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## WEB-BASED BUSINESS APPLICATIONS AS THE SUPPORT FOR INCREASED COMPETITIVENESS IN AGRIBUSINESS\*

Web poslovne aplikacije kao podrška agrobiznisu u cilju podizanja konkurentnosti

### Abstract

During the last several decades, on a global level, the development of information technologies, particularly those with applicability in all spheres of human activity, has shown distinctive excellence. Experts in the field of prediction expect expanded and more reasonable usage of information technologies, particularly in the areas where a full ICT support is needed. Agriculture is the sector which has rather insufficiently relied on information technologies in almost all its activities.

It can be noticed that in the Republic of Serbia information technology, according to its capacities, has provided high-quality assistance to particular areas. However, this does not apply to the sector of agriculture. Due to the above-mentioned reasons, the subject of this paper is devoted to the issues related to information technology support in agribusiness, which is further aimed at strengthening competitiveness.

In addition to introductory notes and conclusions, the paper contains three principal parts in which the positioning of Serbia relative to the application of information technologies has been analyzed, including also considerations of the problem of increased production and marketability on the selected example, as well as the usage of web-based information technologies with the aim of intensifying the activity level of agribusiness.

**Key words:** *agribusiness, marketability, competitiveness, information technologies, electronic business (e-business), web-based business applications*

### Sažetak

U posljednjih par decenija, na globalnom nivou, razvoj informacionih tehnologija, a posebno u primeni u svim sferama ljudske delatnosti, predstavlja određenu izuzetnost. Eksperti iz oblasti predviđanja očekuju dalju, sve racionalniju primenu informacionih tehnologija, naročito u oblastima koje očekuju potpunu podršku. Poljoprivreda je sektor koji je veoma skromno koristilo podršku informacionih tehnologija u svojim aktivnostima.

U Republici Srbiji, prema mogućnostima, može se reći da je informaciona tehnologija podrška određenim oblastima na dosta kvalitetan način, što se ne može reći za oblast poljoprivrede. Iz ovih razloga, tematika rada posvećena je problematici podrške informacione tehnologije u agrobiznisu u cilju jačanja konkurentnosti.

Pored uvodnih napomena i zaključka, rad sadrži tri osnovna dela u kojima se razmatra pozicioniranje Srbije u pogledu primene informacionih tehnologija, razmatranje problema povećanja proizvodnje i tržišnosti na izabranom primeru, kao i korišćenje *web* informacionih tehnologija u cilju podizanja nivoa aktivnosti agrobiznisa.

**Ključne reči:** *agrobiznis, tržišnost, konkurentnost, informacione tehnologije, elektronsko poslovanje, web poslovne aplikacije*

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## Introduction

Today science and information technologies are penetrating into all aspects of economic activities, including agribusiness as well. Methods and manners of planting and growing already existing types, introducing new agricultural sorts and their placement on the market are being constantly improved in versatile ways.

Thanks to the usage of information and communication technologies (ICT), consumers are given the possibility of gaining much more information about producers, distributors, competitors, structure of goods supply and market services, structure of prices, time and place of supply, etc. Therefore, producers themselves more and more frequently show the interest in cooperating with the consumers in all phases of product development. Traditional research of marketing channels has been directed only to selling of products; however, it is nowadays changed, due to numerous reasons, thus giving the way to all-encompassing analysis. Among the main reasons that emphasise the necessity of integral investigation of marketing channels, the following ones can be enumerated: usage of ICT, shortened "life span" of the products, complex, corporative joint business undertakings and constantly increasing demands for versatile services. Such an integral approach in the process of investigating marketing channels implies simultaneous observation of strength proportion among all participants in marketing channels, starting with the producers of raw materials and repro materials, processors of transportation and storage organizations, wholesalers and retailers, up to final consumers. Developing the concentration and cooperation in marketing channels results in corresponding actualization increase [4, p. 173].

Inappropriate application of information technologies that relates to production and turnover of agrarian products, as well as inadequate adjustment to constant changes in the environment present huge blunder and weakness of the Republic of Serbia. World economy continuously works on modifications and improvements, particularly in the part related to the introduction of informatics support into all processes of production and selling, as a manner of increasing competitiveness.

Nowadays, by accepting the Internet technologies, both individuals and organizations constantly improve productivity, simultaneously developing communication on a global level. Using of e-business operations has become the most significant factor in global economy. Moreover, e-business application enables organizations to equally experience advantages and challenges and, in that way, to contribute to better-quality business operations.

The Internet has forced organizations to redefine their information systems. Companies use the Internet in order to enhance their business processes, materials purchase, selling of products, automation of users' services, creation of new income sources, etc.

While the Internet cannot eliminate or replace the classical functions performed within a marketing channel, the Internet can restructure them. In itself, the Internet has become a distribution channel for products and services, with the components of speed, interaction, and flexibility. As a distribution channel, the Internet provides a portal for communication between the buyer, the seller, and the entire distribution phase of the physical item. The Internet offers the marketing channel potential of eliminating some of the marketing costs and combines in the shrinking of the channel and making distribution much more efficient [1, p. 33].

The spread of the Internet as a successful medium of communication and exchange has broadened the scope of doing business to the global market place. The Internet is a global phenomenon in which fortune will favour truly global players. Substantial market shares within one set of territorial or market boundaries have started to become meaningless in a global context. On the other hand, niches unsustainable within purely domestic markets become viable in an electronic networked environment [3, p. 31].

