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VegGIS – A Web-Based Collaborative Research Environment – Pilot Application in Research on Vegetable Production in Greater Bangkok, Thailand

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Introduction

Urban and periurban vegetable production and marketing systems have the potential to contribute to poverty reduction, food and nutritional security, local economic and community development, social inclusion of marginalised groups and women in particular, as well as to enhance urban environmental management by increasing biodiversity and the productive reuse of organic wastes (DRESCHER *et al.* 2012).

However, very often the complexity of urban and periurban vegetable systems is not fully understood by regional and urban planners, city administrators and policy makers, and hence, its potential for sustainable development of urban and periurban areas in developing countries has only be harnessed to a limited extent. As part of the GIZ[1]-funded project *"Understanding urban and periurban vegetable production and marketing systems through GIS[2]-based Community Food Mapping in Greater Bangkok, Thailand"* an innovative new web-based Collaborative Research Environment (CRE) was developed. The CRE supports research to better understand interlinkages between producers, marketeers and consumers. Like described by LINDLEY *et al.* (2010), a key feature of the CRE is ensuring long-term data availability and access. The core of the CRE consists of a central, spatially enabled database and a range of associated tools for distributed data entry, for remote and real-time monitoring of the incoming data, for data analysis, and last but not least for data presentation. The tools include the required geographic information system functionality for spatial analysis and map-based visualisation. In our pilot study the data included in the CRE comprises empirical data from different sources such as questionnaires and surveys, spatial information on production areas in relation to vegetable diversity as well as information on producers, traders and consumers. As it is a web-based application, technical requirements for the users are low apart from having access to the internet. The multilayer food related data can thereby be presented, visualised, evaluated and analysed in a modern and straightforward way which helps to simplify the communication between scientific disciplines and the dissemination of findings to a broader public and to the policy level.

[1] Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Society for International Cooperation)
[2] Geographic information system

The Web-Based Collaborative Research Environment

The complexity of the research topic demanded a large number of participants. In total, a group of about 40 people participated in the investigation. Apart from the PIs, partner scientists and supervisors, a group of students and local research assistants were involved into the project. For the different research areas, groups of different tasks and responsibilities were created. A challenge consisted in the management of the collected data. The participating people worked in different locations and at different times but depended on the data of each other and needed access to the current and up to date data stocks. For this reason we followed a new approach of web-based collaborative data collection. Therefore, a web application with all necessary tools for the collection of spatial and other data was developed (Figure 1). This way, we were able to provide a worldwide and round the clock accessible and easy to use platform for collecting and sharing research data. Another advantage of this way of data management is the low access requirements for the users. Especially when dealing with spatial data, normally, special software and knowledge about this kind of data is required. As we put all required tools into the web application, there were no such requirements apart from having access to the internet.

