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New Version of the AGRIS Web Portal – Overcoming the Digital Divide by Providing Rural Areas with Relevant Information

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Abstract

The present paper brings the outcomes of the second stage of a complex AGRIS web portal upgrade (technological, functional, content and design upgrade) called Agris 5.0. The Agris 5.0 version is recently being tested and will be launched in January 2012 on http://www.agris.cz. Agris 5.0 is built and runs on Microsoft technologies (MS Windows Server 2008, MS IIS 7 web server, MS SQL Server 2008 Enterprise Edition, SP2) using the Model-View-Controller (MVC) SW architectural pattern version 3, .NET framework 4, programming language C#, Razor template system, XML and XHTML 1.1 markup languages, CSS 2.1 styles and JavaScript encoding with the jQuery framework. From the user point of view, the Agris portal usability and availability meeting international standards were the utmost priority of the present upgrade.

Key words

Agris, portal, MVC, digital divide, agrarian sector, rural areas, information resource.

Anotace

Příspěvek představuje výsledek řešení druhé etapy komplexní inovace agrárního WWW portálu AGRIS (technologická, funkční, obsahová, designová), která je označena jako verze Agris 5.0. Tato verze aktuálně prochází testováním a od ledna 2012 bude veřejnosti dostupná na adrese http://www.agris.cz. Portál Agris 5.0 je postaven a provozován na technologiích Microsoft (MS Windows Server 2008, webový server MS IIS 7, databáze MS SQL Server 2008 Enterprise Edition, SP2), dále využívá SW architekturu Model-View-Controller (MVC) verze 3, programového prostředí .NET Framework verze 4, programovací jazyk C# a šablonovací systém Razor, značkovací jazyky XML a XHTML verze 1.1, styly CSS 2.1, skriptovací jazyk JavaScript s frameworkem jQuery. Z uživatelského hlediska bylo při tvorbě dbáno na použitelnost a přístupnost podle nadnárodních standardů.

Klíčová slova

Agris, portál, MVC, digitální propast, agrární sektor, venkov, informační zdroj.

Introduction

The digital divide generally refers to inequalities between groups of people in terms of their access to information and communication technologies (ICT). While some groups have at least a very limited access to the ICT, the others completely lack the Internet connectivity. This is where we speak about the so-called digital exclusion that can have a multitude of social, economic or demographic explanations. It can affect different social groups such as e.g. the unemployed, indigent, less educated, unskilled, disabled or elderly people.

The geographical factor (location) brings along significant disparities not only between and among the groups of states and individual states but as well between and among urban, suburban and rural areas. It is just the location factor that can be considered the most relevant. The other factors might intensify the divide even further i.e. for example that the default situation of disabled persons in rural areas can be worse in comparison with those in urban areas.

As far as the technology is concerned, the digital exclusion, in other words the unavailability of modern ICT, stands for the availability and quality

of broadband Internet connection. In any case, the connectivity and its availability influence the supply, structure, quality and availability of information and the respective services of information society. Apart from the connectivity as such, providing quality information is a key factor of overcoming the digital divide, especially in rural areas.

While talking about information resources for the agrarian sector and rural areas, i.e. about overcoming the digital divide, the AGRIS portal (www.agris.cz) holds the leading position in the long-term. The AGRIS portal was established in 1999 as the very first portal solution - not only in the agrarian sector. It was only after the Agris portal launch when other departmental information resources, including the Ministry of Agriculture websites and other commercial portal solutions, were born.

Aims and methodology

The solution strives to enhance the information security in the regions by innovating a successful, long-run verified and positively perceived departmental information resource – the AGRIS.cz portal. As a result, the portal is sure to help overcoming the digital divide, serving as a unique source of information for the agrarian and food-processing sector, country areas and regional development.

Based on the analyses carried out, a need for a complex upgrade (technological, functional, content) of the agrarian portal AGRIS has arisen. The upgrade was aimed at complying with current user requirements (both professional and general public) and at the same time with the latest cutting edge technologies.

Nowadays, a wide range of end-devices is used. The data are no longer displayed only by means of PCs or portable computers with an Internet browser but more and more by means of various mobile devices, including smartphones, tablets, netbooks, single-purpose devices, screen readers for disabled users or full text search engines. Moreover, we can observe a tremendous development in the field of software tools designed in order to create, process and present the content.

