

## POTENTIAL OF FRUIT PRODUCTION IN THE UPPER DANUBE REGION

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### *Abstract*

*This paper includes analysis of used agricultural areas, areas covered with fruit orchards, and areas covered with realized production in the Republic of Serbia, Central Serbia and AP Vojvodina for the period 2007-2010. Data on the fruit production in the municipalities of the Upper Danube were absent due to lack of such indicators (Sombor, Apatin, Bač and Bačka Palanka). Share of area under fruit plantations in the total agricultural area of Serbia is 4.75%, and a particular area amounts to 1.0% of AP Vojvodina, Sombor 0.6%, Apatin 0.5%, Bač 0.3% and Bačka Palanka 1.0% (2010). Regarding the fact that regions of Central and Western Serbia are known as the largest producers and exporters of fruits, three districts: Zlatibor, Morava and Šumadija were particularly analyzed, participating in Serbian total area covered with fruit plantation in 2010 with 25.4%. Analysing the production (yield) of important species of fruit, it was found that the highest yield was achieved with plum and apple, and the lowest with quince. In the period 2007-2009 the fruit trees has constantly increased its yield in Serbia and in the already mentioned lower territorial units. Reaching 2010 yield has dropped significantly, some fruit species has recorded half of yield, which is attributed to the strong influence of climatic factors acting as the primary specificity of practicing agriculture.*

**Key words:** areas under fruit trees, fruit-growing regions, used agricultural areas, yield fruit.

### INTRODUCTION

Republic of Serbia has all the amenities for the rational production of fruit followed by its long tradition. The extremely favorable natural conditions for the production of raspberries, cherries, plums and apples, and other fruit species exists. Areas covered by orchards are insufficient, regarding the fact of our region natural characteristics diversity to freely raise plantations of different fruit depending on its climate, soil and topographic characteristics. Certainly, the best for fruit production are mountainous areas. Growth of the agricultural land percentage under fruit plantations will increase fruit production proportionally, and Serbia can become a serious competitor in the European market. This paper analyzes data on used agricultural land and orchards owned by companies, cooperatives and family farms (2007-2010). The data collected from official statistics (RSO Belgrade - Serbia) show that used agricultural area of 5.051 million ha accounted for 57.13% of the total area of Serbia, and the area under fruit plantations used in agricultural areas with 4.75%. Area under fruit plantations in AP Vojvodina achieved a

7.5% share of the total area under fruit orchards in Serbia, while the share of area under fruit plantations in the total of the used agricultural area of AP Vojvodina represents about 1%. The largest proportion of land covered with fruit is in Šumadija, Morava and Zlatibor District (Central and Western Serbia), representing also the biggest producers and exporters of fruit. Those districts have organized fruit production covering the 61.254 ha, with a share of 25.5% in the total area under orchards of Serbia during 2009, in 2010 with 61.051 ha accounted for 25.4% of the total area under orchards. Consequently, the region of Central and Western Serbia 2010 had 203 ha of orchards or less (- 0.33%) compared to 2009 year. The increase in surface area in 2010 compared to 2007 year has achieved in Šumadija district by 0.5%, while the reduction was achieved in Zlatibor (2.67%) and Morava (3.01%). Data on yield/production of important fruit species were analyzed for the period 2007-2010, indicating that it has increased in the period 2007-2009, and in 2010 a sharp decline was noticed, and regarding certain types of fruit yield was reduced by half. These statements are valid for Serbia and for the AP Vojvodina.

During 2010 the largest producing region of Serbia was covered with plums (426.846 t), apples (239.945 t) and raspberries (83.870 t). That same year, in the municipalities of AP Vojvodina the highest production of apples (104.661 t), plums (46.748 t) and peaches (15.150 t) was recorded. In Serbia, the fruit production is organized mainly on family farms. However, fruit farms are producing enough for their own needs, while increasing the volume of production necessary to introduce new technology. Obstacle intensification of fruit production on farms is reflected in the fragmentation of holdings and lack of motivation for the new technology introduction.

## MATERIAL AND METHOD

The main of this paper is to analyze total of agricultural land in Serbia, AP Vojvodina and municipalities in the Upper Danube (Sombor, Apatin, Bač and Bačka Palanka), determining the share of land under fruit plantation in the mentioned areas, and a summary of the most important fruit yielding species grown in Serbia and AP Vojvodina, for the period 2007-2010. Data were collected using desk research on which the authors give their own view of the potential fruit production and future development directions. A local literature was used and official publications produced by the Statistical Office of Serbia. The available data are presented in tables, processed by mathematical - statistical methods (average value, the relative structure), with the interpretation of the obtained parameters.