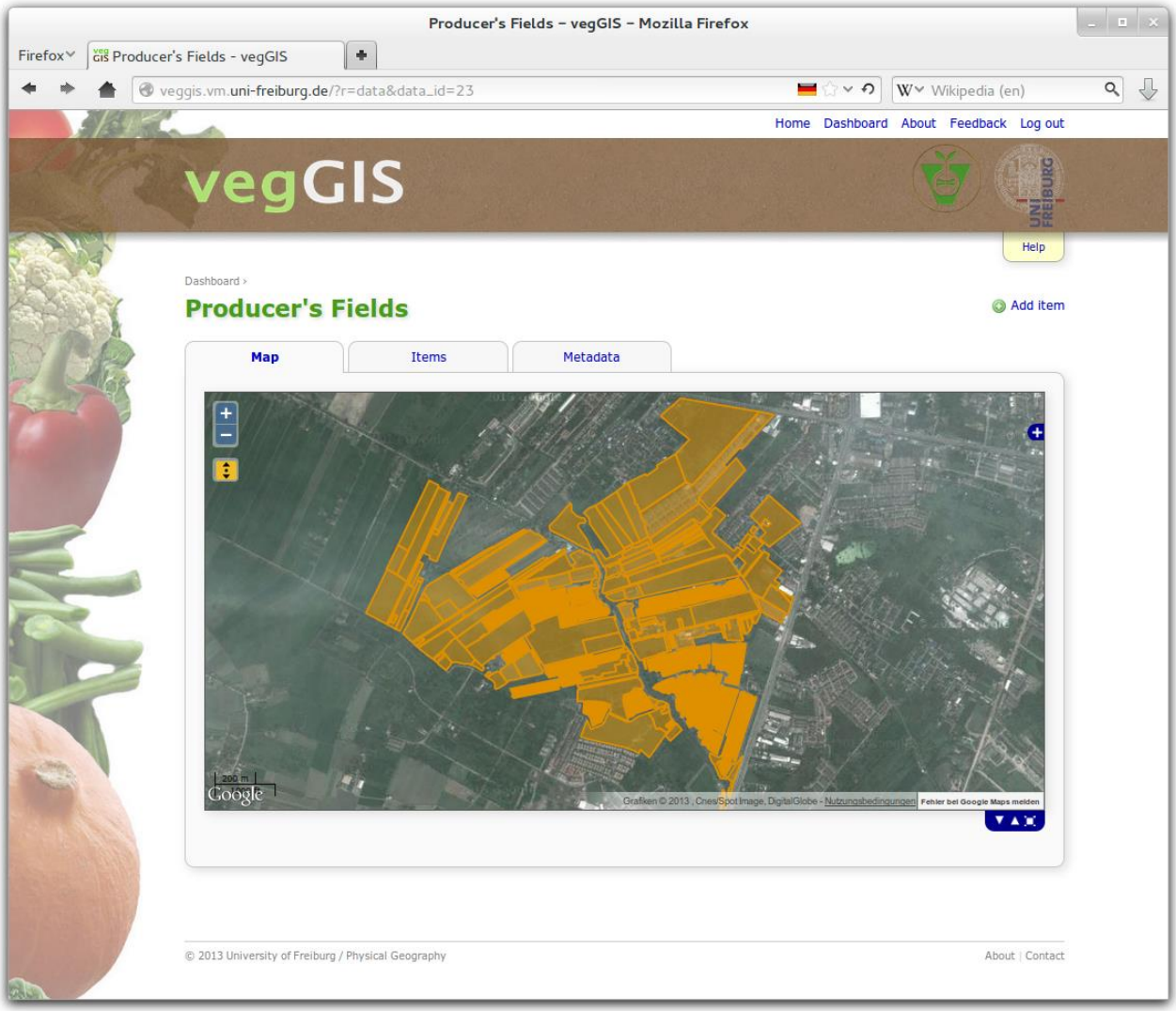

Figure 1: Screenshot of the web application

The web application was implemented in common client-server architecture (Figure 2). The server-side core component consists of a PHP[3] application running on an Apache web server[4]. This application handles the user requests, performs the database operations and renders the user interface templates which are delivered to the web browser. PostgreSQL[5] with PostGIS[6] extension is used as database. The client-side front-end runs in the web browser and consists of HTML[7], CSS[8] and JavaScript. External front-end modules and libraries are embedded as required, for example, the OpenLayers JavaScript library[9] is used for editing and visualizing spatial data and base maps are integrated by external base map servers.
The web application allows the definition of data models where data types and metadata is specified for every data stock. This assures data validity of the entered data and provides a standardized data storage. This way, data conversions can be done easily. The web application provides different options to convert and download the data for further processing, visualizing and analysing tasks in other software.
An integrated user and group management allows the granting of detailed read, write and administration permissions of the data. This way it was possible to create user accounts with different permissions corresponding to roles of the participating persons. Furthermore, accounts with read-only access for data monitoring could be set up.