The new AGRIS portal solution has to reflect the above-mentioned changes (even in spite of implied conservativeness of both the existing and potential users). Furthermore, it needs to reflect varied quality, relevance and structure of the existing and new information resources at the same time. In other words, it has to provide users with authenticated data and information at the shortest possible time and in the quality and format required.

The methodology primarily lies in analyzing the original (current) agrarian portal implementation at all levels, i.e. technological, content and structural analysis together with the user behaviour analysis. Subsequently, an optimal structure of the individual portal components is to be designed, meeting user requirements, habits and behaviour. At the same time, the new structure has to comply with other requirements, especially the technological ones. The latter means assessing current SW platforms and solutions while aiming at an optimal platform to be employed as the new modern solution. Moreover, implementing analytical tools is conditional for a sophisticated monitoring and output of user behaviour. Last but not least, the new version has to be tested on the development platform before it can finally be launched into full operation.

A substantial and integral solution stage consists of maintaining the existing content i.e. an archive of information resources (almost 100,000 entries). Transforming the existing content/archive in the new portal version is quite complicated and challenging.

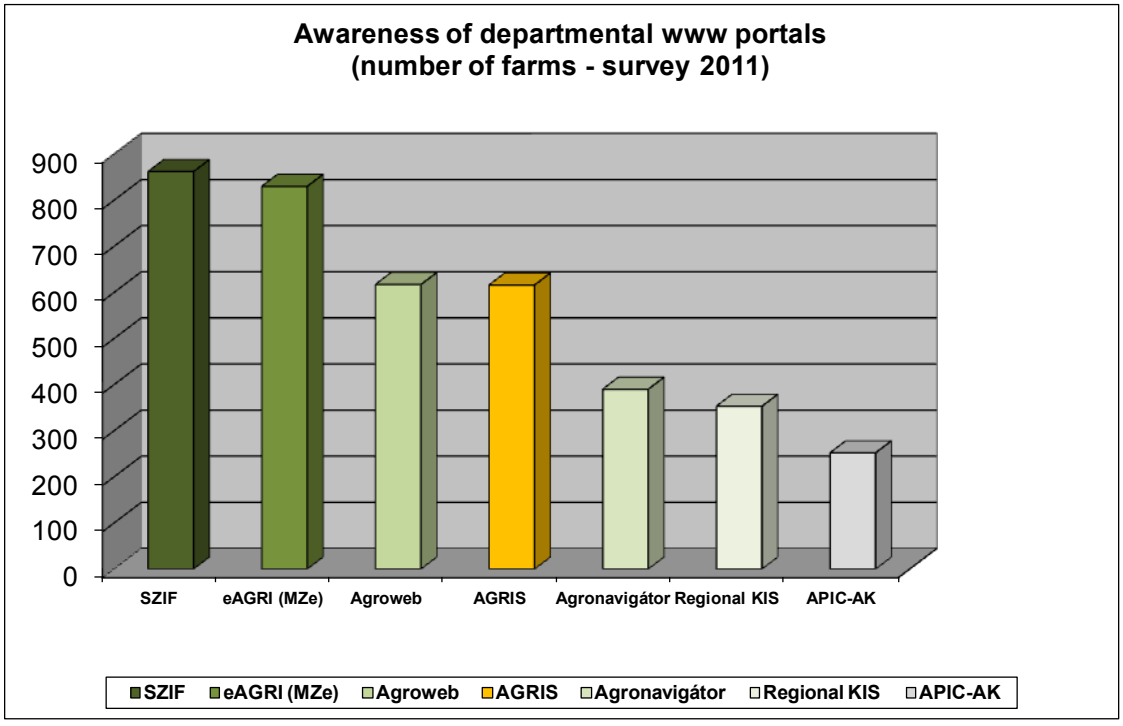
Initial state

The agrarian AGRIS portal has been created and developed by the Czech University of Life Sciences in Prague (in cooperation with the Ministry of Agriculture of the Czech Republic). It constitutes a unique on-line Internet information resource for the agrarian sector (agriculture, food industry, forestry, water management) and rural areas. The target audiences are primarily those employed in and by the agrarian sector (agricultural enterprises, farms, manufacturers, processors, traders, suppliers), state administration, local authorities, students but as well the general public that might be concerned with the respective issues (food consumers, rural areas inhabitants etc.). The agrarian web portal AGRIS provides access to relevant existing information resources, generates its own pieces of information and publishes information from the subjects that do not have their own quality Internet presentation, i.e. those that do not have e.g. enough target users, suitable technologies etc. Recently, the AGRIS database integrates almost 100,000 articles and displays tens of thousands entries concerning price reports and links. The AGRIS portal has been providing its services since 1999. In 2000 it was even awarded a prestigious Zlatý klas (Golden Spike) award at the international agricultural exhibition and fair Země Živitelka (Bread Basket)

in České Budějovice. The portal has always sought to employ innovative approaches, pioneer new cutting edge technologies, attract agrarian sector users while representing a reliable and trustworthy source of departmental information. Further information on the overall concept, solution and development of the AGRIS portal can be found e.g. in J. Vaněk, 2001 or J. Jarolímek, 2003.