## RESULTS AND DISCUSSIONS

**Utilized agricultural area** - Regarding the fact that Serbia has a surface, one may say that it is not fully exploited. This claim is based on available and used data in agricultural areas, with special emphasis on the degree of utilization of the area under fruit plantation. If the percentage of utilization of agricultural land to raise fruit plantations is increased, Serbia could become a serious competitor in the European market.

The largest proportion of land planted by fruit have family farms, and producing to the extent ensure the survival, which is the cause of lack of funding for the introduction of new technologies. These farms mainly need bulking properties and application of modern agricultural methods to increase soil quality and yield [1]. Problems of modern agricultural methods applying squeeze in all aspects of the fruit manipulating organizational process, starting from manufacturer to wholesalers, cold storages, distributors and exporters of fruits [6]. Fruit production per area unit employs about 20 times more labor compared to the production of wheat [2], with 10-15 times more realized value of production.

Participation of used agricultural area (5.051 million ha) in the area of Serbia (88.407 km<sup>2</sup>) is 57.13% [5]. Taking into account the total area under fruit plantations of 240.000 ha, we get a share of 2.71% of total land area or 4.75% of the used agricultural area (2010). That same year, used agricultural area of AP Vojvodina represented a share of 35.33% in used agricultural areas of Serbia. Area under fruit plantations in AP Vojvodina, represents a share of 7.5% in area under fruit orchards of Serbia, while the share of area under fruit plantations in the total of the used agricultural area of AP Vojvodina is approximately 1%. The following table shows the operation data of absolute and relative terms of movement of orchards available in Serbia (*table 1*)

Table 1. The structure of the area under fruit plantation in Serbia 2007-2010

Year	Utilized agricultural land (000 ha)	Orchards land (000 ha)	Percentage in the orchards land of the utilized agricultural area (%)
2007	5.053	240	4,75
2008	5.055	242	4,79
2009	5.058	240	4,74
2010	5.051	240	4,75

Acreage used in Serbia in the observed years has changed, caused by the change of agricultural land use. Therefore, year 2010 records 5.051 million ha of agricultural land, representing 0.04% less comparing to 2007 or total acreage was reduced by 2.000 ha. Areas planted with orchards in the observed years

represented on average about 240.500 ha, and only in 2008 the largest surface area of 242.000 ha was recorded. Comparing the area under orchards with a total agricultural area in the analyzed period, one can notice average share of about 4.7% of orchards. This involvement had the lowest value in 2009 (4.74%) and the highest in 2008 representing (4.79%).

While analyzing the area under fruit plantations at the level of Serbia, it is important to mention the region of Central and Western Serbia, classified as leading manufacturer and exporters of fruits, with emphasis on Šumadija, Morava and Zlatibor District [4]. The significance of the area stems from the fact that these lands are the largest covered by fruits and generate the highest yields. *Figure 1* shows the movements of the area under fruit plantations (in ha) in these districts during the period 2007-2010.

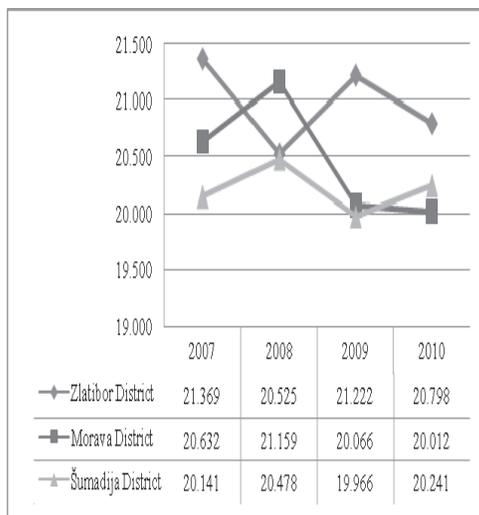


Fig. 1. Areas under fruit plantations (ha) in the three districts of Serbia with the highest share in the total areas of orchards (2007-2010)

