GEO-SERVICES: OPTIMIZING AGRICULTURAL BUSINESS PROCESSES

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ABSTRACT

There scarcely exists an application domain in the GIS-world that has as many spatial components as Agriculture. More or less every agricultural activity has an immanent spatial factor. Although using GeoInformation(GI-)-Technology in Agriculture has a quiet long tradition, the use of this technology has recently experiences a real revival, especially driven by dramatically rising documentation demands in general. Agricultural requirements with regard to necessary geo-information are high. Access to a whole cosmos of geo-referenced data and information coming from diverse sources is necessary. Geo-services within well working Spatial Data Infrastructures are offering a perfect approach to satisfy these new demands in front of the GIS-renaissance in Agriculture. They certainly have the power to optimize agricultural business-processes on every level of application. The paper will give insight into the use of geo-services in two application-examples: one coming from the administrative level, the other from the farm level.

KEYWORDS: Agriculture, Spatial Data Infrastructures, Geo-Services, IACS, Crop Units

BACKGROUND AND MOTIVATION

Being a historical domain for the use of GeoInformation(GI-)-Technology and GeoInformationSystems (GIS) in particular, Agriculture is experiencing a real revival with regard to the use of this technology. The main driving force are massively rising (geo-referenced) documentation demands in general. The most prominent example are the new demands to the Integrated Administration and Controlling System (IACS) within the framework of the management and control of subsidies concerning agricultural activities. From 2005 on, GI-Technology must be deeply integrated into the system at a European-wide level. One output will be the building of so called Land Parcel Information Systems (LPIS) in every single member state. But IACS is just one example. Beside rather traditional GIS-topics like

- Precision Farming,
- Agro-Structural Planning,
- Watershed- and Erosion-Management and
- General Agricultural Consulting,

and themes like

- the Water Framework Directive,

- Tracking and Tracing in Agriculture,
- the Monitoring of Genetically Manipulated Organisms (GMO) or
- Cross Compliance

put GI-Technology into a poll-position in the agricultural IT-world (see Figure 1).

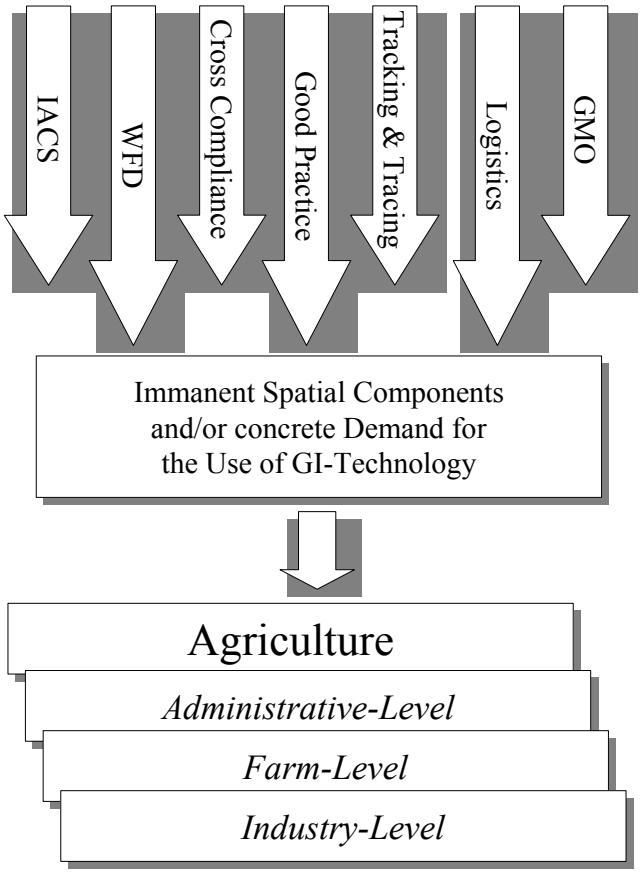

Figure 1: Selection of recent main driving Forces for the Use of GI-Technology in Agriculture

GI-Technology is on the best way to become a key-technology in Agriculture (Nölle, 2003). This evolution effects all levels of agricultural business: the farm-, administrative- and industrial-level as well. However: due to its complexity, the use of GI-Technology in Agriculture needs a lot of information-input from basic and specific geo-information, coming from diverse sources (see Figure 2).

