

DEVELOPING OF WEB-BASED KNOWLEDGE PLATFORM FOR AGRICULTURAL PRODUCTION IN A CONTROLLED ENVIRONMENT

RAZVOJ WEB BAZIRANE PLATFORME ZNANJA ZA UZGOJ BILJAKA U KONTROLISANIM USLOVIMA

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ABSTRACT

This paper describes developing a web-based knowledge platform, which would become a "meeting place" on the Internet for all interested market participants (stakeholders) in business with agricultural production in a controlled environment - greenhouses. The developed platform will allow better visibility of the agricultural products and their positioning in the market, better advertising of the products and increase the possibility of creating products according to market demands. Proposed approach will concentrate the knowledge and information so that every single participant in the market will get timely and appropriate responses to his questions and issues. That way of solving the problems will significantly shorten the time of searching for an answer and avoid "wandering" that unnecessarily consume all the resources (time, money, energy).

Key words: Internet; web-portal; knowledge platform; greenhouses.

REZIME

U ovom radu je opisan razvoj web bazirane platforme znanja koja treba da postane „mesto okupljanja“ na Internetu svih zainteresovanih u oblasti poljoprivredne proizvodnje u kontrolisanim uslovima. Razvijena platforma će obezbediti bolju vidljivost poljoprivrednih proizvoda i njihovo pozicioniranje na tržištu. Platforma će, takođe, omogućiti interakciju proizvođač-potrošač i proizvođač-proizvođač omogućujući zajednički nastup na tržištu i kreiranje proizvoda prema zahtevima potrošača.

Svi zainteresovani za pokretanje posla u oblasti poljoprivredne proizvodnje u kontrolisanim uslovima će u okviru platforme naći većinu neophodnih informacija. Počevši od projektovanja plastenika/staklenika, preko selekcije biljnih kultura, plodoreda i definisanja agrotehničkih mera pa do saveta u vezi prodaje i nastupa na tržištu.

Razvijanjem platforme znanja se istovremeno postiže više ciljeva. Obezbeđivanje različitih vrsta informacionih servisa neophodnih za neometano funkcionisanje tržišno orijentisane poljoprivredne proizvodnje u kontrolisanim uslovima. Obezbeđivanje svih relevantnih informacija neophodnih za intenzivnu i visoko kvalitetnu proizvodnju. Kontinualna komunikacija između svih učesnika na tržištu će ubrzati protok informacija i na taj način ubrzati i protok dobara, usluga i novca u ovoj oblasti. Bolja saradnja svih učesnika u procesu proizvodnje, prometa i potrošnje proizvoda će podići kvalitet cele predmetne privredne delatnosti na viši nivo kroz podizanje kvaliteta robe i usluga na tržištu.

Predloženi koncept web bazirane platforme znanja će izvršiti koncentraciju znanja i informacija na jednom mestu tako da će svaki učesnik na tržištu biti u mogućnosti da dobije pravovremenu informaciju i odgovor na svoja pitanja i probleme. Na taj način će biti izbegnuta nepotrebna „lutanja“ pri traženju informacija i nepotrebna potrošnja kritičnih resursa kao što su vreme, novac i energija.

Ključne reči: Internet; web-portal; platformaznanja; platenici/staklenici.

INTRODUCTION

This paper describes developing a web-based knowledge platform (the Portal), which would become a "meeting place" on the Internet for all interested market participants (stakeholders) in business with agricultural production in a controlled environment.

The developed platform will allow better visibility of the agricultural products and their positioning in the market. Profile of the platform will enable successful advertising of the products. The platform also will allow the interaction producer-consumer and producer-producer, providing the possibility of a joint appearance on the market, but also for creating products according to market demands.

Young farmers and all others who are interested in starting a business with the cultivation of plants under controlled conditions on the Portal will find all necessary advice to launch the business. That advisory role starts from the design of greenhouses, selection of crops and crops rotation. Next step is advising about agro-technique measures regarding soil treatment, fertilizing and protection of plants and all other issues

relevant to the production. In the end, selling and market appearance advice will also be an integral part of the Portal.

The further text describes the goals of the knowledge platform, through a list of theses:

- Providing different types of services necessary to support the smooth and efficient functioning of the market-related plant production under controlled conditions, integrated into a single platform of knowledge in the form of a web portal. Facilitation of starting the plant production in a controlled environment for young farmers and all interested parties with little or no experience in this area.
- Provide all relevant information necessary for intensive, high-quality and highly productive production (choice of crops varieties, treatment of soil and plants according to experience, wishes and capabilities of farmers but also by the needs and special requirements of the market)
- Continuous communication between all relevant stakeholders and market participants. Farmers, traders, consumers and processors of agricultural products, manufacturers and sellers of equipment, devices, and technologies for plant production, manufacturers and sellers of seeds and seedlings, fertilizers and plant protection materials, experts in the field of pedology,

agrochemistry, agro-technics and plant protection, trading, marketing, and market experts and also with banks, financiers, creditors, funds and state administration and funds. Establishing this type of communication will accelerate the flow of information and thus the flow of goods, services, and money in this area.

