Evaluation of Hungarian Wine Producing Fields Using the National GIS Register (VINGIS)

The Role of GI in the Accession Process

The Implementation of the Hungarian GIS Register of Vineyards VINGIS

FÖMI Institute of Geodesy, Cartography and Remote Sensing