

# **Provision of technical support and regulatory reference information on the control of agriculture subsidies in EU through Wiki-based Knowledge Management**

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## **SUMMARY**

One of the primary tasks of the GeoCAP team of the Joint Research Centre (JRC) Agriculture Unit is to provide technical and methodological support on the control of Common Agriculture Policy (CAP) subsidies to EU Member State National Administrations involved in the annual Control with Remote Sensing (CwRS) campaigns. This assistance covers a broad range of issues related not only to the workflow of on-the-spot checks, but also to other relevant topics such as: evaluation of the currency of the Land Parcel Identification System (LPIS); quality control of aerial or satellite orthoimagery; area measurements using GPS and many others.

The provision and dissemination of technical information through the Web is considered a powerful means to provide immediate assistance to users. However, in order to be effective, the information should be presented in well-structured, “subject-oriented”, manner through a simple and user-friendly interface. There is already a substantial knowledge archive collected in the JRC and organized in different technical guidelines, recommendations, specifications and working documents, for which access needed to be optimized.

To address this need, the GeoCAP team implemented a process of review, reorganization and consolidation of the technical and regulatory reference documentation available, in order to provide this knowledge base to users through Wiki-technologies. Such collaborative software tools are already broadly used in Knowledge Management; the use in government services, however, is still quite under developed. In the beginning of 2008, the first version of the system, called WikiCAP, was made available online to the users for review and feedback.

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## **1. INTRODUCTION**

The Common Agriculture Policy (CAP) adopted by the European Union, since its reform in 2003, aims to provide for a stable farmer's income, decoupled from production, within a framework of sustainable development of the rural areas while respecting environmental and other societal needs (EU 2008). The CAP is the EU's most significant policy instrument in financial terms, impacting agricultural practices, environmental sustainability, and the economic livelihood of rural areas. Aid payments – under either of the two main pillars of the CAP – still makes up the largest single component of the EU annual budget. While a major CAP goal is the responsible and sustainable use of rural resources, the correct management and control of these payments is a major task for Member States and Commission services. There are three main categories of player in the process of direct payments management under the Common Agricultural Policy: the EU Institutions, Member State (MS) Administrations (including some MS Regions) and farmers.

The philosophy and practical implementation of the CAP was designed and developed in a series of Council and Commission regulations, which outline the legal framework of the whole process. The monitoring and the control of the correct implementation of the CAP are the responsibility of The Directorate General for Agriculture and Rural Development at the European Commission.

There is a big variety among the EU Member States, in respect of national legislation, historical traditions in land management, climate, landscape, level of agriculture development, etc. Considering this fact and taking into account the complexity of the different regulatory aspects of CAP, the Commission has placed efforts in the elaboration of practical methodologies and introduction of technical tools, which could bring the concept of CAP management and control from the regulations into reality. This task has been given to the Institute for Protection and Security of Citizen (IPSC) at Joint Research Centre (JRC) of the European Commission in Ispra, Italy.

The GeoCAP Action<sup>1</sup> in the Agriculture Unit of IPSC, JRC, addresses the practical aspects of CAP management in the EU Member states, as well as the future information needs for European Policies related to the implementation of Agriculture and Regional Development,

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<sup>1</sup> renamed as of January 2008 from the previous "MARS PAC" action

such as Cross Compliance, Farm Advisory System, food quality and product origin traceability.

The past decade has seen the evolution of the information required by CAP legislation to be geo-referenced, on-line and supported by extensive and up-to-date national image datasets, focused in the Integrated Administration and Control System (IACS). In response to that, GeoCAP supports the Commission with the definition, development and testing of standardized and sustainable control methods in a variety of agriculture-related areas. The Action also follows future development in Geomatics techniques, and supports land administration (cadastre) and multipurpose large scale mapping approaches. Common specifications, standard measurement, data management tools, and validated methods are developed and studied to reinforce the consistency of land parcel identification and measurement across the Union and in Candidate Countries.

## **2. RATIONALE**

### **2.1 The new role of JRC in respect to CAP**

As it was described above, the main goal of GeoCAP is to support DG Agriculture and the EU Member States in the technical aspects of the implementation of CAP. This is related, in particular, to the:

- development of different control methods;
- definition of the specifications and best practices for the collection and handling of the necessary geo-information;
- analysis of the impact on control methodology and estimation of the technical consequences from the introduction of the new policy tools, as Cross Compliance, FAS, Rural Development, etc.

In order to disseminate and communicate the results from the technical research, related to the above-mentioned topics and to provide the relevant regulatory and methodological support, GeoCAP team uses in general, the following means and tools:

1. Annual seminars, workshops and conferences
2. Bi-lateral technical meetings with EU Member States; teleconferences
3. Technical mission in the EU Member States
4. Internet

The provision of technical and reference information via the Web is considered to be the key tool for support, as it is permanently available and easy to access. Until last year, the provision of the relevant information was done primarily through the GeoCAP Web site and some specific online databases.