Graphic representation of the area under fruit plantation yields indicates that only Šumadija county increased as the area under fruit plantation in 2010 compared to 2009 by 1.38%, while the Zlatibor district has decreased by 2% and Morava district by 0.27%. Comparing 2010 to 2007 year, Šumadija District retained the upward trend in the area by 0.5%, while in the Zlatibor District there was a decrease by 2.67% and 3.01% in Morava. These districts in 2010 had fruit production organized on the 61.051

ha, with a share of 25.4% in the total area under orchards of Serbia. In 2009, a total of 240.000 ha of orchards in Serbia, Central Serbia accounted for 222.000 ha, representing 92.5% of total area under orchards, and Districts with 61.254 ha accounted for 25.5% of the total area under orchards. In 2008 year, in a total of 242.000 ha of orchards in Serbia, Central Serbia accounted for 219.757 ha, accounting for 90.81% of the total area under orchards, and Districts with 62.162 ha accounted for 25.69% of the total area under orchards. In 2007 year, in a total of 240.000 ha of orchards in Serbia, Central Serbia accounted for 222.044 ha, accounting for 92.52% of the total area under orchards, and Districts with 62.142 ha accounted for 25.89% of the total area under fruits. In Šumadija District (2010), the largest area of orchards belonging to the City of Kragujevac had occupy 6.761 ha or 33.4%. In Morava District the largest area of orchards belong to the City of Čacak and occupy 6.892 ha, accounted for 34.4%. Zlatibor District has its largest area of orchards in the City of Užice occupying 3.700 ha or 17.79%. Objectively speaking, the leading producers of fruit originate from the region of West and Central Serbia, with the largest share of Zlatibor, Morava and Šumadija District.

After displaying situation of area under fruit plantations in Central and Western Serbia, it is important to mention the participation of this area in AP Vojvodina, where administratively and territorially above mentioned municipalities of the Upper Danube: Apatin, Bač, Bačka Palanka and the City of Sombor belong. The average share of agricultural used areas of AP Vojvodina in Serbian total of used agricultural area is about 35%. The average share of area under fruit plantations of AP Vojvodina in the area under fruit orchards of Serbia represents approximately 7.5%, where the average area is 17.990 ha of fruit plantations. The following table (*Table 2*) gives a fuller examination of used agricultural land and land under fruit plantations in Serbia, AP Vojvodina and these municipalities of the Upper Danube, also and the participation of area under fruit plantations in the used agricultural area in the period 2007 - 2010.

Table 2. Share of area under orchards (%) in the used agricultural areas by territories (2007-2010)

Territory	Utilized agricultural land (ha)	Orchards land (ha)	Percentage (%)	Utilized agricultural land (ha)	Orchards land (ha)	Percentage (%)
	2007			2008		
Srbija*	5.053.000	240.000	4,75	5.055.000	242.000	4,79
AP Vojvodina	1.747.441	17.555	1,0	1.781.253	18.578	1,0
Sombor	99.020	685	0,7	100.846	700	0,7
Apatin	22.577	117	0,5	24.541	119	0,5
Bač	25.842	67	0,3	26.314	61	0,2
Bačka Palanka	46.697	291	0,6	47.905	1.333	2,8
	2009			2010		
Srbija*	5.058.000	240.000	4,74	5.051.000	240.000	4,75
AP Vojvodina	1.780.756	17.833	1,0	1.784.352	17.994	1,0
Sombor	100.730	670	0,7	101.612	628	0,6
Apatin	24.618	124	0,5	24.479	124	0,5
Bač	26.228	68	0,3	26.899	75	0,3
Bačka Palanka	46.816	369	0,8	48.281	490	1,0

Used agricultural land and orchards in the municipalities of AP Vojvodina Upper Danube differently range by years. One of the factors of reduction/increase in area under orchards and changes is land use. This depth of analysis lies in determining the average value of their land, as well as participation in area under orchards total of the used agricultural area. Table view shows the oscillations of used agricultural land in the municipalities. Measured in relative terms, this land in 2010 (the highest value of the analyzed time series) increased by 2.11% compared to 2007 (the lowest value of the analyzed time series), while the absolute figures show an increase of 36.911 ha. Therefore, the average acreage used for AP Vojvodina is 1.773.451 ha and in the municipalities: City of Sombor 100.552 ha, Apatin 24.054 ha, Bač 26.321 ha and Bačka Palanka 47.425 ha. Oscillations are visible regarding the area under fruit plantation. Participation of orchards in AP Vojvodina in the total agricultural area in the analyzed years is about 1%. The relative value of increased area under fruit plantation in the municipalities in 2010 (17.994 ha) compared to 2007 (17.555 ha) was 1.58%, ie. absolute increase is 278 ha. However, in 2010 the area under orchards was lower by 3.14% (745 ha) compared to 2008, when it was the largest area (18.578 ha). The average area under fruit plantation in AP Vojvodina is 17.990 ha, and

observed by the municipalities: City of Sombor 670.75 ha, Apatin 121 ha, Bač 67.75 ha and Bačka Palanka 620.75 ha. The following table (Table 3) shows the share of area under fruit orchards in the municipalities of the Upper Danube in the total area under orchards in AP Vojvodina in the period 2007-2010.