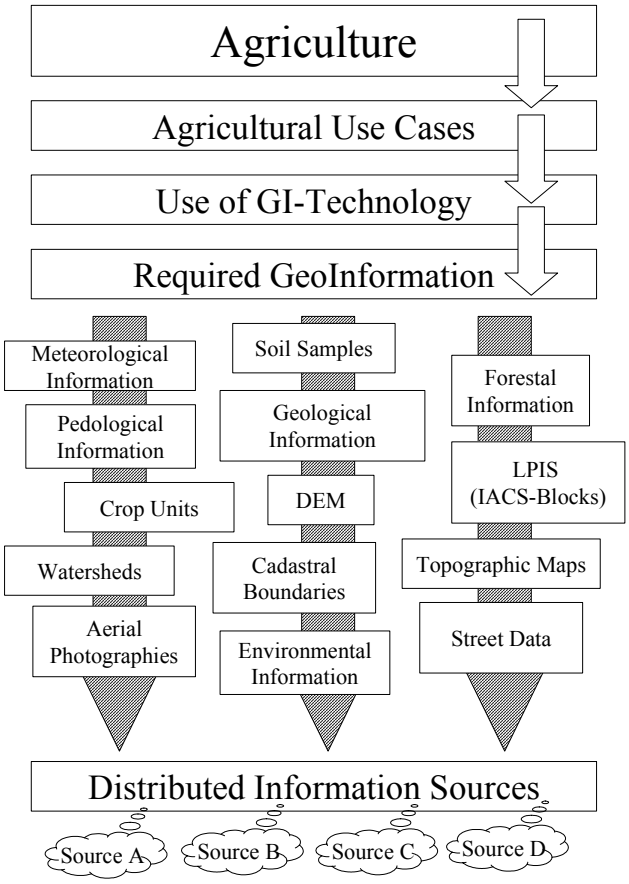

Figure 2: The multifaceted appearance of agricultural GeoInformation-Requirements

The efficient and effective use of GI-Technology in Agriculture, as in other domains as well, depends mainly on an easy, fast, redundance-free and secure access to all required (distributed) data and information. The next two chapters will describe the utilization of standardized geo-services operating within Spatial Data Infrastructures (SDI) to tackle (amongst others) this basic challenge.

ENHANCEMENT OF AGRICULTURAL BUSINESS PROCESSES THROUGH GEO-SERVICES

Optimization Potential on Administrative Level

As discussed in the first chapter, especially the agricultural administration is actually confronted with immense demands to the integration of GI-Technology into its IT-infrastructures. The following example explains, how geo-services are used to optimize the access to geo-

information from the point of view of the Chamber of Agriculture of the State of North Rhine-Westfalia (CoA NRW) in Germany.

The CoA NRW has already decided in 1998 to integrate GI-Technology as a turn-key-technology into its IT-infrastructure. A core aspect of the integration process has been the erection of a central geo-data-server to manage and maintain all basic and specific geo-data (Nölle, 2001). This server is operationally working. It hosts all available external (e.g. aerial photographies, topographic maps, cadastral boundaries) originally coming from sources like

- the states Surveyors Office (SO)
- the Geological Service NRW (GS)
- the Department of Ecology

and internal geo-data (e.g. crop-units, IACS-blocks) for the whole state of NRW. The general administration of this data and the processes of keeping this data actual, is one the most time-consuming and hence expensive GI-Technology-related activities in the CoA. This business-process can and certainly must be optimized to reduce unnecessary data-management activities and costs. One approach will be, to preferably access as much external data as possible directly from its sources, which is a central concern of the Spatial Data Infrastructure Initiative of the state of NRW (GDI NRW; Brüggemann, 2004).

"The aim of the GDI NRW is to enable the geo-information market as well as to improve access, availability and use of geo-information. … The Initiative GDI NRW is based on specification of the OpenGIS Consortium (OGC) and the Technical Committee (TC) 211 of the International Organization for Standarization (ISO)(http://www.gdi-nrw.org/)."

The CoA participates at this initiative as a member in general and also at the recent so called Joint Project of the GDI NRW, which targets at the operationalization of the initiative itself, in terms of establishing and using geo-services (data-services and applications) in the day to day business. It contributes with an OGC-compliant intranet-client which has the power to access corresponding geo-services (here data-services; WebMapServices, WMS and WebFeatureServices, WFS) via the states administrative intranet. The Client is called Agricultural Information Component (AIC) and serves as an use-case-independent intranet-GIS-application for all employees of the CoA (especially dedicated for employees that are not equipped with a full GIS). Figure 3 shows screenshots of the AIC, accessing WMS that are served by the NRWs Department for Data Processing and Statistics by order of the states Surveyors Office and Geological Service.