The last changes in CAP regulation (Reg. 972/2007 amending Reg. 796/2004) outlined better the role of JRC, giving to GeoCAP a clear mandate to define the applicable technical standards at Community level. This required some changes in the way of interaction between the different actors in the CAP process and a revision of the existing use case model of communication and support. Furthermore, the main tools for provision and dissemination of

information had to be evaluated and upgraded in order to enhance the efficiency to the level required by recently given mandate.

The figure below illustrates the new use case defined:

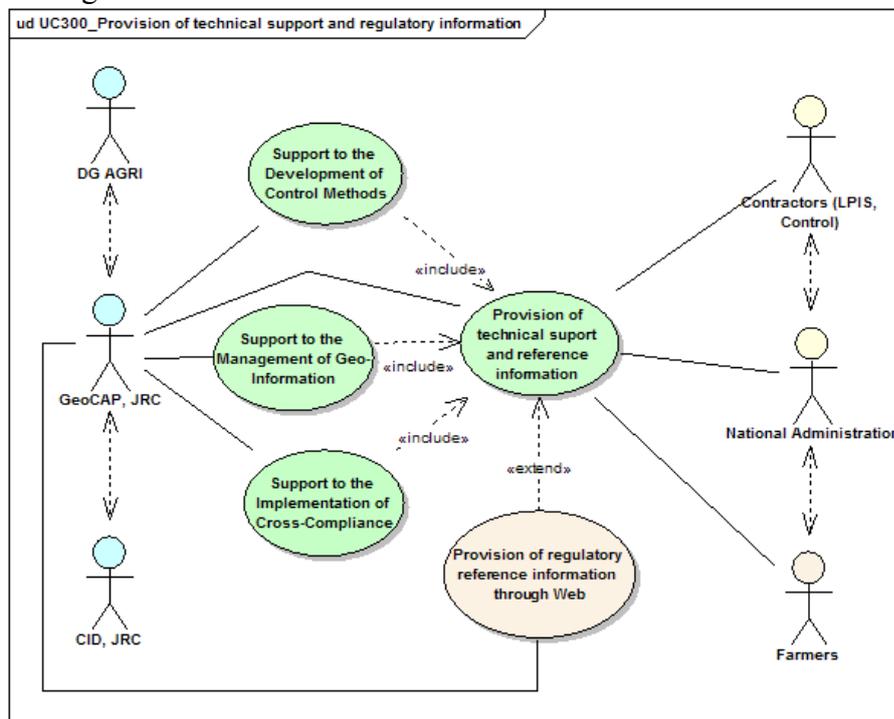


Fig. 1: The JRC Use Case: Provision of technical and regulatory support

Based on the new use case defined and taking into account the instruments used by GeoCAP for technical support to the parties involved (National Administrations, Contractors, Farmers, etc.), it was clear that the provision of regulatory reference information via Web is the key element, which needed revision and improvement.

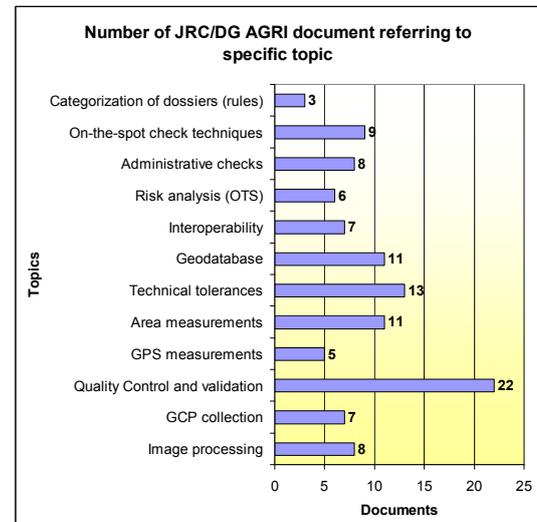
It should be noted, that the MS Administration and local partners were considered as actors, who could contribute more actively in the elaboration and clarification of the technical methods proposed, based on their extensive operational experience.

## 2.2 Problems encountered and objectives outlined

Until recently, the “remote” provision of regulatory and technical documentation was done through the GeoCAP website or by email, where the information was stored and separated in large number of specific documents, mainly in PDF format. Each change or update of the information, required the creation of a new version of the PDF file, where the recent updates were highlighted in different ways. Moreover, feedback received last year from users revealed the fact that most of the users could not get the information they need from the Web site easily. They reported that the information is scattered in different files; sometimes not consistent; with many overlaps and redundancies, and lack of traceability. Other comments highlighted that users were not consistently alerted to new versions of reports and guidelines.