From the point of view of today's ICT development, usage of dynamic web pages has absolutely become widespread subject matter regarding all business interactions. Static web sites are losing the battle since they have simply lost their functionality which can be provided by dynamic web sites. Content Management System – CMS has been used for some time and, generally speaking, it simplifies web pages, generating dynamic web pages. Additionally, CMS scripts of the open code have been used. Among the others, with the

appearance of Joomla<sup>1</sup> system, as the very powerful CMS of the open source code, obtained were the advantages of this system, implying very simple administration of the web contents and using of versatile patterns. Flexibility of this system presents one of the key characteristics; therefore, it appears now to be the most significant feature for the web contents that is being created. Web dynamic business applications nowadays absolutely demand flexibility, also including various different possibilities offered by Joomla system. Moreover, Joomla system can be managed without any previous programming knowledge or experience related to database systems operations. Therefore, it is seen as the greatest advantage of this system. The basic assumption is that without particular capital investment in software and without possessing any special skills and knowledge in the field of information technologies, it is possible to become competitive on the Internet, particularly in the domain of agribusiness, as it will be presented further in this paper.

### Positioning of Serbia in the domain of information-communication technologies

With the aim of reaching the conclusion regarding the level of agricultural development concept implementation in the Republic of Serbia and scrutinizing the manner in which it is possible to encourage such a concept by applying information technologies, it is necessary to call attention to the current situation of the Republic of Serbia referring to the domain of information technologies. The surveys that were carried out and that are relevant, encompass the surveys and conclusions of the World Economic Forum [14], specifying the position of the Republic of Serbia in the world, as well as the surveys of the Statistical Office of the Republic of Serbia [11] regarding the usage of ICT in the Republic of Serbia.

World Economic Forum has published the 13<sup>th</sup> issue of the Report on Information Technologies, accentuating that the report has been published in the period when the world economy is supposed to strengthen the recovery after the period of the worst economic and financial crisis during the last 80 years. In the context of the world's

economy recovery, ICT has the key role in presenting versatile innovations and enabling new working positions.

The mentioned report has been monitoring world development of ICT for over a decade, pointing out the significance of the data and long-term competitiveness. The report from 2014 offers a global overview of the current situation in the area of ICT. The data have been observed through the prism of the so-called Networked Readiness Index which is decomposed into four segments. Additionally, it is to be emphasized that the survey has been conducted in 148 countries and it has the greatest coverage ever, regarding the number of world economies involved.

Four segments (subindexes) that are defined in scope of Networked Readiness Index and further decomposed into ten additional parts involve [13, p. 6]:

1. Environment subindex
  - Political and regulatory environment
  - Business and innovation environment
2. Readiness subindex
  - Infrastructure and digital content
  - Affordability
  - Skills
3. Usage subindex
  - Individual usage
  - Business usage
  - Government usage
4. Impact subindex
  - Economic impacts
  - Social impacts

The final NRI score is a simple average of the four composing subindex scores, while each subindex's score is a simple average of those of the composing pillars. In doing this, we assume that all NRI subindexes make a similar contribution to networked readiness.

The environment subindex gauges the friendliness of a country's market and regulatory framework in supporting high levels of ICT uptake and the emergence of entrepreneurship and innovation-prone conditions. A supportive environment is necessary to maximize the potential impacts of ICTs in boosting competitiveness and well-being.

The readiness subindex, with a total of 12 variables, measures the degree to which a society is prepared to

1 The name comes from Swahili language, meaning "all together".

make good use of an affordable ICT infrastructure and digital content.

The usage subindex assesses the individual efforts of the main social agents – that is, individuals, business, and government – to increase their capacity to use ICTs as well as their actual use in their day-to-day activities with other agents. It includes 16 variables.

The impact subindex gauges the broad economic and social impacts accruing from ICTs to boost competitiveness and well-being and that reflect the transformation toward an ICT- and technology-savvy economy and society. It includes a total of eight variables.

Overall survey is divided into 54 indicators (variables), whereof 27 (50%) present quantitative data, and the rest 27 indicators relate to qualitative data; more precisely said, internationally comparable data simply were not attainable for a large enough number of countries, but were, however, crucial for the analysis and therefore were classified as qualitative variables.

Total estimation of NRI index is measured on the scale from 1 to 7. Values on the scale define measures from the best to the worst ranked participating economies:

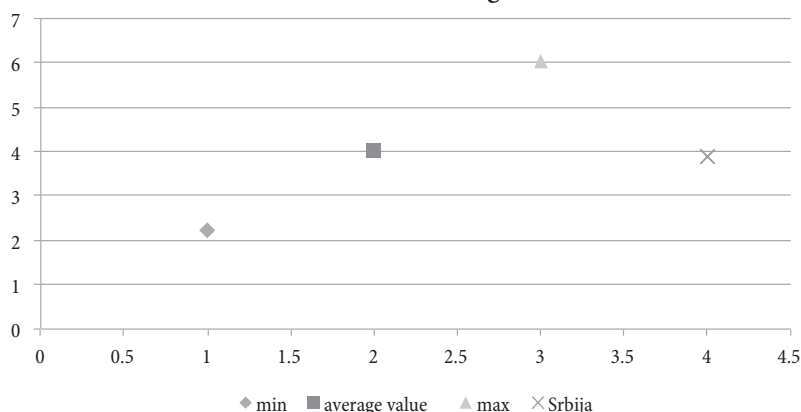
- 7.0 – 5.4 (the best ranked)
- 5.4 – 5.0
- 5.0 – 4.0
- 4.0 – 3.3
- 3.3 – 1.0 (the worst ranked)