- Better cooperation of all participants in the process of production, trading, and consumption of products and thus raise the quality of production to a higher level through increasing the quality of goods and services in a given market.
- Creating a common platform and space that allows the consolidation and merging of production will lead to the creation of clusters of producers.

Proposed approach will concentrate the knowledge and information so that every single participant in the market will get timely and appropriate responses to his questions and issues. That way of solving the problems will significantly shorten the time of searching for an answer and avoid "wandering" that unnecessarily consumes all the resources (time, money, energy).

MATERIAL AND METHOD

Information communication technologies (ICT) penetrated so deep to all areas of human's life and activities (Bačkalović et al., 2016; Nikolić et al., 2016; Kamenko et al., 2015; Bugarški et al., 2014; Kamenko et al., 2012; Kamenko et al., 2011; Nikolić et al., 2011; Nikolić et al., 2010a; Nikolić et al., 2010b). Unfortunately, agriculture seems to be an exception. The power of ICT is not used enough in agriculture activities. The reasons are different, but the most significant are that rural population mostly is old, poorly educated, lives in the countryside with a weak connection to contemporary ICTs. But young people are close to new technologies, use it and feel it as a natural part of their life. Because of that, ICTs can be one of the flywheels for the returning of young to the rural areas and agriculture activities.

The primary roles of ICT in agriculture are (Yaduraju et al., 2016):

- Agricultural extension and advisory services – ICTs bridge the gap between agricultural researchers, extension agents and farmers, thereby enhancing agricultural production.
- Promoting environmentally sustainable farming practices – ICTs improve access to climate-smart solutions as well as appropriate knowledge to use them.
- Disaster management and early warning system – ICTs provide actionable information to communities and governments on disaster prevention, in real-time, while also providing advice on risk-mitigation techniques
- Enhancing market access – ICTs facilitate market access for inputs as well as product marketing and trade in a variety of ways.
- Food safety and traceability – ICTs help deliver more efficient and reliable data to comply with international traceability standards.
- Financial inclusion, insurance, and risk management – ICTs increase access to financial services for rural communities, helping to secure savings, find affordable insurance and tools for better manage risk.
- Capacity building and empowerment – ICTs widen the reach of local communities, including women and youth, and provide newer business opportunities, thereby enhancing livelihoods.
- Regulatory and policy – ICTs assist with implementing regulatory policies, frameworks, and ways to monitor progress.

By those above, it is clear that ICTs are a powerful tool which can be used for improving the agriculture as well as some of their parts. This paper will treat the possible influence of ICTs

to vegetable production in a controlled environment, helping to improve that branch of agriculture (Dimitrijević et al., 2012; Kamenko et al., 2016).

The basic idea is to assist farmers farming bringing them all necessary and relevant information in time. That goal will be achieved through web-based knowledge platform.

What is the "knowledge platform"? "Knowledgeplatform" (KP) is a universal integrator of knowledge (where you are going to get the knowledge) able to provide access to knowledge for the development of products or services (Tekić, 2012). If someone tries to establish or construct the KP, the first necessary information is what kind of knowledge is he looking for? Next question is where we can find required knowledge? The third one is how it should be organized for easy and efficient using? The fourth question is how to build functional system which will serve users and be able to change and develop in case to future requirements? In further text, we will discuss and an answer to the question listed above.

DISCUSSION AND DISCUSSION

Suppose that a young man with no experience in agriculture own some land wants to start the cultivation of plants in greenhouses. For that purpose, there are a number tasks which should be solved. All they can be grouped in three phases, each consists of three tasks, accordingly to order of solving. The list of tasks is not complete, but it is long enough to cover one production cycle and to show how many problems one must to solve when starts with greenhouse planting business.

Phase 1. Constructing

Task 1.1. The design of greenhouse, selection of crops and crops rotation and defining of agro-technic measures (e.g. fertilizing and watering).

Task 1.2. Finding appropriate greenhouse, good quality seed and/or seedling and all necessary material, equipment, tools and machines on the market.

Task 1.3. The project financing. Where to find money for a start? Credit, loan, leasing, grant? Bank, state, fund? Where to find a good information? How to fill in the application forms? Which type of insurance and insurance broker to choose?

Phase 2. Farming

Task 2.1. Maintenance of plants in good condition. Watering, air-conditioning, fertilizing. Not too little nor too much, exactly how should be.