The figure below shows a view of the GeoCAP original website listing documents concerning on the spot checks with remote sensing:

Part	Description	
1	<b>NEW</b> Draft guidance document on the selection of control zones and risk analysis - 2008 campaign	<a href="#">PDF</a>
-	Example of use of LPS data for zone selection (presentation from the Koh 2003 conference by Csaba Wirthardt)	<a href="#">PDF</a>
5	<b>NEW</b> Summary Statistics (Guidelines and Tables to be completed) - 2007 campaign	<a href="#">ZIP</a>
4	<b>NEW</b> Quality control - 2007 Campaign	<a href="#">PDF</a>
4a	<b>NEW</b> MS Access Databases for Quality Control - 2007 campaign	<a href="#">PDF</a>
3	<b>NEW</b> Technical tolerances and categorisation rules - 2007 Campaign	<a href="#">PDF</a>
2	<b>NEW</b> Pre-processing of data and CAPI - 2007 Campaign	<a href="#">PDF</a>
-	AGRI working document 60363/2005-REV1 - "Guidance for on-the-spot checks of area measurement"	<a href="#">PDF</a>
-	Working Document AGR 49533/2002 - On the Concept of obvious error according to Art 12 OF COMMISSION REGULATION (EC) NO 2419/2001	<a href="#">PDF</a>
-	<b>NEW</b> Technical Tolerance for On the Spot Checks (ref JRC IPSC/G03/P/SKA/ska D(2006)[5834]) - revised July 6, 2007	<a href="#">PDF</a>
-	<b>NEW</b> Guidelines for Best Practice and Quality Checking of Ortho Imagery (ref JRC IPSC/G03/P/SKA/ska D(2003)[2402]) - revised May 11, 2007	<a href="#">PDF</a>
VHR	<b>NEW</b> VHR Imagery Specifications for the CwRS Programme	<a href="#">PDF</a>
LID DOTNET and VHR Browser	LID DOTNET server and VHR Browser - Users' Guide (JRC IPSC/G03/P/PAR/par (3908))	<a href="#">PDF</a>



(a) (b)  
 Fig. 2: Current GeoCAP website (a) and statistics showing the level of redundancy of the information (b), made via an analysis of which documents covered generic subjects.

The following main problems related to the use of the existing reference information via Web, have been outlined:

- Unclear structure of documentation
- Same topics covered in different documents
- Redundancy and overlapping of information
- Lack of traceability and document history
- Interaction is not user friendly

In addition, it was discovered, that keeping the information in such static and closed mode, is not convenient also for the members of the GeoCAP team for their daily technical work.

It was therefore decided that strong revision of the documentation structure and new approach for dissemination of information was necessary. This approach should be based on the concept of Knowledge Management ('KM') (Bellenger, G., 2002, Wilson 2002), as it would imply the introduction of a range of practices to identify, create, represent, and distribute knowledge for reuse, awareness and learning.

The approach (conceptual and technological) should result in a Knowledge Management system, which:

- Provides transparent and easy-to-use collaboration platform for information exchange, update and dissemination;
- Enables fast access to reference technical regulatory information
- Ensure the traceability of the reference information, as well as an easy access to data history (with the relevant metadata)
- Is simple to manage and maintain, as well as cost-efficient

### **3. METHODOLOGY**

#### **3.1 Description of the Means and Tools**

The elaboration of such Knowledge Management system comprises two important steps: design of the new documentation structure and development of system for information dissemination. This was done using two innovative instruments – UML and Wiki.

##### **3.1.1 UML**

Unified Modeling Language (UML) is a standardized specification language for object modeling (ISO/IEC 19501, 2005). It is broadly used for business process modeling, systems engineering modeling and representing organizational structures. The Unified modeling language was found very useful in order to help the organization and visualization of the documentation structure by specifying and constructing the workflow and relationships between processes, related to CAP control.

##### **3.1.2 Wiki technology**

Wiki software is a tool that allows users to easily create, edit and link web pages and thus elaborate collaborative and powerful community websites (Ebersbach, A., 2006). Wikis are increasingly being installed by businesses to provide affordable and effective Intranets for use in Knowledge Management (Tapscott and Williams, 2006).

An evaluation of Wiki software was made to review which tools would be appropriate for use in the context of GeoCAP. The open-source software MediaWiki (<http://www.mediawiki.org/wiki/MediaWiki>), originally written for Wikipedia, was chosen as the backbone of the KM system. Recently MediaWiki has become quite widely adopted by a range of web sites, and is used by many other online knowledge management projects.

#### **3.2 Approach and Design of the Document Structure**

##### **3.2.1 Data Review and Collection**

The first step was to review all the available documentation at GeoCAP. This covered not only the documentation published on the main GeoCAP web site, but also included other reference information available in the internal database. The information was categorized, according to the different topics covered.