The first survey of overall NRI score shows that Serbia is in 80<sup>th</sup> position, on the list of 148 countries, with the score 3.88; it is better in comparison with the previous year, when Serbia was in the 87<sup>th</sup> position. Figure 1 shows the minimal value, maximal value, average value and value of Serbia’s score among all 148 countries:

The survey Environment subindex shows that Serbia is in the position 106, with the score 3.58. Figure 2 presents minimal, average score, as well as the score of Serbia in the category of this survey:

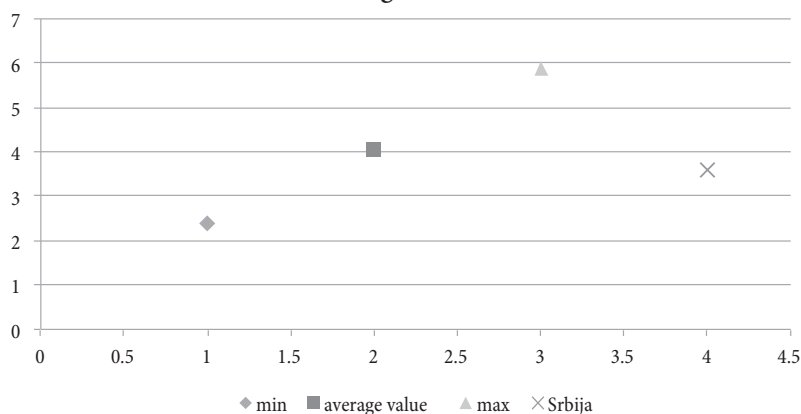
The survey Readiness subindex, indicating the general readiness of usage and improvement in ICT, shows that

**Figure 1: Total values of Networked Readiness Index – average values, extreme values and score for Serbia**



Source: Data processed by the author, according to [13]

**Figure 2: Environment subindex – average values, extreme values and score of Serbia**



Source: Data processed by the author, according to World Economic Forum, 2014 [13]

Serbia in the area of Infrastructure and digital content takes the 49<sup>th</sup> position, regarding the area of Affordability, the 67<sup>th</sup> position, and referring to the area of Skills, Serbia is in the 63<sup>rd</sup> position (see Figure 3). The scores of the above-mentioned sub-categories obviously indicate the overall 53<sup>rd</sup> position, with the general score of 5.11.

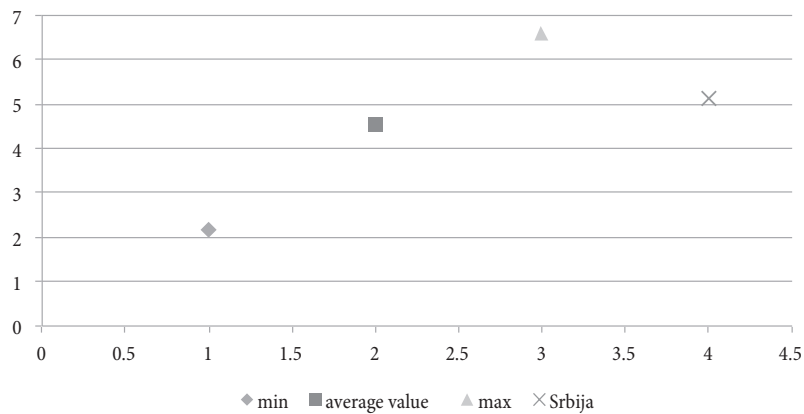
The survey Usage subindex presents the scores for the sub-categories: Individual usage, Business usage and

Government usage. Total score of 3.66 places Serbia on the 72<sup>nd</sup> position of this survey (see Figure 4).

Finally, the survey Impact subindex shows the scores for Economic impacts and Social impacts. Total score of these two sub-categories equals 3.19, positioning Serbia in the 93<sup>rd</sup> place (see Figure 5).

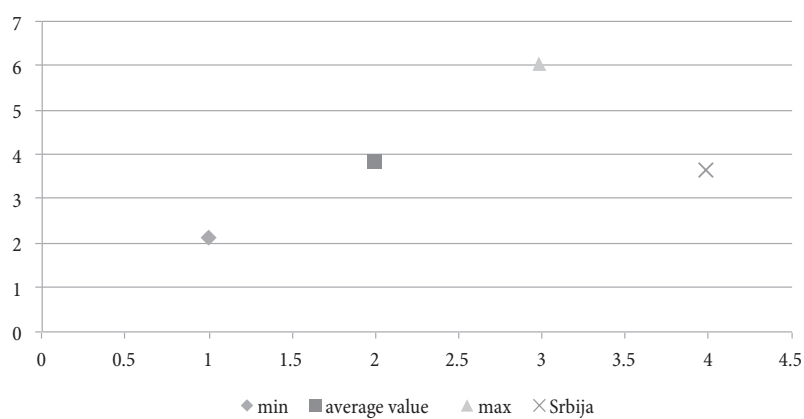
According to the presented data from the surveys, it can be concluded that the position of Serbia in the area of

