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POSSIBILITIES FOR IMPROVEMENT OF FRUIT PRODUCTION IN SERBIA
MOGUĆNOSTI UNAPREĐENJA VOĆARSKE PROIZVODNJE U SRBIJI

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ABSTRACT

Based on the number of bearing trees and realized production in investigated period (2000-2009) in fruit production in Serbia, the most important fruits are plums, apples, and cherries. With an average production of 482,000 tonnes, plums contribute 44.90% of total fruit production followed by apples (19.20%), and sour cherries and raspberries with an average share of 7.55% each. Analysis of the investigated period reveals a tendency of the fruit production increase. Trend of increase was especially evident in plum production (rate of change 9.81%), followed by apple (7.42%), apricot (7.31%), peach (6.83%) and cherry 6.64%. From 2010 to 2013, the Ministry of Agriculture, Forestry and Water Management of Republic of Serbia adopted measures through the National Program of Agriculture for the development of fruit and viticulture production. The meassures primarily relate to the production and distribution of planting material, cultural technology with special emphasis on organic production, logistics, quality and standards for packaging. At this time, there is a great opportunity for the adoption of quality production from the choice of certified planting materials and modern variety selections to revolutionize this branch of agriculture. Serbia has many natural advantages for fruit production: the spatial and biological diversity, favorable climate conditions, and our tradition in the fruit production. A considerable interest among fruit farmers, steady government support through incentives and integration through cooperatives (associations) could translate into significant results.

Key words: *fruit production, trends in development, measures for improvement, Republic of Serbia.*

REZIME

U ispitivanom periodu (2000-2009) u voćarskoj proizvodnji Srbije najznačajnije voćne vrste su šljiva, jabuka i višnja, kako po broju rodnih stabala, tako i po ostvarenoj proizvodnji. Sa prosečnom proizvodnjom od 482.000 t. šljiva učestvuje sa 44,9% u ukupnoj proizvodnji voća. Prema zastupljenosti u ukupnoj proizvodnji voća zatim slede jabuka (19,20%), višnja i malina sa prosečnim učešćem od 7,55% . Analizirane voćne vrste pokazuju tendenciju povećanja. Trend povećanja je naročito izražen u proizvodnji šljive (stopa promene 9,81%), proizvodnji jabuke (stopa promene 7,42%), kajsije (7,31%), breskve (6,83%) i proizvodnji višnje (stopa promene 6,64%). Ministarstvo poljoprivrede, šumarstva i vodoprivrede Republike Srbije je u okviru Nacionalnog programa poljoprivrede od 2010. do 2013. godine donelo mere za razvoj voćarsko-vinogradarske proizvodnje, koje se prvenstveno odnose na proizvodnju i promet sadnog materijala, tehnologiju gajenja, sa posebnim naglaskom na organsku proizvodnju, kvalitet i standardizaciju, pakovanje i logistiku. U ovom trenutku velika je šansa, da primenom kvalitetne proizvodnje od materijala za sadnju preko odabira pravog sortimenta, ostvarimo pravu malu revoluciju u ovoj grani poljoprivrede. Prednost našeg voćarstva je u prostornoj i biološkoj raznovrsnosti, povoljnoj klimi, tradiciji u proizvodnji voća. Postoji značajna zainteresovanost poljoprivrednika za voćarstvo, koje uz državne podsticajne mere i osnivanje zadruga (asocijacija) mogu ostvariti dobre rezultate.

Ključne reči: *voćarska proizvodnja, tendencije razvoja, mere za unapređenje, Republika Srbija.*