##### **3.2.2 Reference (Correlation) Matrix**

In order to better analyze the content of the documentation, a specific reference matrix (table) was created. All technical topics, related to CAP, were listed in the columns of the table, while the reference documents from MARS website and internal database were listed in the

rows. If the content of a document refers to certain topics, the relevant cells in the table are marked. This gave a good overview of the correlation between the content in the different reference documents and provided estimation of the level of the redundancy of information. Using such table, it was possible to prepare the initial structure of the future Knowledge Management system.

Document					
	Image processing	GCP collection	Quality Control and validation	GPS measurements	Area measurements
Common Technical Specifications 2007 Campaign Summary Statistics (Guidelines and Tables to be completed) - 2007 campaign	X	X	X		X
Quality control - 2007 Campaign			X		
MS Access Databases for Quality Control - 2007 campaign			X		
Technical tolerances and categorisation rules - 2007 Campaign					
Pre-processing of data and CAPI - 2007 Campaign	X				X
AGRI working document 60363/2005-REV1 - "Guidance for on-the-spot checks of area measurement"					X
Working Document AGR 49533/2002 - On the Concept of obvious error according to Art 12 OF COMMISSION REGULATION (EC) NO 2419/2001					
IPSC/G03/P/SKA/ska D(2006)(5834)) - revised July 6, 2007			X	X	X

Fig. 3: Extract from the reference matrix; crosses indicate the topics covered by certain reference document.

### 3.2.3 Description of the workflow (Use Cases)

Another important step was to organize the documentation in a way to naturally follow the defined workflow, related to a specific part (use case) of the CAP implementation - control method, data collection, quality control procedure, etc. To achieve that target, UML-based activity diagrams have been created for each use case. This gave the possibility to analyze better the relationship and connection between the different technical topics and elements, relevant to a specific use case.

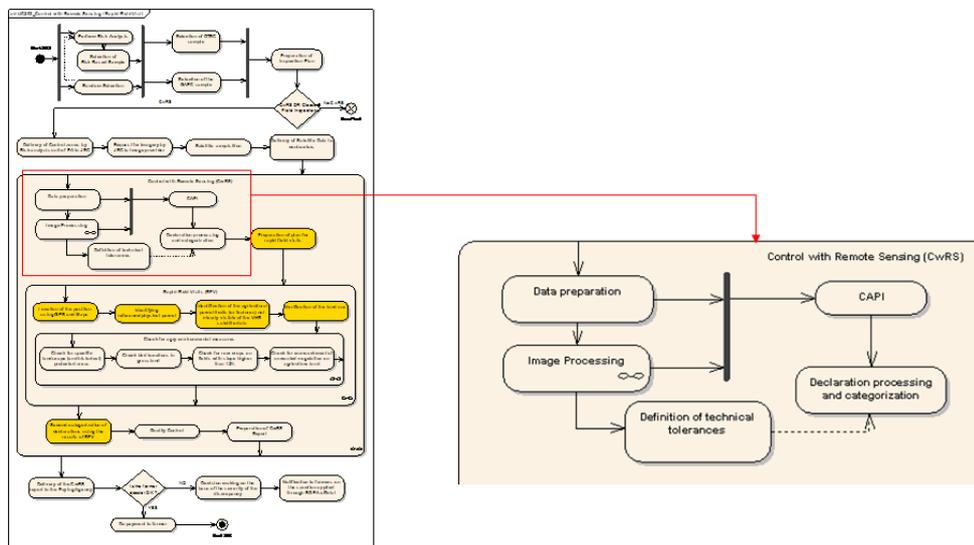


Fig 4. Example of UML-based Activity Diagram for the workflow related to the Control with Remote Sensing

### 3.2.4 New Structure of the documentation and Data Import

Based on the reference table and the UML diagrams, the initial structure of the web pages (called Articles) was created in MediaWiki. The open source PostgreSQL was used as database for the Wiki platform.

First, the articles of the main thematic domains of CAP were created – On-the-Spot Control, LPIS, Cross-Compliance, etc. Then, a stratified approach was used to develop the tree-based hierarchical structure of the sub-articles for each main theme. The principle of *polychotomy* was applied wherever possible, in order to reduce the redundancy of the information. This means that the documents were split and classified into non-overlapping parts, according to the thematic information they contain.

For the actual data import into the initially blank article, the following rules have been used:

- Text was imported as it was in the original document, without any modifications or formatting
- A description was given in the metadata, about the source of the text – name/number of document, chapter, section, paragraph, etc.
- The follow-up formatting was according to a pre-defined template.
- All formatting and editing of typing mistakes was flagged as minor change in the content
- All major changes and editing later on were justified in the history metadata.

## 3.3 Implementation

### 3.3.1 Implementation phase

The work started in October 2007. The preparation phase (Data review and UML workflows) took about two months. The major data import was done from December 2007 until the beginning of January 2008. The draft version of the Knowledgebase Management System, named WikiCAP, was made available to the user community in mid-January 2008. It should be noted that the main changes and modification in WikiCAP during this implementation period were related mainly to the presentation of the information and not to the actual content.