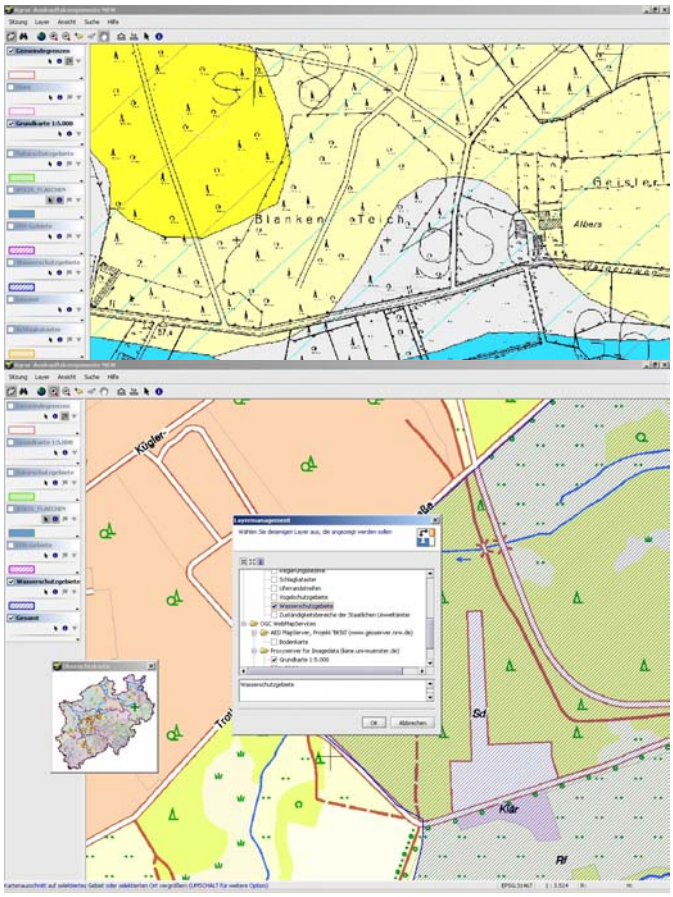

Figure 3: OGC-compliant Intranet-GIS-Client of the Chamber of Agriculture, NRW, Germany,

Agricultural Information Component

The previous figure illustrates the AIC accessing pedological information from the GS and topographic information from the SO in a standardized way via the states administrative intranet. It should also be mentioned that the underlying data is no longer administrated on the CoA's own geo-data-server, but coming from an external source that is operating as a geo-service-provider for the SO and the GS. Consequently the use of geo-services has definitely the power to optimize the business-process of accessing external basic and specific geo-information relevant for the chambers GI-activities. It is foreseeable that soon more and more geo-information that is recently (not redundance-free) stored on the geo-data-server of the CoA NRW will be available via geo-services, so that cost-reducing and optimization with regard to geo-data-management is tangibly near.

Optimization Potential on Farm Level

Referring to the first chapter, GI-Technology is not only finding its way to the administrative level but also to the farm-level. It is predictable that there will be a drastic demand for geo-information on farm-level. Approaches must be followed that enable farmers to get easy access to geo-information and applications, satisfying their needs (Bill, 2004). Because there is a generation change going on (not only) in German Agriculture, younger farmers, that already intensively use the internet as a platform for their work, are taking over the business, so that the time is mature to offer these farmers access to geo-services (data and applications) via internet (see Figure 4).