**Figure 3: Readiness subindex – average values, extreme values and score of Serbia**



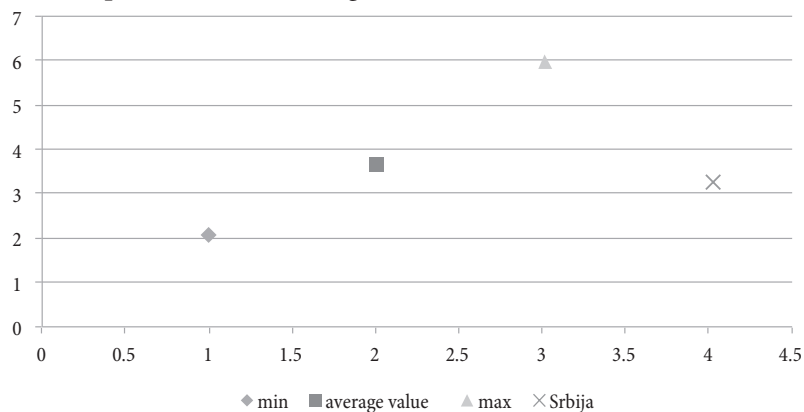
Source: Data processed by the author, according to [13]

**Figure 4: Usage subindex – average values, extreme values and score and score of Serbia**



Source: Data processed by the author, according to [13]

**Figure 5: Impact subindex – average values, extreme values and score of Serbia**



Source: Data processed by the author, according to [13]

ICT, expressed by several economic and sociological criteria is not at a desirable level. There are several relatively good conditions for further improvement and introduction of ICT innovations, but much more efforts are required, particularly with the support of the government strategy.

The data that could depict the rough picture of the situation regarding ICT usage in the Republic of Serbia encompass the official data of the Statistical Office of the Republic of Serbia. Such data are obtained as two-phase stratified sample and as such, they do not present completely obvious picture of the current situation; however, they certainly reflect in a very good manner the actual situation of ICT usage. Selection of two-phase stratified sample is performed in two phases: the first phase presents the selection of certain number of strata, while the second phase relates to the selection of elements that contain particular characteristic which is relevant for the survey.

Considering that in this paper the focus is placed on economic potential of agribusiness which can increase, among other ways, by applying information technologies, particular attention should be paid to technologies which might encourage agricultural development.

E-business presents the domain of ICT which, among other issues, also offers application of e-commerce. This is the area which can, for the most part, contribute to growth of agribusiness' potentials and as such, the data correlated with this area become relevant for the purpose of enabling creation of the image of actual ICT usage.

The survey was carried out by the Statistical Office of the Republic of Serbia, encompassing both individuals and enterprises. In order to reach certain relevant data that could be important in the domain of e-commerce in scope of agribusiness, attention has been paid only to data which involve usage of computers, the Internet and e-commerce on the Internet. Particular data referring to agricultural products' trade on the Internet, in any

form, cannot be obtained since they were not considered in the survey.

The survey represents that using of suitability of e-business appears to be very disputable. First of all, the fact is that in 2014, regarding the section of individuals, 59.5% have never performed the trade over the Internet. Even though the number has decreased in comparison with the previous years, the situation still remains dissatisfying. Table 1 presents the review of the users of e-commerce on the Internet:

Concisely, 1,160,000 persons purchased or ordered goods or services on the Internet in 2014, presenting the increased number of persons for somewhat over 260,000 respective to 2013.

Regarding enterprises, 74% of enterprises possess website and 83% of them consider their website suitable for visitors, i.e. it offers all possibilities to its visitors. Percentage of enterprises which ordered products/services over the Internet amounts to 40.4%, while 21.2% of enterprises received orders (excluding e-mail orders) for delivery of the own products/services, thus presenting only a half of the enterprises of the previous group. The reason for half the number of enterprises that received orders for their products/services can be, among other things, found in the fact that their web sites are not web dynamic defined to the extent so as to be able to offer an adequate interaction with the buyers.

In scope of the section related to share of total turnover realized on the basis of orders received via the Internet, the enterprises provided the following answers:

- with less than 24% of turnover (63.5% of enterprises);
- more than 24% and less than 50% of turnover (17.2% of enterprises);
- more than 50% and less than 75% of turnover (13.4% of enterprises);
- 75% and over turnover (5.9% of enterprises).

**Table 1: Users of e-commerce (in %), in the period 2006-2014**

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Never performed e-commerce	88.4	89.7	86.3	87.4	87.0	81.9	73.3	64.5	59.5
Performed e-commerce in the last 3 months	5.6	3.7	6.3	6.5	6.1	9.3	16.6	19.3	21.6
Performed e-commerce more than 3 months ago and less than a year ago	4.6	3.2	4.9	4.0	4.5	5.1	5.4	9.2	10.2
Performed e-commerce more than a year ago	1.4	3.4	2.5	2.1	2.4	3.7	4.7	7.0	8.8

Source: [9]

The provided data indicate that almost all preconditions for electronic trade of goods and services exist, but they are not used in the appropriate and best possible manner.