In the long-term, the AGRIS portal position can be illustrated by the results of complex surveys concerned with ICT development in the Czech agricultural enterprises. The latter surveys are regularly carried out by the Department of Information Technologies FEM CULS in cooperation with the Information and Consulting Centre FEM CULS. The latest data available come from mid-2011. According to the above surveys, the AGRIS portal is positively perceived by agriculture professionals as a significant departmental information resource. Leaving apart the obviously winning portals of the state departmental institutions (State Agricultural Intervention Fund and eAgri – Ministry of Agriculture of the Czech Republic), the AGRIS portal is an important competitor of the professional commercial Agroweb system and is well ahead of all the other systems, such as the Agronavigator (Institute of Agricultural Economics and Information – ÚZEI in Czech) and portals of the Agrarian Chamber of the Czech Republic (see Fig. 1).

The technological and functional upgrade is prerequisite for maintaining high qualitative and functional standards of the portal. The upgrade was realized in line with the most modern technologies, latest information resources development, current trends and requirements of the portal users. In 2010, the first stage of the new system development was achieved – Agris 4.0. This stage was mostly concerned with complex analyses and basic technological and functional innovation. However, the existing portal functionalities and design were maintained under this stage. The fourth version of the portal - Agris 4.0 - is now fully implemented and field-tested. Recently, the second follow-up stage representing a brand new complex solution, inclusive of new functionalities and design, has been prepared. The new AGRIS portal version (AGRIS 5.0) is now being tested and will be implemented into full operation in January 2012. The fore-mentioned innovations have been realized primarily within the framework of the FEM Research Program, second stage of the University Internal Grant Agency grant, first stage of the Internal Grant Agency grant and other related projects.



Note: SZIF = State Agricultural Intervention Fund
MZe = Ministry of Agriculture of the Czech Republic
Agronavigator = portal of the Institute of Agricultural Economics and Information
Regional KIS, APIC AK = portals of the Agrarian Chamber of the Czech Republic

Figure 1: Awareness of departmental web portals – survey 2011 (DIT FEM CULS)

The current AGRIS 4.0 portal version succeeded in resolving the technical and technological upgrade in 2010 when the PHP4 (PHP, 1997 – 2011) on MS Windows Server 2003 R2 and IIS 6.0 web server was replaced by the .NET Framework on MS Windows Server 2008 and IIS 7.0 web server. In order to implement the upgrade from version 3.0 to version 4.0, the following criteria have been suggested (based on the previous analysis):