### 3.3.2 Validation phase

During the Validation phase, called also “Consultation period” (January – March 2008), the new users (National Administrations, Commission Directorates, other GeoCAP team members) were requested to review the Web-based system and provide their notes and suggestions on the format and content of the information available. An important point was the fact, that the users had the direct possibility to edit the content and contribute to WikiCAP on-line and in real-time.

The overall feedback from the user community was very positive. Most of the users, found the reference documentation, presented in better way, more visible and traceable. However, few of them used their right to edit or comment the content online.

The 2008 validation phase was closed on April 9<sup>th</sup> 2008; however, the Wiki remains open for comment and updating by all users.

## 4. WikiCAP – FINAL RESULTS

### 4.1 Overview

WikiCAP has been developed (Woods and Thoeny, 2007) on the base of the Wiki engine MediaWiki, which was installed in the following environment:

- WWW server: Apache release 10333100;
- Database: PostgreSQL 8.1.3;
- PHP 5.2.0.
- MediaWiki v. 1.10.2, with the following extensions:
  - Password Reset (version 1.6): Resets Wiki user's passwords
  - Renameuser: Rename a user
  - WikiArticleFeeds (version 0.6.3): Produces feeds generated from MediaWiki articles.
  - Cite: Adds tags, for citations
  - DynamicPageList2 (version 1.6.8): based on DynamicPageList, featuring many improvements
  - Wiki Category Tag Cloud: A Category Tag Cloud derived, improved, and fixed from the YetAnotherTagCloud Extension
  - Lockdown: per-namespace group permissions
  - NamespacePermissions (version ): flexible access management for custom namespaces

Although WikiCAP has been designed as Internet-based application, the access is restricted to authorized users. Once the user logs to the system (with username and password), the title page of WikiCAP is loaded (Fig. 5). The main components of that page are as follows:

- List of the links to the main thematic articles – On the spot checks; LPIS; Cross compliance
- Set of Tags (called “Tag Cloud”), which provides an easy way to locate and navigate to the topics of interest
- Help and support section
- Navigation, Search and toolbox menus
- Page related menu: edit, discussion, history, watch, etc.

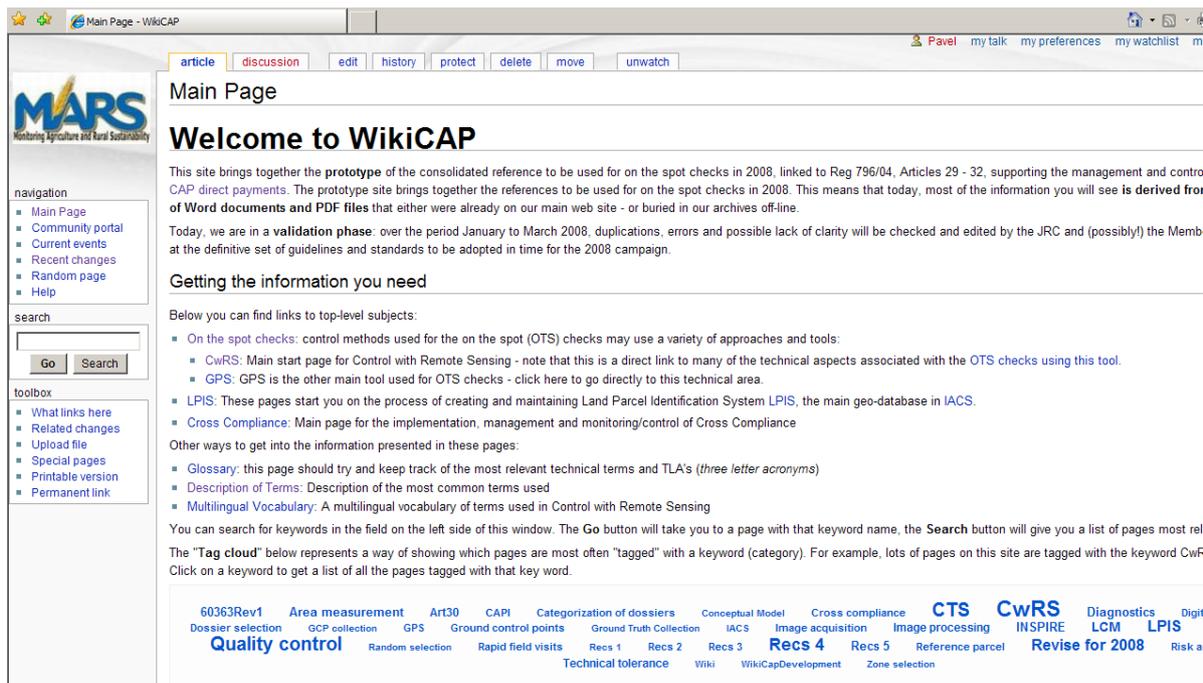


Fig 5. The WikiCAP main page

The relationship between different pages is based on selected and highlighted keywords, which provide links from the one page to another (a sub-page or page from another thematic topic).

