PUBLIC PARTICIPATORY GEOGRAPHIC INFORMATION SYSTEMS (PPGIS) AS TOOL FOR IMPROVING WATER RESOURCES MANAGEMENT IN AGRICULTURE

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Abstract
The SIRIUS (Sustainable Irrigation Water Management and River – basin Governance: implementing User - driven Services) project, funded by EC FP7, is developing new services for water managers and food producers, including maps detailing irrigation water requirements in different areas, crop water consumption estimates, and a range of additional information products in support of sustainable irrigation water use and management under conditions of water scarcity and drought. To build an archive of local knowledge that leads to understand the local community fabric and facilitates the project objectives there are developed in SIRIUS two main participatory tools: the PPGIS community and the stakeholder workshops.
The paper reports the activities carried out during the implementation of the PPGIS in the Italian pilot areas, showing how this new kind of participatory tools can contribute, along with the technology, to reach the goal of the efficient water management in agriculture.

Keywords: PPGIS, water management

Introduction

Italy is considered a country with a good availability of water resources. The characteristics of its territory are: (i) very unequal distribution of the rainfalls between different areas of the country, (ii) the irregularity of water flow and (iii) the not good state of the water infrastructures, do not allow the efficient use of water recourses.
Efficient water management is becoming a well known topic recently due to water scarcity phenomena especially for the southern Italian regions and, more in general, for the raising awareness of people to the environmental issues related with climate change.
A great contribution to the increased people awareness to the topics related to the efficient water management in agriculture is to be acknowledged to numerous national and international research projects financed during the last decade.
SIRIUS project is an example. It addresses efficient water resource management in water-scarce environments, focussing in particular on water use for food production with the perspective of a sustainable agriculture in the context of integrated river-basin management, including drought management.
SIRIUS addresses users (water managers and food producers) at scales ranging from farm, over irrigation scheme or aquifer, to river-basins. It will provide them with maps of irrigation water requirements, crop water consumption and a range of further products for sustainable irrigation water use and management under conditions of water scarcity and drought, integrated in leading-edge participatory spatial online Decision-support systems. The SIRIUS service concept considers the economic, environmental, technical, social, and political dimensions in an integrated way.
Beside the development of technological tools to assist water management in agriculture, SIRIUS goes beyond trying to put emphasis to the active role and participation of all stakeholders in each pilot areas. To this aim one of the project activities is the building of a PPGIS (Public Participation Geographic Information Systems) community, which refers to a group of people who will be participating in the 'Public Participatory GIS' practice. PPGIS is "the tool empowering ordinary people in the local community in adding value and authority to their spatial knowledge through the use of geo-spatial information technologies (GIT) and to use maps to communicate effectively". This practice involves several levels from ground mapping (drawing in the sand) to participatory interpretation of remote sensing images, networking, communication and alliance building (CTA/IFAD).

Methodology

The attempt to take an inventory of the natural resources, particularly the water resources, through GIS and with the participation of the community members was conducted in Italy, in the area managed by the 'Consorzio di Bonifica Sannio Alifano', located in the northern part of the Campania Region, with a total area utilized for agriculture of 66,189 ha, which covers 58% of the administrative area of the Consorzio. Irrigation infrastructures are present in an area of 14,070 ha (21% of the utilized agricultural area) and the irrigated surface is 10,735 ha (76% of the area served by irrigation infrastructures).
The GIS language is highly technical while water study is scientific and in some case complicate. Bringing these two together and introducing them to the community at the language they best understand may be tricky. Thus, public participatory GIS is considered an effective approach in bringing into convergence the scientific and the technical components with the local community's knowledge and participation. Participatory GIS implies making Geographic Information Technologies and Systems (GIT&S) accessible and understandable to disadvantaged groups in society in order to enhance their capacity in generating, managing, analyzing and communicating spatial information (CTA, 2008). One such popular tool for spatial data collection is participatory mapping.

PPGIS represents a broad notion that the spatial visualization and analysis capacities inherent in GIS present a unique opportunity for enhanced citizen involvement in public policy and planning issues.
In this sense, a map can facilitate mutual understanding and common agreement about basic facts, and can be used to develop trusting relationships across a diverse set of participants.
The methodology involves several phases which are: (1) initial consultation with leaders and networking, (2) data preparation, (3) initial consultation with the community and site analysis, (4) community mapping activity, (5) community validation, (6) technical integration, and (7) presentation and submission.
In line with the SIRIUS approach of using the synergy between technology (SPIDER[System of Participatory Information, Decision support,& Expert knowledge for irrigation River basin water Management] and Earth observation satellites) and participation, the SIRIUS PPGIS community is being set up around SPIDER and its prime users, the nucleus of Core Stakeholders. In the following, we define further key members of the ppgis community, in particular the role of the Lead Cartographer or GIS Specialist, Gender Focal Point, Community Leaders, Subject Matter Specialists & Storytellers.
Information about the water resources and other agro-environmental data were collected and stored in the PPGIS database that falls under different categories:
– Database of interested persons and key institutions;
– Data required to feed SPIDER;
– Other resources maps;
– Relevant literature from diverse sources.

Data collected are quantitative and qualitative: official (from government sources), academic (from universities) or popular (from public libraries and newspapers).
Besides resource maps, existing aerial photographs and information on major crop grown and water problems of the pilot area, local literature, including stories, legends, films and songs on the local water culture and related to agriculture are very important.
To ensure that the voice and knowledge of the locals will be integrated into the whole process, a community mapping process was conducted. Community mapping is one of the participative approaches and tools that provide a venue for the community to spatially express their situation, culture and issues in a drawn map. It was an opportunity to involve community members in developing baseline data and a common understanding of their place.

Conclusions
After the maps were completed, validated and officially turned-over to the owners, the members of the community, the researcher and the GIS specialist, who helped prepare the map once again sat down with the members of the community, to open a discussion on the significance and utility of maps that were produced. This also became the venue for the researcher to share with the community the state of the water resources management in the pilot area and how it is related to their own locality. In this way, it was hoped that community understanding would lead to improved use and management of their water resources.

Literature
Al-Kodmany K., 2001. Visualization tools and methods for participatory planning and design, Journal of Urban Technology, Volume 8, number 2, pp. 1-37.
CTA, 2008. About participatory GIS. Retrieved June 1, 2010, from Technical Centre for Agricultural and Rural Cooperation (CTA) Web site: http://pgis.cta.int/about-pgis.
CTA/IFAD PPGIS Training Kit (http://pgis-tk-en.cta.int/).
http://www.sirius-gmes.es/

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