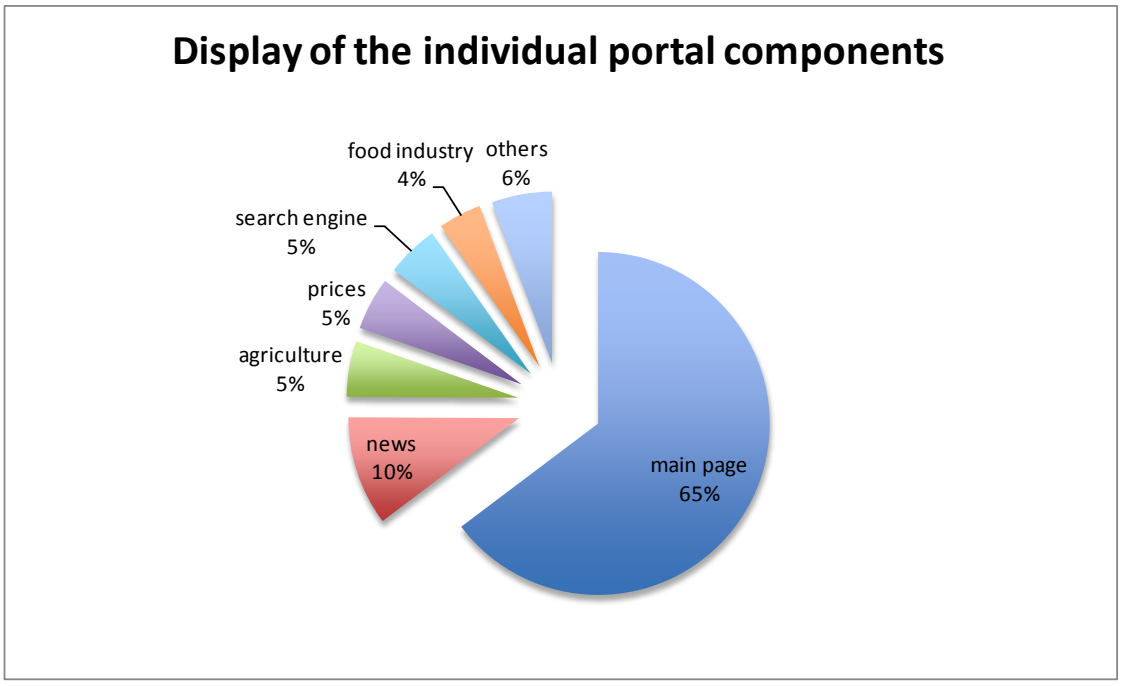
- retaining the Microsoft platform: implementation of up-to-date SW versions - IIS 7 web server and MS SQL database server (E. Whalen, 2005);
- maintaining current system functionality, independent of design;
- enhancing the overall throughput, stability and availability;
- dividing data, application and presentation layers of the system
- enhancing data throughput of the applications by innovating the relational data model;
- extending the service range provided (RSS, web services etc.).

As the number of database entries has been growing in the course of last years, significant delays have been occurring in the response of several data selection and projection procedures, especially in the news listings on the main page, news listings in the individual sections and listings of the most read/opened content. These failures were caused by the procedure construction as such, the SQL construction and partially as well by the relations database model.

Most of the AGRIS content is saved in XML files. However, the content is not saved in the Unicode standard and does not contain any metadata. As a result, exporting the content to other platforms and systems is hard, which is the main drawback of the current portal version.

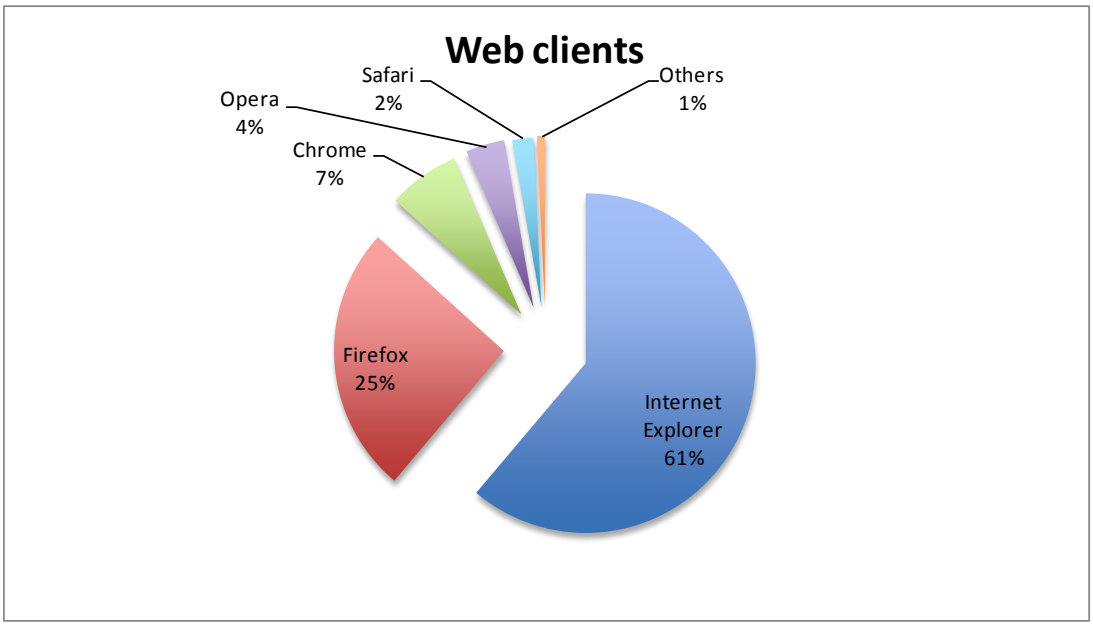
The AGRIS web portal provides complex agrarian news coverage divided into 12 sections and tens of subsections. The user behaviour analysis showed that a vast majority of users opens main page daily to access an overview of the latest news. However, users' interest in reading the thematic sections is quite marginal. While searching for a concrete piece of news or topic, the users definitely prefer an integrated fulltext search engine or the news filter. Therefore, it clearly stems from the analysis that a detailed classification into individual thematic sections is no longer needed.