INTRODUCTION

In Serbia, due to very favorable climate and soil conditions, there is a great potential for development and further improvement of fruit production, especially on family farms. The utilization of available resources requires the prior establishment of a favorable environment for the recovery of agriculture and the economy as a whole. A clear developmental concept is a prerequisite for further advancement of fruit production in Serbia. The developmental programs for sustainable fruit production should be established on stable marketing systems within available resources and requirements of modern domestic and international markets (Vukoje and Milić, 2009). As an important field of plant production, *fruit growing* is based on series of comparative advantages over the other branches of agriculture. In the future, production of the fresh and processed fruit should be given more attention. It could be a profitable enterprise, particularly the export of fresh fruit, canned fruit and various fruit preparations. However, it is necessary to take meaningful steps towards more intensified fruit production and the introduction of modern and specialized processing capacities (Milić and Radojević, 2003).The favorable growing conditions for fruit production (climate, soil, location, etc.) in the fruit producing regions, have positive impacts on personal and local standards of fruit growers in Serbia. Changes in fruit assortment and steady introduction of the latest scietific knowledge in plant nutrition, protection and adequate pruning play ipmortant roles in modern fruit growing. The prioraties in this branch of rural economy are intensification of production and introduction of modern mechanization. Changes of the assortments and introduction of new cultivars with higher quality and biological potential will futher improve fruit production. Development of new and cost-effective growing systems, research in crown framework formation suitable for new cultivars and growing environment and improvment in cultural technology (pruning, fertilization, irrigation and protection of the fruit trees from pests and diseases) would substentialy benefit serbian fruit growers.

MATERIAL AND METHOD

Fruit production has traditionally been one of the most important branches of agriculture in the Republic of Serbia. The orchards establised in this region were to meet grower's own needs for both fresh and processed fruits and the surplus for the sale on domestic and international markets. Since fruit growing

is a very complex area of plant production, the main aim of research is to determine the underlying trends of fruit production with development of inovative measures to enhance and improve fruit production in the Republic of Serbia. The tradition of growing fruit draws a great deal of interest among farmers, and the incentives offered by Serbian government are expected to further enhance development of rural areas.

The sources of data were the Statistical Office of the Republic of Serbia (www. webrzs.stat.gov.rs), the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia (www.minpolj.gov.rs) and the available literature (author's publications, books, brochures, magazines, etc.). The objective of the research was a comparative analysis of the input data for fruit production in the Republic of Serbia. The combination of the accurate statistical data on the territory of the Republic of Serbia and empirical findings from available sources, were used as the starting point for deciding the state of fruit growing in this area and measures necessary for its improvement. The relevant results were achieved by using the analytical approach to the data analysis. Data analysis was preceded by their collection and classification.

RESULTS AND DISCUSSION

Based on the number of bearing trees and realized production in investigated period (2000-2009) in fruit production in Serbia, the most important fruits are plums, apples, and cherries (Table 1). With an average production of 482,000 tonnes plums contribute 44.90% of total fruit production followed by apples (19.20%), and sour cherries and raspberries with an average share of 7.55% each.

Table 1. Fruit production in the Republic of Serbia (2000-2009)

Fruit species	*Number of productive age trees (000)*	*Production*	
		Average yield (000 t)	*Rate changes (%)*
Apple	14,779	206	7.42
Pear	5,035	56	3.81
Quince	903	12	3.67
Plum	42,280	482	9.81
Cherry	1,844	24	4.96
Sour cherry	8,633	81	6.64
Apricot	1,597	22	7.31
Peach	3,961	55	6.83
Walnut	1,733	21	5.33
Strawberry	8,370[1]	33	2.48
Raspberry	15,048[1]	81	2.13

Source:www.statserb.sr.gov.rs
[1] area in hectares

Despite numerous challenges to the fruit production in Serbia, the actual production growth trends are generally positive. The analysis of the fruit species in the investigated period reveals a tendency of the fruit production to increase. The increase was especially evident in plum production (rate of change 9.81%), apple (7.42%), apricot (7.31%), peach (6.83%) and sour cherry 6.64%. Much needs to be done to improve cultural technology and eliminate traditionalism in the production, which prevents the adoption of new technologies. Farmers would further increase fruit production by overcoming challenges such as the small percentage of irrigated areas, minimal percentage under integrate and organic fruit production, obsolete machinery, lack of crop insurance, small areas under anti-hail nets, poor integration in associations and cooperatives and obsolete fruit assortments.

Measures to improving of fruit production

Fruit production of Serbia is facing great changes imposed by the transitional period of the country. The Ministry of Agriculture, Forestry and Water Management defined the activities and measures that will lead to the implementation of a series of reforms in fruit production. The three main development objectives are:

– improvement of the quality of planting material by introducing a system of certification and control;
– regulation of pesticide distribution and control of residue;
– increase of the area of certified organic and integrate certified orchards.