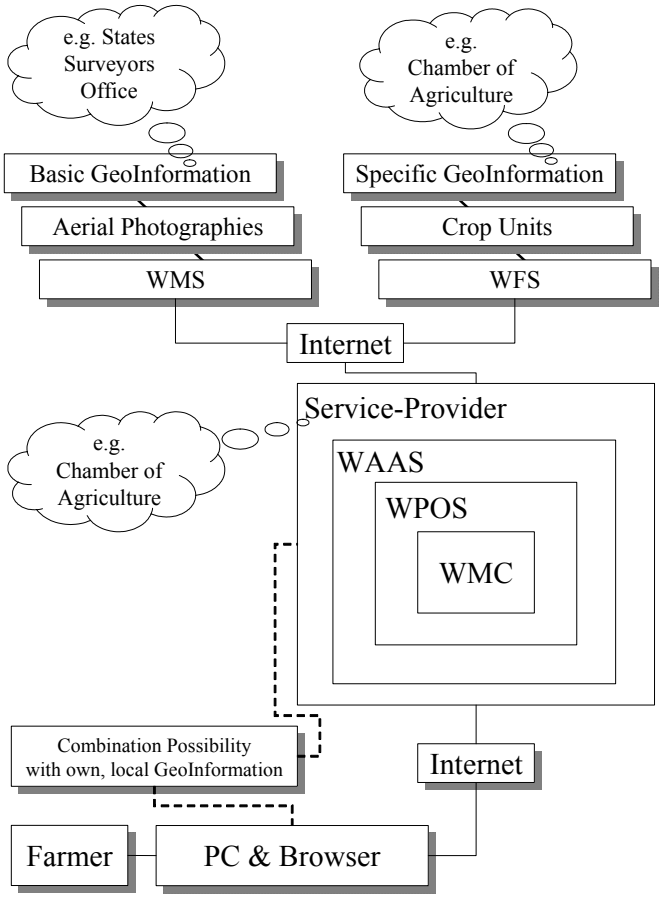

Figure 4: Simplified Illustrations of a geo-service-based Crop-Unit-Documentation-Service for Farmers

Within the Special Interest Group Agriculture and Forestry (SIG A + F) of the GDI NRW and also internally within the CoA NRW, a first basic geo-service (application) has been identified to bring farmers in touch with this technology on a broad basis: a simple Crop-Unit-Documentation Service. The application (WebMapClient, WMC) would simply bring together basic background

geo-information (e.g. aerial photographies) and farm-specific information (crop-units). The basic geo-information could be served through the states SO and the specific information could be delivered by the CoA. The client would be enriched by at least a Web Authentication and Authorization Service (WAAS) to ensure that only authorized persons can get access to the farm-specific information. Moreover Web Pricing and Ordering Services (WPOS) could play a role, to discount the use of e.g. basic geo-information. The application itself could be offered by the CoA.

One argument for the CoA acting as a provider in this case could be the fact that in near future the chamber will have extensive access to crop-units of their farmers, created within the framework of their GIS-supported agricultural consulting. Provided by the concerned farmers with the right to use this data for example in the discussed application, the CoA could refine already existing geo-data through such a service, which is another central aim of the GDI NRW. So, both parties, CoA and farmers would profit from such a geo-service (Nölle, 2002).

The optimization potential for the farm level is obvious: a simple to use geo-service delivered via internet allows the farmers easy access to all required geo-information, instead of locally installed Farm-GIS-solutions that overstrain most users not only with regard to their functionality but also concerning the geo-information management. Of course the described documentation service allows, at a later extension stage, to enrich the application with further (demanded) functionality.

CONCLUSION AND OUTLOOK

As discussed and described in this paper, standardized geo-services in well-working SDIs have a high potential to optimize all GI-Technology related business-processes in Agriculture, simply by reducing data- and information-management efforts. Moreover they offer the opportunity to refine existing geo-data as demonstrated by the example of the crop-unit-documentation service.

Because of their immanent simplicity, guaranteed through standardization in terms of merging geo-services, agricultural use-cases handling cross-boarder-activities such as optimization of phytosanitary monitoring processes will soon arise. Furthermore service-based data-integration activities will be on the agenda such as updating cadastral land-use-information via for example IACS-blocks. So, their will be no lack of ideas how to enhance agro-business-processes on every application-level by geo-services.

But: although there is certainly a feeling that the idea of geo-services is on the brink of a breakthrough (not only with regard to the optimization of agro-processes), it must be noticed that there haven't been enough proven examples, realizations under realistic conditions in terms of a sufficient basis to convince the whole community (here agro-community) to follow the geo-service approach.

To guarantee a successful end of the geo-service- and SDI-approach, much more activities like the above mentioned Joint Project within GDI NRW must be initialized. Moreover more power must be invested in rising general consciousness for these topics, especially focusing on (here agricultural) education. Potential customers with low consciousness and understanding about GI-Technology are much harder to convince than well-informed customers, who can formulate their demands with regard to this technology more easily.

Moreover the foundation of a European-wide Interest Group SDIs and geo-service for Agriculture would certainly help to bring together valuable information and experiences for this domain

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