The data that strongly support this topic in the area of agriculture, obtained on the basis of 2012 Census of Agriculture [8], involve the data that present number of holdings in the Republic of Serbia, by municipalities, which used computers for bookkeeping records about agricultural business activities. Furthermore, they present the only official data showing whether and to which extent the holdings are ready to use innovations in scope of information technologies, with the aim of improving their positions on the market.

Total number of holdings that answered to be using computers for bookkeeping records about the agricultural business operations amounts to 10,355, presenting 1.6% of total number of agricultural holdings in Serbia, according to 2012 Census of Agriculture. In order to depict more meaningful result of the total number of 165 municipalities, the holdings were divided into strata:

- Up to 10 holdings;
- From 11 to 30 holdings;
- From 31 to 60 holdings;
- From 61 to 100 holdings;
- From 101 to 200 holdings;
- Over 200 holdings.

The data represented in Figure 6 do not illustrate overall survey, but only the parts which are of significance for the issues that this paper deals with.

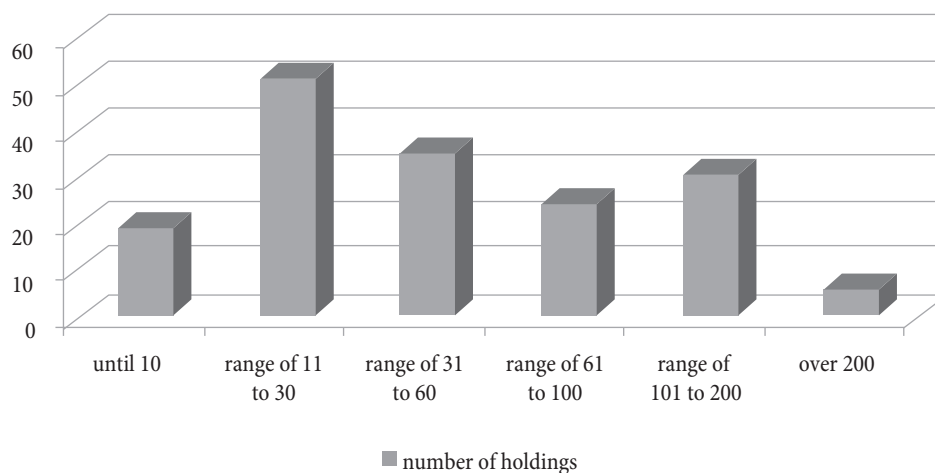
## Production potential and marketability in the section of vegetables growing on the selected example

The Republic of Serbia has not been using its huge potential in the section of agriculture to the highest possible extent. Agriculture participates in gross domestic product with 8.5% [7], while regarding exports of agricultural products it participates with 22.8% [7]. The structure of holdings is highly inappropriate, with the average size of 3.6 hectares, while only 2.37 hectares present arable land, and only 5.5% of agricultural producers of total number of 778,891 cultivate over 10 hectares.

Agrarian budget is a part of total budget of the Republic of Serbia that is intended for development of agricultural production, improvement of products' quality and their promotion. Moreover, it predicts expenditures for crop production and livestock breeding in the sense of subventions and premiums. During the last several years, remarkable is the increase of budget expenditures intended for organic farming and rural development.

The Republic of Serbia is, in regional terms, the greatest producer of vegetables, and the position it takes in total production, consumption and exports indicates attractiveness and profitability of this branch for business activities. Climatic conditions are the most favourable for planting mid-early and mid-late vegetables, and it has resulted in development of various types of production, such as gardening, field and intensive industrial production

Figure 6: Number of holdings which used computers for bookkeeping records, by strata



Source: Data processed by the author according to [8]

or production under protective covers (glasshouses, poly-tunnels, etc.). Out of total sown areas, 9% is under vegetable crops, while 11.3% of overall agricultural production is realized exactly in this section [5].

Decreased purchasing power of agricultural producers and insufficient usage of information technologies diminish their demand for agrarian inputs, thus influencing the extensiveness of agricultural production, instability of yields and volume of production, relatively low level of using the capacities of the corresponding branches of manufacturing and even greater decrease of competitiveness of agriculture of the Republic of Serbia on the market.

The degree in which agricultural products appear in trade of goods, that is, a percentage of agricultural production which is purchased on the market is called marketability of agricultural production. In the most developed countries, the degree of marketability amounts to 70-80%.

Agricultural producers of modest size, of fairly small productive and financial resources are most frequently determined to productive orientation and satisfying the own needs of their households. Potential market surplus and turnover of their own products are conceded to the others, middlemen, purchasers, or to direct sale on the market. Information about market trends and flows is realized through mediators to which they sell their products. Huge agricultural producers with expressive

merchantability of production most frequently establish their own selling policies (product, prices, promotion, etc.), thus tending to direct selling and immediate realization of market demands. In majority of cases, this is the way of direct and generally short channels of turnover. The above-presented facts lead to the conclusion that direction of further consideration should relate to higher level of informatics support, since the Internet is getting more and more important factor of wider vertical and horizontal cooperation among the producers and trade organizations.

Through the example-based analysis of the selected product – potato, which in the observed referent period 2003-2012 recorded the greatest produced quantities within the section of vegetables growing, due to low marketability, it can be concluded that there exists particular problem in well-organized channels of marketing, as a result of shortage of information about inputs and sales. Placement of goods mostly ends via direct channel of marketing or in natural consumption.