Table 3. Share of area under fruit orchards (%) in the municipalities of the Upper Danube in the total area under fruit plantations of AP Vojvodina (2007-2010)

Year	2007		2008		2009		2010	
	Area (ha)	Percentage (%)						
Territory								
AP Vojvodina	17.555	-	18.578	-	17.833	-	17.994	-
Sombor	685	3,90	700	3,77	670	3,76	628	3,49
Apatin	117	0,67	119	0,64	124	0,70	124	0,69
Bač	67	0,38	61	0,33	68	0,38	75	0,42
Bačka Palanka	291	1,66	1.333	7,17	369	2,07	490	2,72

Table 3 provides greater visibility of participation area under fruit orchards in the municipalities of the Upper Danube in the total area under fruit plantations of AP Vojvodina. During the observed four-year period Sombor has achieved average percentage of the fruit orchards of 3.73% in area planted by fruit in AP Vojvodina, Apatin 0.68%, 0.38% and Bač and Bačka Palanka 3.41%. Of course, the obligation to preserve the existing area under fruit plantations is imposed, with the possible increase, not allowing further decline and fragmentation of land. Primarily, to consider further sustainability of farms / producers must be aware of strategic importance for the future development of agriculture of AP Vojvodina, which is consequently reflected in the development of agriculture in Serbia.

**The yield of the major types of fruit** - Fruit production potential of Serbia, Central Serbia and AP Vojvodina were analyzed in terms of actual yield (manufacture) of the most important fruit species [7]. Figure 2 shows the total production of major species of fruit in Serbia in the period 2007-2010.

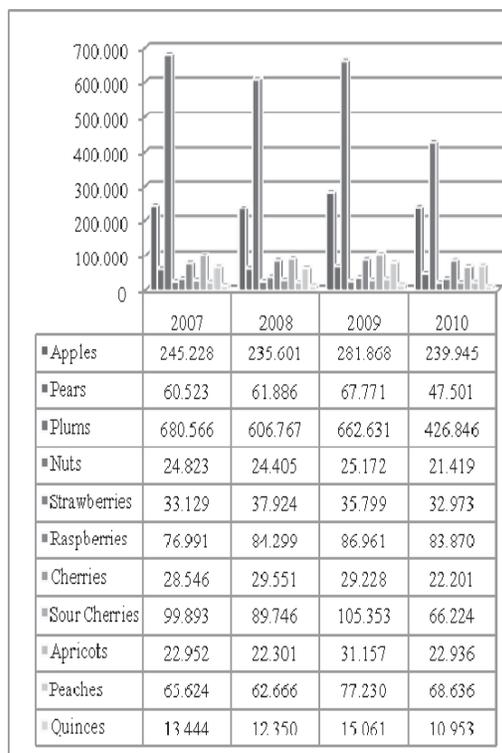


Fig. 2. Total yield (t) of principal fruits grown in Serbia in the period 2007-2010

Figure 2 graphically and in tabular form indicate that the fluctuations in the realized yield / production are expressed in all types of fruit and none has achieved a constant growth, which may be attributable to the impact of weather conditions (drought, the hail) in fruit production due to lack of modern anti-hail protection systems of drip irrigation as well as late spring frosts. Production was generally on the rise in the period of 2007 - 2009, and in 2010 showing a sharp decline in production volume. Yield increase in 2010 compared to 2007 was realized only 8.93% for raspberries and 4.59% for peaches. The reason for the production reduction may be a change of areas use for the fruit production or the reorientation of production to another type of fruit. Considering only year of 2010, the highest yields were obtained in the production of plums (426.846 t), followed by apples (239.945 t) and raspberries (83.870 t) and lowest is the production of quinces (10.953 t). *Figure 3* shows the total yield of important fruit species (in t) in Central Serbia in the period 2007-2010.