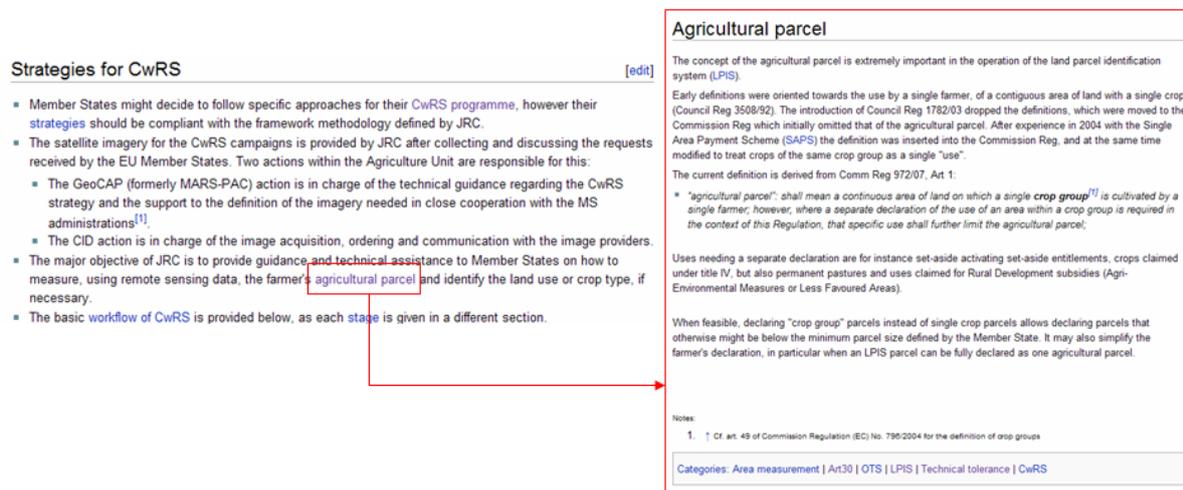


Fig 6. Example of the hierarchical structure of the information

## 4.2 Data Structure and Traceability

### 4.2.1 Namespaces

WikiCAP also implements a native mechanism for granting privileges to user groups and for restricting access, using the co-called “namespaces”. Different access right could be set for each namespace. For example, all the documentation related to the practical implementation of CAP belongs to the namespace “Main”, while information related to INSPIRE is assigned to namespace “SDIC”, as this data is available only to users belonging to the “SDIC” community. This permits fine-grain management of access rights inside the same Wiki.

### 4.2.2 Categories and Tag Cloud

Each technical topic, related to CAP or any important legal or document references, could define a certain category. All articles in WikiCAP have one or more categories assigned. This is used as “index”, in order to locate a certain page or topic more easily, as well as to navigate from one page to another, based on their thematic or reference relation.

In addition, a special tool, called “Tag Cloud” is implemented on the main (title) page. It shows all categories, displaying them in different sizes, according to the number of the pages associated with. Clicking on certain category from the tag cloud provides the user with the list of pages associated and a hyperlink to them (Fig. 7).