Furthermore, apart from its share in exports, potatoes also present specific goods grouping of vegetables which have recorded the greatest share in consumption as compared with other vegetables (see Table 3), the greatest share in produced quantities of vegetables (see Table 2), and also the enormous commercial, technological and nutritional significance.

**Table 2: Comparative review of production of vegetables with the largest share in Serbia (in tonnes)**

	Potatoes	Cabbage and kale	Tomatoes
2003	679,309	301,850	163,606
2004	975,090	304,085	184,688
2005	969,562	272,760	169,076
2006	930,305	324,657	189,222
2007	743,282	280,191	152,005
2008	843,545	300,519	176,501
2009	898,282	326,162	189,353
2010	887,363	336,600	189,412
2011	891,513	315,490	198,677
2012	577,966	281,557	155,663
<b>Total</b>	<b>8,396,217</b>	<b>3,043,871</b>	<b>1,768,203</b>

Source: Data processed by the author on the basis of SORS data, Statistical Yearbooks of RS (2003-2012)

**Table 3: Annual consumption of vegetables per a household member, in kilograms, 2009**

Potato	Cabbage	Tomato	Beans	Tuber vegetables	Onion	Other vegetables	Total
36.2	18.8	15.1	5.6	9.8	13.0	22.7	121.2

Source: Household Budget Survey, the Statistical Office of the Republic of Serbia



The production and consumption of potatoes in Serbia have their established tradition because potatoes are one of the main vegetable crops. The current efficiency of potatoes farming in Serbia is by far under its potential. Rational use of the capacities of potatoes producers in Serbia is limited by factors such as availability of varieties, availability of quality seeds, disregard of crop rotation, inadequate soil fertility, inadequate control of plant pathogens and pests, insufficient use of irrigation system, lack of adequate storage, and insufficient usage of information technologies restricting access to information.

Organised sale and especially purchase influence considerably market-oriented vegetable growing. Technological progress in vegetable production and production under protective cover provide unlimited conditions for vegetable growing all the year round and facilitate the making of offers of various structure and assortment. Traditional supply with fresh vegetables on farmers' markets and its relatively large share in the turnover will gradually diminish the turnover share in favour of organised wholesale and retail trade provided that the producers have necessary information on the needs of larger market.

Associations or cooperatives of producers are almost inexistent. Only a few potatoes producers are organised in associations (Association of Market-oriented Potato Producers "Zablace", Association of Potato Producers "Kondor", Leskovac) or are clearly defined as a group within various other associations of agricultural producers (e.g. "Plodovi Srbije" – group for potatoes, the association "100P plus" from Vojvodina). The members of the mentioned associations are mainly producers with 1-5 and 5-20 hectares, although there are several of those with more than 20 hectares [6].

Potatoes producers are getting organised in view of simpler and more favourable purchase of seeds, fertilizers and chemicals, as well as joint market positioning. The way producers are organised at their own initiative, the attainment of more advantageous purchase of seeds and the objectives to making exclusive producers' profit need particular attention, since being at initial stage. Farmers should attend training related to all possible options and advantages of computer support in the process of organising production and marketing channels.

The training should deal with producers' action, their possibilities and advantages of organization, method of financing the associations and surveys pertinent to the work of the associations. More stable and stronger producers' association should be created for decision-making in all aspects of production, which will influence the decisions of government administration.

As far as production and consumption are concerned, potatoes are the most important vegetables. The average production of potatoes in the mentioned period amounts to 840,000 tonnes, with a downward trend of on average 4.52% annually (see Table 4).

Delivery of potatoes on the market can be divided into two marketing channels. The first one is the delivery through organized marketing channels, i.e. through specialized purchase and trade organizations. Farmers' markets as direct marketing channels are the second form of potatoes placement on the market. The delivery through organized channels on average amounts to 23,000 tonnes. When observed in relation to marketing channels organization, delivery movements went in different directions. Namely, the sale in the scope of enterprises and cooperatives has recorded an annual growth rate of

**Table 4: Offer of potatoes by entities of marketing channels on the market of the RS (2003-2012)**

Characteristics	Total	
	Average	Rate %
<b>Production -000 tonnes</b>	<b>840</b>	<b>-4.52</b>
Family holding	809	-4.65
Enterprises and cooperatives	31	-1.32
<b>Delivery, intermediary marketing channels -000 tonnes</b>	<b>23</b>	<b>0.3</b>
Family holding	6	-7.95
Enterprises and cooperatives	17	2.75
Turnover on farmers' market, 000 tonnes	29	-4.48

Source: Authors' processing of SORS data, Statistical Yearbooks of the RS (2003-2012)

**Table 5: Marketability of potatoes by entities of marketing channels on the market of the RS (2003-2012)**

Characteristics	Total	
	Average %	Rate %
<b>Marketability</b> (total marketability shown with farmers' market)	<b>6.43</b>	<b>1.88</b>
Total marketability of family holdings	4.5	-0.24
Marketability of enterprises and cooperatives	55	4.13
Marketability of family holdings, direct marketing channel	3.7	0.17
Marketability of family holdings, indirect marketing channel	0.78	-3.47

Source: Authors' processing of SORS data, Statistical Yearbooks of the RS (2003-2012)

+2.75%, with considerable 44.58% variation. At the same time, the purchase from family holdings saw a significant annual growth rate of -7.95%, with a 47.59% variation. One of the reasons is badly organized and dysfunctional sale channel. The mentioned conclusion confirms that efficient marketing channels, accompanied by adequate usage of information technologies, are a key assumption of competitiveness of agricultural business in modern circumstances.