Furthermore, the user behaviour analysis showed that some services provided by the AGRIS portal are hardly ever used or sometimes not even used at all. This is mostly due to a complicated navigation to the service in question or due to its „invisibility“ in the portal structure. In line with the latest web application development trends, the portal services or content should be available using as few operations as possible while hypertext links need to be apparent, clearly visible and easily available.



Source: Own research and monitoring.

Figure 2: Agris web portal – display of the individual portal components (October 2011).



Source: Own research and monitoring.

Figure 3: Agris web portal – Web Clients (October 2011).

According to the client monitoring, more than 60% of the Agris portal users use MS Internet Explorer while 25% employ Mozilla Firefox and some 7% Google Chrome. Other users tend to employ minority browsers e.g. Opera, Safari etc. The number of mobile accesses ranges from tens to hundreds per month. However, we estimate that the share of mobile accesses will be growing and thus a modern portal should be fully available and usable, including all its services and functionalities, on mobile devices too.

Four main factors affect a modern, user-centered web portal:

- Content
- User-friendliness
- Performance
- Brand power

It also stems from the analyses that the content and brand power constitute the main strengths of the AGRIS portal. The portal provides high quality information and data concerning the agrarian sector, food industry and rural areas development. The data and information quantity is remarkable too. The AGRIS brand has been used since 1999. Since then, during more than ten years of its existence, the portal has reached one of the leading positions among specialized web portals and is backed by a wide range of users.

Among portal weaknesses, we have to mention its usability and performance. These two factors are recently the main drawbacks of the portal, affecting significantly its use. The whole portal needs to be simplified and its performance requires substantial strengthening. The above situation is outlined in Fig. 4.

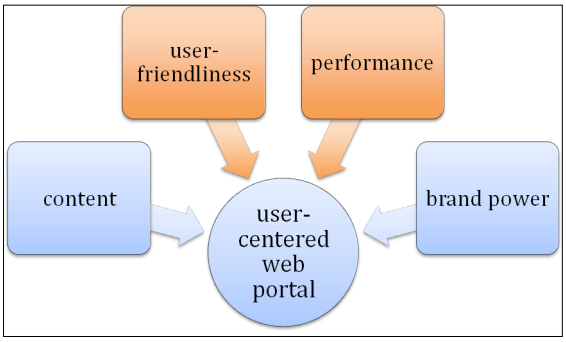


Figure 4: Factors affecting a user-centered web portal.

Results and discussion

The whole AGRIS portal underwent a complex technological upgrade in 2010 while in 2011 the main focus has been on improving the usability and performance. To optimize the platform and at the same time maximize the portal performance, the following technologies and components are used:

- Operation system: MS Windows Server 2008 retained
- Web server: MS IIS 7 retained
- Software framework: .NET Framework version 3.5 replaced by version 4, MVC version 2

upgraded to version 3; C# programming language and Razor template system retained

- Database: MS SQL Server 2008 Enterprise Edition, SP2
- Markup languages: XML retained and XHTML version 1.1 adopted
- Style: CSS 2.1
- Scripting language: JavaScript with jQuery framework

Apart from replacing the PHP by the ASP.NET, implementing the MVC (model –view - controller) software architecture constitutes the most significant change. The MVC software architecture separates the data model of the application, the user interface and the control application logic. These three components are thus quite independent and autonomous; in other words, modifying one component does not affect at all or just minimally the others. The MVC is understood as an aggregate pattern or SW architectural pattern rather than a simple architectural pattern. It is then an architectural foundation (R. F. Grove, 2011). Creating applications within the present structure or its layers is becoming more and more popular and when it comes to extending or maintaining applications, it minimizes possible negative impacts (H. Hanyan, 2011). There exist many frameworks that enable facilitating and speeding up the application development by simplifying repeated and time-consuming actions. Most of them belong to MVC patterns (S. Ahrndt, 2011).

The Model component is a domain-tight specific information representation with which the application of the web portal works. The View component obtains data from the Model and transforms them into suitable interactive data display and presentation to the user. The Controller component reacts on user actions and ensures changes in the Model and the View. The Controller and View components represent a presentation layer in the standard layers division (presentation, domain and data).