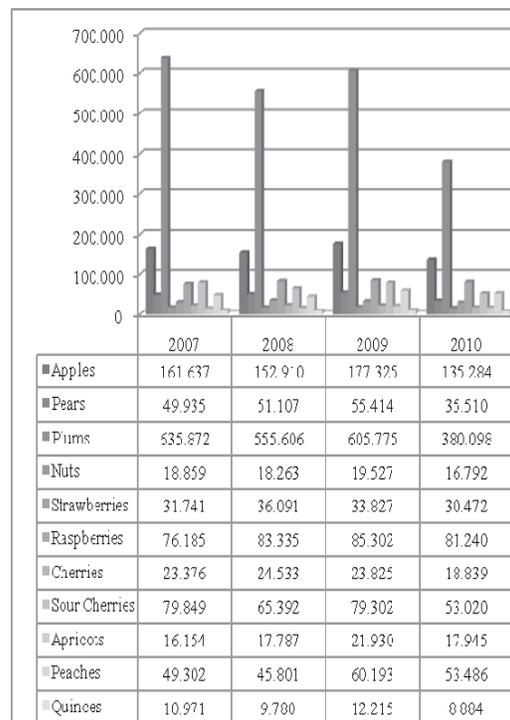


Fig. 3. Total yield (t) of principal fruits grown in Central Serbia in the period 2007-2010

Figure 3 represents the yields in Central Serbia decreased in 2010 compared to 2007 for all types of fruit. The deviation was found only in raspberries, apricots and peaches. Raspberries yield was increased by 6.64%, apricots 11.09% and peaches to 8.49%. In 2010, the highest yields were obtained in the production of plums (380.098 t), apples (135.284 t) and raspberries (81.240 t) and lowest in the production of quinces (8.884 t). In *Figure 4* the total yield of important fruit species was presented in the territory of AP Vojvodina in the period 2007-2010.

Analyzing yield of important fruit species in AP Vojvodina an identical trend as the entire territory of Serbia might be observed. In the period of 2007-2009 production was generally moving upward, in spite that 2010 saw a sharp decline in the genus. The upward trend in the four-year period took place only in strawberries and raspberries. Yield of strawberries in 2010 compared to 2007 increased by 80.19%, ie. by 1.8 times, and raspberries to 226.3%, ie. to 3.26 times. Regarding the 2010, the highest yield was of apples (104.661 t), plums (46.748 t) and peaches (15.150 t), while the lowest production achieved quinces (2.069 t).

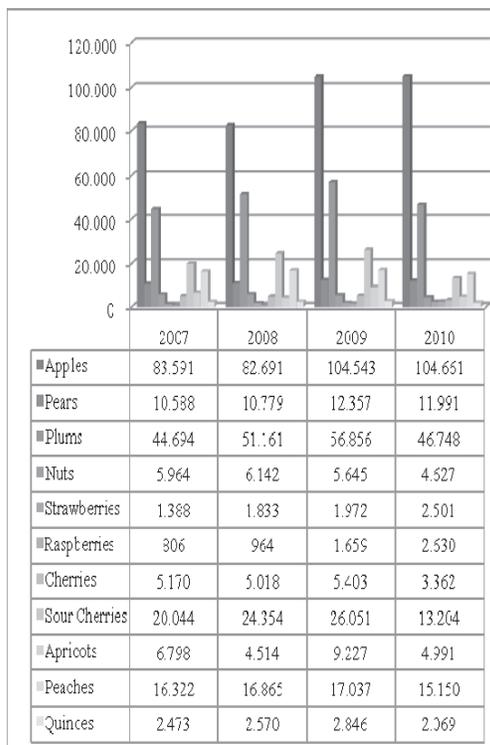


Fig. 4. Total yield (t) of principal fruits grown in AP Vojvodina in the period 2007-2010

The yield of the remaining fruit species is not to ignore, both in Serbia and AP Vojvodina, because their volume forming the structure of fruit production. The structure of fruit production in Serbia depends on the smallest territorial units (in this case the municipalities of the Upper Danube) that make participation in the structure of fruit production of AP Vojvodina and finally Serbia.

On the next chart the participation of Central Serbia and AP Vojvodina in Serbian total fruit production in 2010 will be shown.

Analyzing only the year of 2010, *Figure 5* indicates that the region of Central Serbia in total Serbian realized fruit production accounts for over 70% (except in the production of apples 56.38%). Central Serbia achieved the highest share in the production of raspberries (96.86%), while the AP Vojvodina accounts for only 3.14%. In addition to raspberries, there is an obvious representation of the region in strawberries production (92.41%), representing a proportion of AP Vojvodina with 7.5%. The significance of the site is in production of cherries (84.86%) and the percentage of AP Vojvodina is 15.14%.