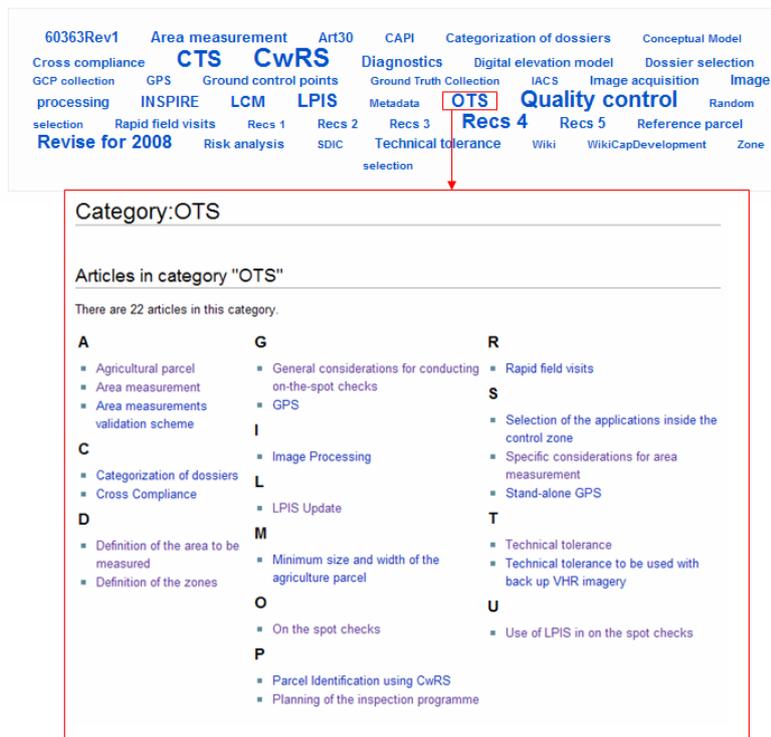


Fig 7. The Tag Cloud and the Categories

## 4.2.3 History and Version Compare

One the main reasons to choose MediaWiki from other available Wiki engines, was the richer handling of page history. A user is able to track the changes in the document using the metadata available – date of the change, person who did the change, type of change, additional notes, etc. Through the history list, the user can compare any version of the document or article, having the changes highlighted and displayed by line and paragraph.

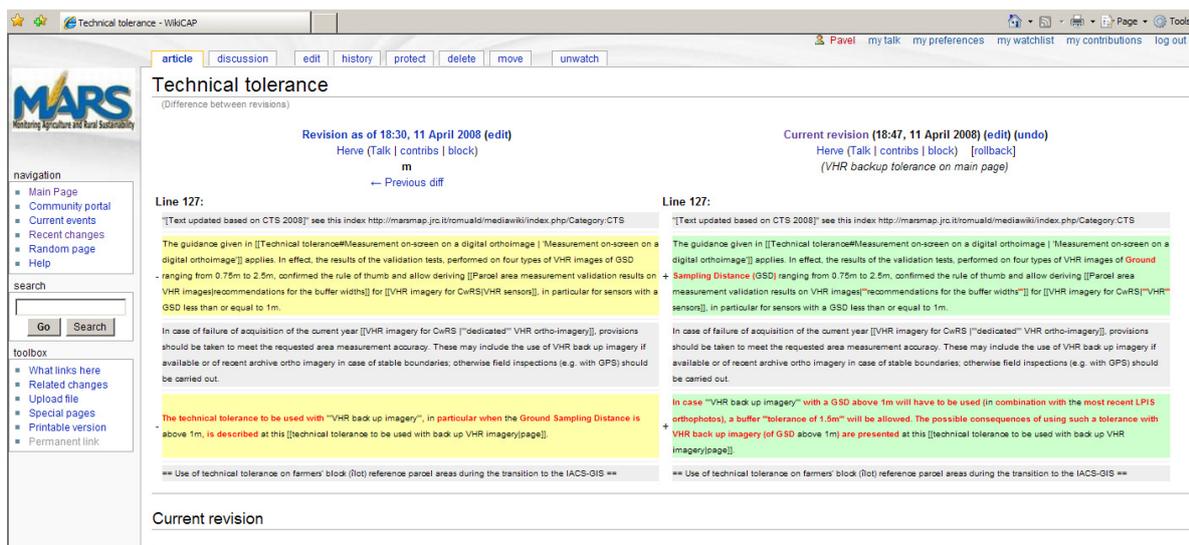


Fig 8. History and version compare

## 4.2.4 Free text and article search

Specific topics and articles could be easily located using a simple search tool, available on the main page. It is sufficient to type a specific keyword in the search field, as the system provide a list of all articles where the keyword is presented (listing also the lines in the page, where this keyword appears).

## 4.3 Information Update

### 4.3.1 Discussion (Talk) Pages

Users with edit permissions could modify directly the content of the articles; however they might decide to propose first a draft version of the modification. This could be done through the Discussion Page, available for each article. During the consolidation period, the user community preferred to use this mean to propose any changes in the actual text, presented in the articles.

### 4.3.2 Watch lists

A great advantage for WikiCAP was the availability of the monitoring service, called “Watch list”. Each user could select and enable the watching possibility for the articles of his interest. In this case, the user is notified for each change in the content of the pages selected (valid also for the Talk pages), either via his watch list or even by an e-mail sent to his e-mail address. The watch list is effectively used by GeoCAP to monitor the WikiCAP content and to track any change proposed.