The MVC 3 principle application consists basically of the following steps:

1. The user delivers an action in the user interface, e.g. he/she clicks on a link or a button on the AGRIS portal.
2. The Controller receives the respective action information from the user interface object.
3. The Controller accesses the Model and, in case of need, brings it up-to-date according to the user action, i.e. shortlists the articles in the section
4. The domain logic processes the data changed.
5. The View uses the updated Model in order to display the updated data (content) to the user. The View component gathers data straight away from the Model.
6. The user interface waits for another user action that starts the whole cycle over

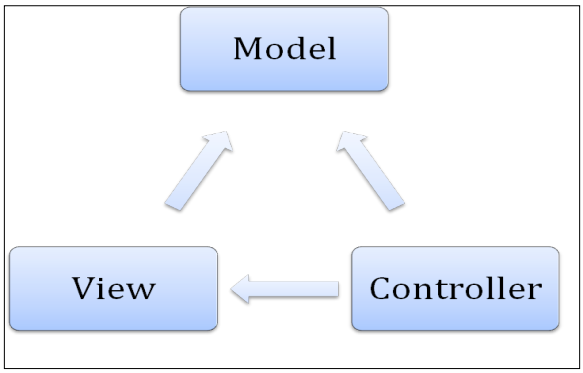


Figure 5: The principle of the MVC architecture (Microsoft, 2009).

Implementing the ASP.NET MVC Framework therefore means that the Model represents the business logic of the whole application while the View provides the application‘s user interface.

All data in the new agrarian portal version have been transformed in the Unicode UTF-8 character set (both in the XML and the database) and the database has been optimized from both the relations and procedures point of view. Unicode is a standard that enables consistent encoding, representation and handling of text in different national alphabets/ writing systems (C. J. Lu, 2008). The exposed data in the charts are indexed every 24 hours which significantly speeded their selection up. A vast majority of the procedures has been totally redone and simplified. As a result, the response on the database has been lowered and so did the database server workload (E. Whalen, 2008).

Almost all content is saved in the XML data format. XML is a markup language used for the representation of arbitrary data structures. An optimal SW structure for an effective XML files processing has been designed, having minimum HW requirements (S. Wang, 2010).

The output sent to client browsers is marked by the XHTML 1.1 markup language and is fully valid according to the W3C specifications. As a result, the Agris portal availability on a vast majority of end-use devices – not only the web browsers on the PC platform (W3C, XHTMLTM 1.1 – Module-based XHTML) - is granted. The graphic design is formatted using CSS cascading style sheets 2.1 and

3.0, fully adjusted to web browsers. It means that in case of CSS 3.0 unavailability, the 2.1 version is used to display the whole portal. Moreover, the information part and the graphic part are completely separate resulting in portal availability for clients without the CSS, such as e.g. single-purpose devices, screen readers of visually impaired users or fulltext search engine robots.

The whole portal has been made available also for the visually-impaired Internet users in accordance with the WCAG – Web Content Accessibility Guidelines 2.0 (W3C, Web Content Accessibility Guidelines 2.0). The content and widgets are presented so that they can be perceived, understood and controlled by people with disabilities. The content itself is robust enough to be accessible by means of a wide range of assisting technologies (screen-readers, Braille displays etc.).

Basic navigational tools of the portal have been highlighted and simplified in a substantial way. The content is now classified in 6 sections only and the services that provide high added value (e.g. content-based search, price reporting and development, opportunity to edit the portal content etc.) have been highlighted. The portal users can classify and sort the content by means of very simple filters or chronologically just by clicking on the date in the calendar.

Conclusion

Based on the upgrade and innovations realized, the AGRIS portal will go on serving as a unique on-line information resource for the agrarian sector, countryside development and leisure. The portal information will be available anytime, on almost any end-use device, and even minimum connectivity and response time. As a result, the portal will hold its leading position among quality information resources in the agrarian sector and rural areas.

The Agris portal content has been partially integrated in the international VOA3R project (Virtual Open Access Agriculture and Aquaculture Repository: Sharing Scientific and Scholarly Research related to Agriculture, Food and Environment). The new content is inclusive of metadata description and the metadata have been created and added to the content saved in the English language. The AGROVOC key words system, a multilingual thesaurus developed and maintained by the Food and Agriculture Organization of the United Nations (C. Caracciolo, 2011), has been used for specialist article description.

Figure 6: New graphic design of the Agris web portal.

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