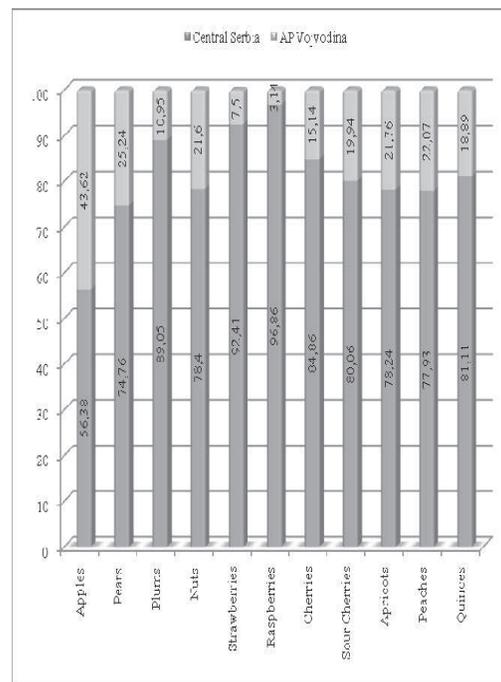


Fig. 5. The share of fruit production (%) in Central Serbia and AP Vojvodina in the total production of fruits in Serbia in 2010

The smallest representation of Central Serbia is reflected in the production of apples, with the participation of 56.38%, while AP Vojvodina covers 43.52% of the maximum achieved in the produced fruit species.

## CONCLUSIONS

Regarding the potential that Serbia has in the amount of arable land, it may be underlined that they are not fully exploited. Although the growing of fruit reaches 10-15 times the value of production per hectare comparing to the production of wheat and corn, fruit production was not represented sufficiently. Share of area under fruit crops in total agricultural land is changed by particular years. One of the factors of orchards representation is change of use of the land on which the fruit is grown by then, due to the reorientation of producers in other lines of production or plant fruits. Undeniable fact is that West and Central Serbia has the largest area of orchards; achieve maximum fruit production, and also have the largest share in the actual production.

Fruit production in Serbia is characterized by unfavorable structure of fruit species,

significant amortization of fruit plantations, unfavorable utilization of processing capacity, inconsistent with the needs of the varieties of processing and exporting fresh fruit and processed fruit, reduction or stagnation in the number of fruit trees and lack of organization and production plants, with pronounced reduction in the fragmentation of production plants [3].

Fertility of the most important fruit species grown in Serbia augmented in the period 2007-2009. However, due to the lack of organized and planned production there was a hyper production, which creates a higher offer than demand. Already, in 2010 yield has dropped significantly, in some fruits even halved, which is attributed to the strong influence of climatic factors acting as the primary specificity of practicing agriculture. Fruit production is organized mainly on family farms. However, fruit farms are producing only for their own needs, while increasing the volume of production necessary to introduce new technology. Obstacle intensification of fruit production on farms is reflected in the fragmentation of holdings and lack of motivation for the introduction of new technology. Exploitation of fruit plantations last few decades, and is fully justified to say that it is the most profitable branch of plant production.

The basic postulate of increasing fruit production is the increase in area under fruit plantations. Since not all farms are able to invest the accumulated funds in rising new or expansion of existing plants and production capacity, the greater necessary budget allocations are. The current support of the Ministry of Agriculture to fruit production includes the payment of funds for subsidizing crop insurance, fruits, nursery and young orchard [8]. Part of incentives to improve fruit production, manufacturers can achieve by applying regulations to support rural development through investments in manufacturing and marketing of fruits and regulations for the use of incentives to raise production orchards of fruit trees. However, due to fragmentation of land recourses those individual producers are getting scarce,

although the subsidies covered all types of expenditure. Of course, it is necessary to harmonize the views of the Ministry of Agriculture, Trade, Forestry and Water Management of Republic of Serbia with regional chambers of commerce, Associations, Societies and finally agricultural advisers who receive direct contact with producers on farms. Adequate and timely implementation of these regulations by the manufacturer can gradually improve the situation in fruit growing to the mutual satisfaction of the producers and the state.

## ACKNOWLEDGEMENTS

Paper work is part of the project research 46006 “Sustainable agriculture and rural development in function of Republic of Serbia strategic goals achievement within the Danube region” financed by the Ministry of Education and Science Republic of Serbia.

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