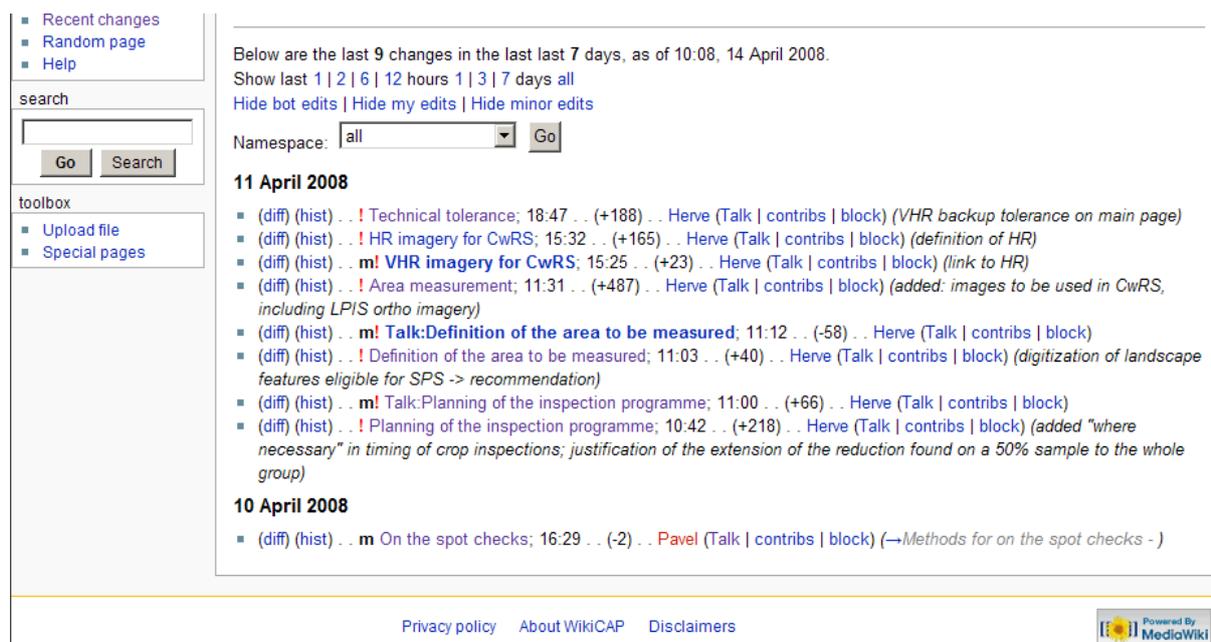


Fig 9. User-defined watch list

### 4.4 Specific considerations

Although, the new Wiki-base Knowledge Management platform has been found very efficient, flexible and easy to handle in respect with the documentation management, the solution has some properties that could be considered initially as drawbacks. The major difference with the previous way of presenting of the reference documentation is the fact that in WikiCAP the document structure is transferred to HTML-like format. As such, all sections and paragraphs from the original document are dissolved into a more amorphous structure with articles and sub-articles, organized in a completely different way. Thus, the merging of the thematic content into a document-like format suitable for printing could be a challenging task. Recently a first solution was tested with the introduction of a special extension, called DPL (DynamicPageList), allowing the merging of selected articles into a single printable document.

## 5. CONCLUSIONS

The major advantage of the migration of the existing GeoCAP reference documentation into WikiCAP, is the fact that a pattern relation amidst the data and information is created and visualized, which generates the potential to represent knowledge (Bellenger, G., 2002). Through this knowledge, one is able to realize and understand the processes and their implications. The proper interpretation of the regulatory reference information, related to CAP among the user community is essential to the successful implementation of the Community Policy, and thus the knowledge management is a crucial phase in ensuring effective implementation.

Moreover, the open platform of WikiCAP, helps the Administrations of the Member States to strengthen their cooperation not only with the European Commission, but also among themselves. Through WikiCAP, EU MS have the possibility to contribute their vision on all technical and operational aspects related to the CAP, which enhance their integration and cohesion in the frame of the EU.

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## BIOGRAPHICAL NOTES

**Pavel Milenov** was born in 1971 in Sofia, Bulgaria. He has MSc in Civil Engineering at the University of Architecture, Building and Geodesy, Sofia.

He has more than 10 years experience in GIS and Remote Sensing. He participated in various national and international projects for land cover/land use mapping, image processing, land management and urban planning, infrastructure monitoring and agriculture development using RS. He worked as FAO TCCT consultant from 2002 till 2004. Currently, Pavel Milenov is working as Seconded National Expert, working in the GeoCAP team of the Agriculture Unit, at JRC. His main tasks are related to the development of new methods using remote sensing for control of area-based subsidies in the frame of the Common Agriculture Policy. Another field of his work is linked with the development of specifications for the aerial and satellite imagery used in the Control with Remote Sensing Program.

**Simon Kay** was born in 1963, in Accra (Ghana). He has a MSc degree in Remote Sensing and PhD in Geography awarded by the University of London.

Before joining the European Commission, he gained a broad range of work experience for international agencies and companies, relating to the application of Remote Sensing, GIS and database management in agricultural and environmental domains. His background includes supervision of projects in the whole of the European Union, as well as international consultancy in Oman, Spain, Cape Verde, India and Mozambique. He started in 1995 in the Space Applications Institute of JRC - EC, as scientific/technical officer. Currently, he is Action Leader of GeoCAP, Institute for Protection and Security of the Citizen, Agriculture Unit, overseeing an 18=person team responsible for the development and technical monitoring of Common Agricultural Policy (CAP) management and control systems.

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