In order to increase fruit-grape production in Serbia, the Ministry of Agriculture, Forestry and Water Management (www.minpolj.gov.rs) legislated the following regulations:

– Regulation of financial incentives for establishment of fruit tree, vine and hops stockyards in 2010;
– Regulation of financial incentives for establishment of new fruit orchards, vineyards and hops plantations in 2010;
– Regulation on establishing the program of measures for long-term loans for agricultural production in 2010. and the 2011;
– Regulation on establishing the program of measures to subsidize interest rates for short-term loans for agricultural production in 2010.

The production and distribution of planting materials

In the past Serbia was a major exporter of the planting materials to the European market. However, in the last ten years, EU countries require only certified planting material. Serbia did not have legislated certification schemes, procedure and criteria for the production of plants to satisfy European market requirements. In Serbia the production of planting material was based on standard stock (the lowest category), so exports became practically impossible.

Based on the legislation from 2005 the production of planting materials can only establish legal entities and entrepreneurs. Therefore, today in Serbia 309 companies participate in the production, distribution, and import of planting materials, and only 242 companies produce plant materials. New regulations prohibit the sale of seedlings at farmers markets, directives determine selling locations and certificates (labels) introduced and issued by the Ministry of Agriculture, Forestry and Water Management- Department of Plant Protection are required.

Through the certificate, the state guarantees to the buyers that the seedlings purchased were true-to-type, healthy and pathogen- and other pests-free. Certification contributed to the gradual introduction of order in production of planting material, to the restoration of the trust of customers (farmers), to return to the Russian market (Krasnodarska area), and to the establishment of financial incentives for the certified planting material (the higher the subsidy for certified, than for the standard). This resulted in increased demand for certified seedlings and increased interest of propagators.

Possible solutions in the production of planting materials primarily relate to:

– Help to the producers to locate sites which meet the requirements of isolation for example: the priority should be given to the propagators for the public land lease which meet the

requirements of insulation and is suitable for the seedlings production. Also, help to organize the consortium and common certified stockyards for larger number of propagators;

– Extension of the transition period should be in accordance of the needs and pace of the process of restructuring of nurseries' production from the standard to certified planting materials;

– Organization of the institutional assistance in the procurement of the source stock of planting material for most of the existing nurseries. It is favorable that a Group of Planting Material Producers has recently been formed at the Serbian Chamber of Commerce;

– Adoption of the Law on the Protection of Plant Varieties, membership in the International Organization for the Protection of Plant Varieties (UPOV) and intensive phytosanitary inspection related to planting material propagation of the protected varieties. Traditionally, the fruit varieties of Serbia do not follow the dynamic of changes in the world for new fruit cultivars, which provide better quality, higher degree of resistance to diseases and pests, and the extension of the season**.**

Growing technology

The changes in the cultural technology of fruit production are, primarily, related to the changes in the cropping systems and implementation of new techniques and machinery in the production process, regardless of fruit species. The changes include following:

– Extension of the production season, not only through the variety choice but also growing methods.

– Setting up anti-hail nets in orchards and plantations, to ensure less dependence on weather conditions (at a cost of 8,000 to 15,000 € per hectare, only one destroyed season would be enough to make the investment worthwhile).

– The introduction of new machinery in fruit growing: hammer-type shredders for easy brush removal at the pruning, rotary mowers, and narrow platforms for the box pallets for example.

The integral fruit production could be defined as a production based on the scientific and ecological principles under permanent control. This approach protects the environment from pollution, provides a consumer with healthy products, and at the same time ensures cost-efficient investments for growers (Milić et al., 2010).

Special growing techniques include so-called "ecological" or "organic" or "biological" production. These refer to growing plants using existing soil fertility and available water, the natural properties of plants and animals, increased yields and resistance of plants with prescribed use of fertilizers, pesticides for plant and animal protection according to the international norms. In short, this means that the grower guarantees to the buyer that:

1) synthetic materials or artificial chemicals for soil treatment have not been used in previous three year;

2) farm and production techniques have been controlled at least once a year by an independent agency authorized to issue certificates;

3) the production has only used non-toxic, ecologically friendly methods and materials;

4) the mix of organic and conventional additives in the production is strictly prohibited;

5) the non-toxic means have been used to maintain the equipment,

6) the product have not been exposed to some toxic chemicals during production and handling.