The sale through farmers' markets is predominant in the structure of the total delivery, participating with 56% in total deliveries. Family holdings choose direct marketing channels because it is cost-efficient and because they cannot store potatoes in adequate technological conditions in order to prolong the shelf life.

The total marketability of production is the ratio of delivery through organized marketing channels and farmers' markets. The average marketability of the total production of potatoes without farmers' market amounts to approximately 2.8%. Thus, for example, the largest marketability amounted to 3.88% in 2008, and the smallest was recorded in 2004, being 1.44%. Low marketability is due to the fact that production is oriented towards households' own consumption of potatoes, while the remaining quantities are mainly sold on farmers' markets. There are only a few real, large potatoes producers in our country because of, among all other things, a lack of adequate information on market needs. The conclusion is that a new system emerges in the production of food by integration process. The competitiveness is becoming more obvious rather among integrated systems than among independent entities of the agricultural business; this is a prerequisite for good information.

Family holdings (see Table 5) record a very small percentage of marketability through indirect and direct marketing channels, being 4.5%. The maximum marketability of the mentioned form of business amounted to 5.6% in 2007. Decreasing trend is noted with family holdings, being 0.24%, while enterprises and cooperatives show an increase of 4.13%.

Marketability through farmers' markets amounts on average to 3.7% and is relatively stable. Marketability through farmers' markets, family holdings is significantly larger than the marketability through organized marketing channels. The total marketability, farmers' markets included, amounted on average to 6.4% on annual basis, with a variation coefficient of 48%, which is expressive of considerable variations in trends. The maximum marketability was noted in the last observed year when it was 8.2% and the minimum was 4.87% in 2004.

The largest part of potatoes, 96%, produced by family holdings is consumed in agricultural enterprises and farms through natural consumption or is used as seeds. Of the total production of potatoes 0.71% is sold by agricultural holdings through indirect marketing to trade enterprises, with a downward trend of 7.95% and extreme one of 48%. 3.6% of the production of family holdings is sold on farmers' markets, with a negative trend of 4.48% and negative variations of 7.2%. Enterprises and cooperatives deliver 55% of their total production to trade enterprises through retail trade establishments and manufacturing industry for the production of chips, French fries, etc.

Low income of family holdings does not allow savings and modernization. Marketing channels of vegetables are not organized well; the intermediaries deal in grey economy. The link such as cooling of vegetables on the level of farmers, wholesale and retail trade is necessary.

The inexistence of cooling facilities renders lower quality of vegetables and considerable waste due to inadequate business conditions. Vegetables are mainly exported through food manufacturers or exporters. Feedback about the needs of final consumers does not reach the producers. Producers cannot diversify their production without feedback. In addition to external link between the producers and exporters, there is no link between producers and manufacturers. Consulting services for production advancement are under-developed; hence producers' business is based on classical principles. The assumption is that these links would be reinforced by using available information technologies.

#### Usage of web information technologies in view of raising agricultural competitiveness

The paper defines the assumption that the usage of information technologies, especially web information technologies can improve market entry and the general output and sale, especially of agricultural produces. Web information technologies are technologies based on Internet usage. The system of web dynamic contents is particularly convenient because open code systems are widely utilized. The usage of these systems is cheap and very user-friendly. No specific knowledge of programming languages or skills of databases administration are required for managing these systems. The above-mentioned Joomla is one of the most frequently used open-source content management system, and its application will be briefly explained below.

In every content management system Administrator Backend is the most important part, as being the place from which complete dynamic web presentation is managed. The first page of the Administrator Backend is the control panel containing all options for web content management. It is consisted of the following:

1. *Add new article* (this option allows the access to the page for adding new article);
2. *Article manager* (presents the list of all articles created in this system, which can also be updated in this option);
3. *Front page manager* (displays all the articles that the users of the web presentation need to view);
4. *Section manager* (option for section updating);
5. *Category manager* (option of category updating);
6. *Media manager* (option where different files can be uploaded within this system);
7. *Menu manager* (option for defining new menu options or new menus);
8. *Language manager* (option for changing the default language for pages viewed by the users);
9. *User manager* (option of users' account management);
10. *Global configuration* (option for a large number of various settings).

#### Section management in the system

Section management in Joomla is indicated as "Section manager" in the scope of which articles can be viewed. The number of sections will depend on the number of pages necessary in the whole web presentation. A bigger number of sections allow larger flexibility in dealing with articles. However, in addition to these sections, several categories need to be created if a number of different articles are at disposal – i.e. for each type of articles a new category is to be opened. It is necessary first to create a section and then the content inside.

The creation of sections comes before the creation of categories or articles. Let assume that a web application for the sale of agricultural produces of an agricultural holding is to be created. It is necessary first to divide the sections for each type of produces (vegetables, fruit, cereals, etc.) and then to define the categories within the respective sections (e.g. maize, cabbage, tomato, etc.). "Section manager" opens, and in the scope of this page a tools panel opens in which are to be entered the name of the section, level of access, possible section description in the box for text entry, as well as the picture of the produce.