Task 2.2. Fight against pests and diseases. What chemicals to use? Or chemicals are not necessary? Who knows? Who can help? Who should I ask? Where to find him/them?

Task 2.3. The best time for harvest. What is the best time for harvest? What are the necessary conditions for harvest? Low concentrate of chemicals or no chemicals in vegetables? Which part of the day? Who knows? Who can help? Who should I ask? Where to find him/them?

Phase 3. Selling

Task 3.1. When and at what price to sell? Sell in advance or after harvesting? How to ensure the best price for my goods?

Task 3.2. How to sell? Sell everything in advance for a known buyer or small amount every day?

Task 3.3. To whom sell? Directly sell to the final consumer (local market in the nearby town) or merchants? If he sells to merchants, which of them to choose? Small local stores or big chain of supermarkets?

The text above shows that there exists a lot of questions and problems - tasks. It is evident that solving all the tasks mentioned above requires a lot of effort. Time, energy and money. A lot of people simply gives up after facing with all those challenges. "It is too complicated and hazardous, with no guarantee that it will succeed," people thinks. And they are right!

No one can ensure that the project will be successful 100%, but... If one have enough right and in time information before and during the project, he significantly rises the chances of being successful. Logical answer for all those questions and doubts is "knowledge platform." Let's develop it!

First, all tasks can be sorted into four groups: technics, market, advice and financing. Figure 1a) shows the situation without using of KP and 1b) with using of KP. It easy to conclude that if one has all necessary information in one place he will have a multiple benefit. But, information is useless if they are not organized in the way where it is easy to use them.

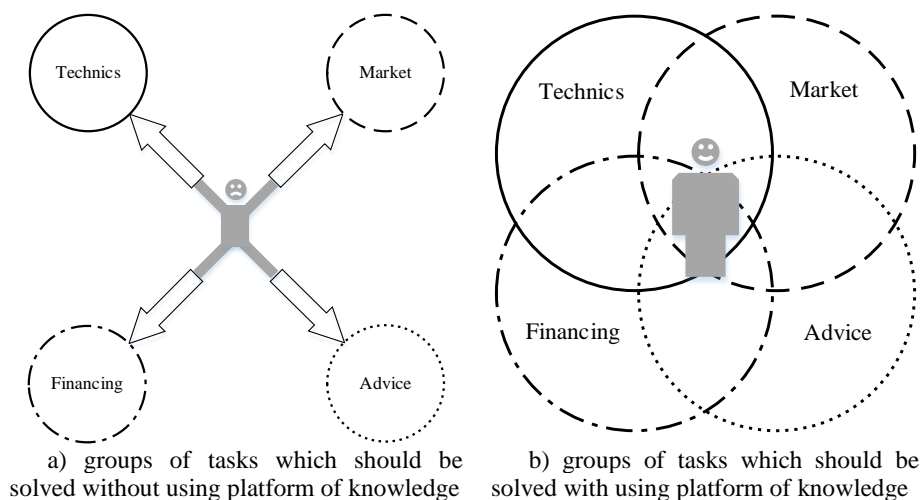


Fig. 1. Groups of tasks which should be solved without and with using platform of knowledge

All defined groups contain information relevant to adequate tasks as it is stated in the further text.

Technique: *Greenhouse designing* – generation of the basic design of greenhouse according to farmer's requirements. *Selection of crops and crops rotation* – advice of what and in which order to plant accordingly to soil quality analysis and geographic location of the greenhouse. *Agro-technique* -defining of agro-technique measures according to selected crops, soil quality, and geographic location.

Market: *Trading* – selling and buying of planting products (fresh vegetables) and goods in connection with farming (materials, equipment, tools, machines, seeds, seedlings, fertilizers, chemistry). *Stock market* – selling all quantities of final production of fresh vegetables to the known buyer in advance; following the prices of goods on the market (domestic and worldwide). *Advertising* – commercial ads for selling or buying of goods and products.

Advice: *Agricultural extension services* – state or private agricultural advisory services whose helping farmers planting through the answering to their questions and solving the problems (usually pests and diseases troubles). *Discussion forums* – "an Internet forum, or message board, is an online discussion site where people can hold conversations in the form of posted messages" (*Internet forum, Wikipedia*). This part is used for the exchange of good practice. Users can publish their stories and experience in case of some topic

(e.g. tomato planting, greenhouse building or blight-fighting) successful or not. The discussion is not "in live", but it can be, posts can be long with additional contents (photos, sound records, movies...); *Live chats* – "an online customer service software with live support, help desk software, and web analytics capabilities" (*LiveChat, Wikipedia*). Live chat is "live discussion group," all users are "on-line" and chats "in live". Messages are short, usually without additional contents, but with the possibility of using it (e.g. discussion about blight, someone sends a photo with infected foliage); *Automatic response service* – in some cases predefined knowledge can be stored in Platform tools, and when user ask for help, the first answer can be generated automatically.