Quality and standardization

The standards provide a simple and effective marketing communication. Standardization helps producers to provide a product that is in demand and gets easily sold and customers to get quality products they want. The Association of large supermarkets introduces the quality standards which production must meet (Dillon and Griffith,2001). The quality standards are related to biochemical characteristics, appearance (weight, color, diameter of fruits) and the presence of hazardous substances such as (nitrates, heavy metals, pesticides residual, phytohormones etc.). The Global-GAP standards are for agricultural production and the Hazard Analysis and Critical Control Points (HACCP) standards are for processing industry. These standards were created as a result of consumers' response to the occurrence of unhealthy food and during the epidemic of livestock diseases (mad cow disease, foot and mouth disease) and fears of the introduction genetically modified foods.

Global-GAP is a standard that covers the main aspects of a production (soil and crop management and harvest), as well as issues of pollution, treatment of labor and environmental protection. This standard follows the production from planting (the origin of seed and history of the soil), through the crop growing (use of herbicides, pesticides and fertilizer- quantity, type, quality, place and method of application), irrigation and harvest (the level of hygiene during the harvest and storage conditions) followed by packaging, and transport to the final destination store shelves.

The Euro-Retailer Produce Working Group (EUREP) provides the framework for development of Good Agricultural Practice (GAP) for plant production (fruits, vegetables, potatoes, lettuce, ornamental flowers and fruit orchards). This framework provides minimum standards which leading European merchants accept in retail. The standard is based on integrated crop management Integral Crop Management (ICM). The ICM requires that crop production must be economically and environmentally sustainable.

Packaging and logistics

The fruit packing should be adequate to protect products from damage during the handling and transport and to preserve product longer in good condition. Given the relatively low unit cost of products, the cost of packaging is a significant portion of a sale price. Also, the proper packaging selection affects the products competitiveness.

Serbia is accustomed to wooden and cardboard packaging. Plastic is also available, mostly imported, while the glass packaging is strictly imported. Proper packaging and labeling is the next important step in the supply chain. It should be noted several common elements of packaging:

1. The buyers require healthy and recyclable packaging. This is particularly important to the biggest fruit consumers. They are also the most concerned about the environmental protection;

2. Variability is another feature of packaging since worldwide packaging standardization still does not exist. There are numerous types of packages which are different for small and large customers, although big carriers still opt for package uniformity;

3. In retail colourfully printed packaging is present with a visible logo which attracts customers and connects with local brand producers;

4. Modern packaging has to be specifically created for each type of fruit to maintain both longest self life and minimize losses and at the same time to accommodate the requirements of customers;

5. Packaging should be practical, with very little free space, so it protects the product from mechanical bruising during transport;

CONCLUSION

Based on the number of bearing trees and realized production in investigated period (2000-2009) in fruit production in Serbia, the most important fruits are plums, apples, and cherries. With an average production of 482,000 tonnes, plums contribute 44.90% of total fruit production followed by apples (19.20%), sour cherries and raspberries with an average share of 7.55% each. The analysis of the investigated period reveals a tendency of the fruit production increase. Trend of increase was especially evident in plum production (rate of change 9.81%), apple (7.42%), apricot (7.31%), peach (6.83%) and cherry (6.64%).

Production of planting material is the backbone for further development of modern fruit growing. Prior to an orchard establishment it is necessary to supply high quality and world renowned planting material. High quality with the state-backed warranty allows that one day we export to selective world market. The introduction of quality standards, especially HACCP and Global-GAP standards provides an important guideline in the development of each farm and processing capacities. At the beginning, the introduction of standards was costly investment, but it is necessary for the future progress of fruit production.

At this time, there is a great opportunity for the adoption of quality production from the choice of certified planting materials and modern variety selections to revolutionize this branch of agriculture. Serbia has many natural advantages for fruit production: the spatial and biological diversity, favorable climate conditions, and our tradition in the fruit production. A considerable interest among fruit farmers, steady government support through incentives and integration through cooperatives (associations) could translate into significant results.

By increasing the quantity and quality of products, the competitiveness of domestic production and development of rural areas would open possibilities for employment increase and improve growers' bottom line. Based on the EU experience, the integration of supply through cooperatives, business associations and the use of financial aids from the state support additional progress.

At the end, investment in equipment for harvesting, sorting and fruit packing, construction of storage and cooling capacities, investment in infrastructure, would allow the creation of new jobs, maintaining rural areas and prevent migration of the population to urban areas.

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