#### Content creation

The content of the web presentation is the most important and it shows how the whole presentation will look like. Without content it is only possible to create a non organised, insufficiently clear and hard to use presentation. Consequently the presentation is not useful. It is completely obvious that the content management system such as Joomla cannot function properly at all without a well-designed content of

the presentation. However, the content certainly needs to be organised when a web presentation is created, whether Joomla is used or not.

Content creation in Joomla relies generally on the creation of articles, being in a way the material parts of the content. The tool used in the system for article creation is *Article manager*. Content management and entry of different parameters and texts is done in the so-called *backend*, and the display of this content and result of different entries and modifications on the webpage is the so-called *frontend*.

Within the creation of articles the following parameters are set up in *Article manager*: article title (e.g. sale of agricultural produces), selection of the section to which the article belongs (the sections may be for example vegetables, fruit, etc.), publication (No/Yes) and space for text entry relevant to the article.

After safeguarding these changes, it is possible to view the article by clicking on the option "Preview", which opens in this case in form of a picture with the name and description of a particular agricultural produce.

In addition to the content, the user part of the presentation can contain links grouped as a menu, which would allow going to certain pages of the presentation. It is necessary to select a new menu in *Menu manager*, then to define new parameters, such as individual name, name and description of the menu. The name of the new menu appears on the menu list, rendering the access to the new menu very simple. The links within the menu are also easily accessed. By accessing the new menu *Menu item manager* opens within which it is possible to add new items.

Joomla system is in constant communication with the database management system MySQL through PHP scripts, which already exist in the system and do not need to be created separately. This way all changes made in the web presentation via Joomla are recorded in the database. There is no Dynamic Content Platform used on the Internet without being supported by databases. The use of databases is of great importance. However, Joomla does not require having skills for databases systems, although these are constantly used for data storage and handling.

Software extensions existing in Joomla are a special convenience that allows the use and modification of components, modules, plug-in additions, patterns and languages. *Extension manager* is designed to install wanted extensions in the system.

*Components* are an application performed within the system and located in the main part of the page. Components already incorporated in Joomla are as follows:

- Banners (Banner manager) – installation of banners on a web presentation. Banners are sometimes used as a link to other parts of a presentation, and sometimes as a method for generating income by selling advertising space;
- Contacts (Contact manager) – creation of personal page with contact information;
- News feeds (News feed manager) – collection of news and other information. Review of RSS (Really Simple Syndication) content, where News feeds allow the users to read different messages and review web presentations;
- Polls (Poll manager) – creation of different polls, where next to questions answers are proposed, of which one is to be ticked;
- Search (Search statistics) – allow simple searching of information;
- Web links (Web link manager) – display URL addresses in form of list of categories.

Joomla system is completely open for handling dynamic web content. Skills in programming languages are a convenience to reach higher level of system management. In addition, the system is free. All this makes it a very powerful and flexible system which will further progress along with other web content in the field of e-commerce. This is at the same time an excellent example of application and the subject of this paper.

The usage of information technologies is really necessary; hence one needs to design a system which will facilitate the access on the Internet to offers and sales of agricultural produces. Also, it is possible to network several smaller systems (family holdings) through one system and make the market more accessible.

## Conclusion

The fact is that agriculture, as an economic activity, contains special characteristics influencing production, storage, sale, etc, which is mentioned a number of times in the paper. This being:

- Diversified products;
- Holding geographical location;
- Geological soil composition;
- Number of agricultural holdings;
- Holding size;
- Production technique;
- Climate;
- Dispersion on large surfaces;
- Tradition.

Each of these characteristics has its own modalities, which influence considerably the production – quantity, quality, transport, and sale; thus it is only natural that this paper presents the nature of the problem and suggests the usage of web information technologies as a solution to it.

Raising competitiveness in the agricultural business requires information on a number of characteristics, producers and consumers, which would, provided the usage of certain information technologies, contribute to better business. According to what is said above, one should be concerned about the situation in the Republic of Serbia; thus this paper aims at finding an answer to the following question: how to improve the usage of information technologies so that agriculture can take on expected good characteristics? The analysis of data provides answers on the position of Serbia in the World. Numerous research studies (of world research institutes, both economical and statistical, dedicated agricultural forum in Serbia, etc.) and data processing by the authors oriented to the relationships of Serbia with the World convey a clearer picture of the situation in Serbia, as far as information technologies are concerned.

The problem of production potential and marketability, on the example of vegetable growing, points to certain issues and possibilities of considerable improvement of products placement with the help of modern information technologies. The paper also stressed out products losses

that occur because large quantities, which have not reached the market or consumer, have to be destroyed.

Agricultural competitiveness requires, among all other things, the usage of web information technologies that contributes to better offer and sale of agricultural produce. The description of the management of an open-source web dynamic content system offers the possibility to raise the competitiveness of agricultural holdings. The paper also presents how to manage the sections and create a web open-source dynamic content platform. One should not forget to mention that some time ago only big companies were able to be present on the web, but today, owing to the open code software with various GPL (General Public Licence) and economic solutions, small companies and systems can also come out with a quality dynamic web location and establish a certain level of competitiveness to large enterprises.

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