For example, the farmer saw some spots on tomato fruits. Immediately he takes a photo with his mobile phone and sends it to Platform – Advisory part. The Platform has embedded algorithms for image analysis and pattern recognition, and in a few tens of seconds, the farmer gets back automatically answer like: "It seems that there is Black mold (*Alternaria alternata*) on tomato fruit. Call agronomist immediately, phone number +38160123654789, e-mail: agrohelp123@gmail.com"

Financing: *Banks* – all relevant information about conditions, conveniences, discounts and benefits for agriculture and farming in protected environment. *Funds* – all relevant data about private, state or EU funds which finance agriculture activities, with emphasis to currently open calls for proposals and competes. *State* – all useful information about financial benefits for farmers and other activities and events in connection with agricultural production in a controlled environment. Terms, rules, and conditions for annual subsidies, loans, credits. Information about forums, fairs, and other important events. Figure 2. The structure of designed web KP for farming in controlled environment graphically shows the structure of previous described Portal. The main page is www.e-greenhouse.net. After entering the main page, the user can register or proceed unregistered browsing through the parts of the site. Only registered users can use the platform in full range of all benefits and information. The using of Portal will be complete free of charge for farmers.

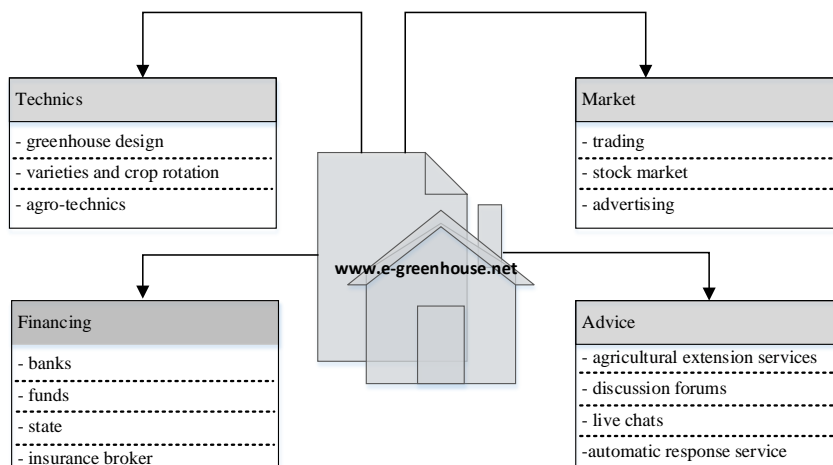


Fig. 2. Structure of knowledge platform for farming in controlled environment

Figure 3. shows the way of using and flow of information in such a system. The user, after entering the address www.e-greenhouse.net in smartphone or PCs web browser, through the Internet access to the Portal's home page. After that, user browses the Portal, finding requested information, reading or posting messages and information, and discussing with other users. Optionally, Portal can establish communication with all the most popular social networks and web-based applications, and the user can receive and send information as fast as they appear on the website (dashed line in the figure). In that way, user can choose to be regularly informed about topics of interest (new calls for grants or discounts for some machinery).

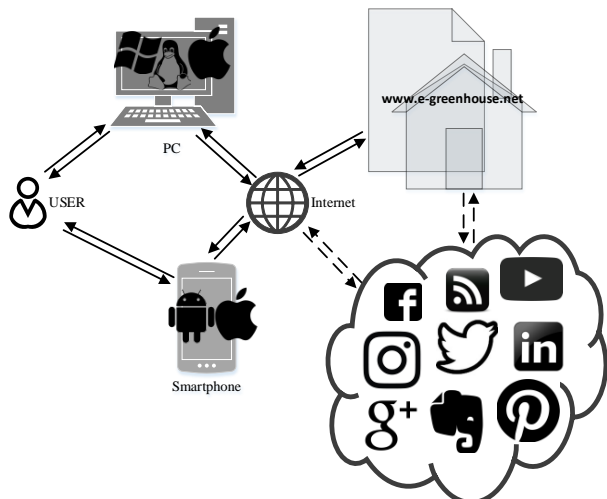


Fig. 3. Illustration of using of developed platform

CONCLUSION

This paper describes developing a web-based knowledge platform which is planned to become a "meeting place" on the Internet for all interested market participants (stakeholders) in business with agricultural production in a controlled environment. The Platform consists of four parts: technique, market, advice and financing. Every part is independent, but only together they can provide the right support to the farmers. The developed platform will help to all stakeholders in greenhouse business allowing better cooperation of all participants in the process of production, trading, and consumption of products and thus raise the quality of production to a higher level through increasing the quality of goods and services in a given market.

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