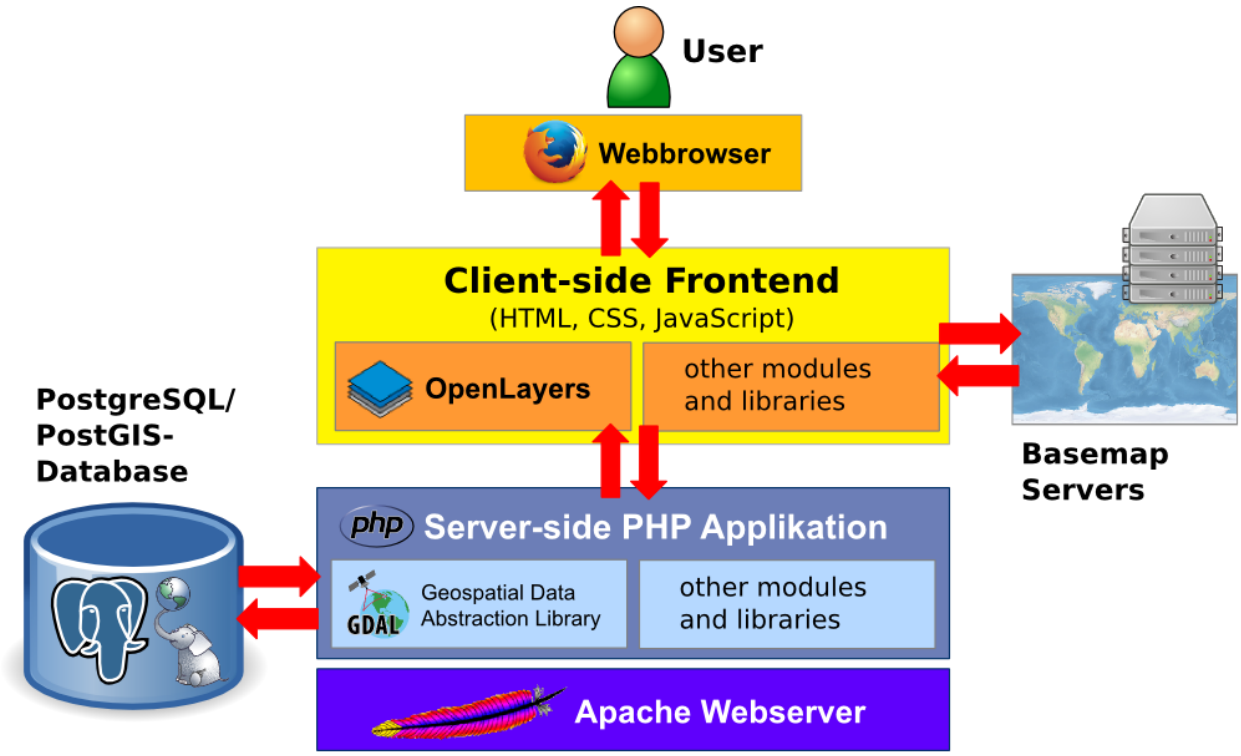

Figure 2: The basic structure of the web application

[3] PHP: Hypertext Preprocessor is a server-side scripting language (http://php.net/)
[4] Apache HTTP Server is a common open source web-server software (http://httpd.apache.org/)
[5] An open source object-relational database management system (http://www.postgresql.org/)
[6] Spatial extension for the PostgreSQL database (http://postgis.net/)
[7] HyperText Markup Language
[8] Cascading Style Sheets
[9] Open source JavaScript web map library (http://openlayers.org/)

Results and Discussion

The main result of this pilot project is the establishment of a web-based functional collaborative research environment (CRE). The CRE allows online data entry, which enables the researchers to directly enter data in Bangkok (or any other place in the world) on a server based at the University of Freiburg. From here real time project monitoring and quality control can be realised. The current data status is always up-to-date and accessible by all involved participants. In two field campaigns in April-August 2012 and 2013 the different components of the urban food system (producers, consumers, markets, traders and community gardens) were captured, and a total of about 10,000 data records were collected. The CRE allows data export in different formats and the data is still available for further analysis. Preliminary results of the study content will be published at the SEAVEG 2014 in Bangkok.

Conclusions and Outlook

The project has proven, that the CRE is a useful tool to collect, manage, process and store large amounts of data in a more sustainable and centralized way than this is done usually (e.g. in separate files on different data storage mediums). The facilitation of easy and 24/7 access and availability in a project with a large number of researchers dispersed in different locations is of great advantage. The pilot CRE offers great potential for further development and application in project up-scaling and modification for other project demands. The important geographic component allows the visualisation of results, identification of spatial patterns of specific attributes and facilitates better understanding of problems faced by certain communities.
Besides the mere scientific findings the project was an eye opener for a large number of Thai and German students and researchers, regarding the overlooked importance of vegetables in the urban food system and the technical possibilities to make those more visible.

References

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