

BUSINESS RESULTS CHANGE UNDER EFFECTS OF FARM SIZE AND DEGREE OF PRODUCTION SPECIALIZATION

Lj. Bastajić¹

Abstract: The study was conducted with the objective of analyzing the economic effects provoked by the change in farm size, depending on the degree of production specialization (questionnaires encompassing 30 farms of different size were used) using comparative analysis, regression analysis, correlation analysis and production function analysis. Research comprised essential parameters of business conditions on the farms and results of their business. The farms analyzed were classified according to the size of used cultivable land and degree of production specialization.

In both farm groups, with different degrees of production specialization, the indices of business results were found to rise with size increase and were noticed to be the most favorable in the case of over 10 ha-farms. Comparing farms of identical size but of different degree of specialization, the following may be concluded: more favorable business results were achieved on farms with higher degree of specialization.

Key words: farm size, cultivable land, business conditions and results, degree of specialization.

I n t r o d u c t i o n

In the Serbian agriculture structure farms have the biggest production capacity of cultivable land and livestock number. The farms differ between themselves as to production type, production intensity, livestock availability, labor availability, degree of market production, size of used cultivable land and degree of production specialization.

¹ Ljubomir Bastajić, M.Sc., Assistant, Faculty of Agriculture, 11081 Belgrade-Zemun, Nemanjina 6, Serbia and Montenegro

The size of used cultivable land is used in most researches as an indicator of farm size. Bogavac Violeta and Krstić (1997) studying farm size and transition process, mentioned that one of the important factors that generally influence the success, even in the transition process, is the size of the organizational unit in agriculture. Bukorović et al. (1988), among other things, concluded that with the increase of the farm size, the number of family members and fixed assets value per farm grow. Researching the farm models oriented to livestock production, Krstić et al. (1995) concluded that larger farms produce better economic business results.

The specialization of agricultural production represents the process of production orientation from wide to less wide by selection, but larger in quantity and better in quality, with the purpose of achieving better economic effect. Bajcetić (1985) mentioned that the specialization of agricultural production represents orientation of production unit to a smaller number of products and a smaller number of production lines, where the largest distribution have products that utilize to the maximum natural and economic conditions of the environment.

Materials and Methods

To be able to visualize the economic effects of farm size change depending on degree of production specialization, we conducted a detailed poll research on 30 farms of different sizes, oriented to pig or cattle breeding. Research comprised essential indices of business conditions on the farms and results of their business: family members and their work on the farms, land used per farm and family member, sowing structure, farm supply with means of production, livestock availability on the farms, accomplished production, value, structure and market of agricultural production, and farms' business results.

The degree of specialization of agricultural production is defined by the number and value of final production of individual production on the farm, in total value of final farm production. To calculate the degree of production specialization, we used the production variety index calculated by the following formula:

$$Ir = \frac{100^2}{a_1^2 + a_2^2 + a_3^2 + \dots + a_n^2}$$

where: Ir - production variety index,

$a_1^2 \dots a_n^2$ - square of proportional participation of final production value of individual productions in total value of final farm production.

Based on the established indexes of business conditions and results, considering the degree of production specialization, there are two types of farms:

- farms with higher degree of specialization (Degree 1), and
- farms with lower degree of specialization (Degree 2).

Between the two types of farms the influence of farm size change on business conditions and results was established, as well as the optimal farm size, competitiveness between farms was observed. The methods of comparative analysis, regression analysis, correlation analysis and production function analysis have been used for data processing. Comparing of business results of different farm sizes but of the same type and comparing of business results of the farms of identical size but of different type was done by the method of comparative analysis. Regression analysis was used to determine the type of the production function that best indicates dependency of business results change on the size of used cultivable land. Correlation analysis was used for determining the dependency of business results on the farm size change. With graph presentation of square function, the marginal analyses were performed, calculating the total, average and limit function values and elasticity coefficient.

Results and Discussion

With the increase of the size of used cultivable land, farms of both degrees of specialization produce greater yields of the most frequently used field crops, and they are the greatest in farm size groups over 8 ha (table 1). Comparing the yields of the same-size farms but of different degree of specialization, one can see that the yields are once greater in Degree 1 farms and the next time in Degree 2 farms. That means that degree of farm specialization does not influence the yield of field crops.

Liveweight gain of basic livestock species and total liveweight gain on farms of both degrees of specialization, with the increase of farm size, have growing trend. Comparing the farms of the same size but of different degree of specialization, one can see that Degree 1 farms make higher pig live weight gain, and Degree 2 farms higher cattle liveweight gain (except 8-10 ha-farms), which indicates that specialized farms are oriented to pig production and farms with a greater variety are oriented to cattle production.

Degree 1 farms of adequate size make higher pig liveweight gain per sow (except farms over 10 ha) and higher cattle liveweight gain per cow (except farms up to 3 ha and 5-8 ha farms). Higher total liveweight gain and liveweight gain per ha of cultivable land have the Degree 1 farms of adequate size (except 5-8 ha farms).

T a b. 1. - Production achieved

Indices	Cultivable land (ha)					Average
	up to 3	3 to 5	5 to 8	8 to 10	over 10	
Farms with higher degree of specialization – Degree 1						
I Field crop production (t/ha)						
1. Wheat	4.16	4.02	3.56	4.01	4.20	3.96
2. Maize	3.12	3.92	4.44	6.36	3.71	4.20
3. Sugar beet	-	-	30.49	-	-	30.49
4. Peppers	-	10.50	30.00	33.33	47.06	26.28
5. Water melon	-	-	11.81	27.78	13.64	16.26
6. Alfalfa (hay)	0.97	5.68	4.57	6.90	6.66	5.31
II Livestock breeding						
1. Milk (l): per farm	910	2062	7380	10290	3625	4555
per cow	2730	3112	3790	2940	2312	3099
2. Liveweight gain (kg): pigs	1828	2428	2926	2425	6270	2953
cattle	70	364	1221	1865	670	775
other animals	96	130	172	280	205	164
total	1994	2922	4319	4570	7145	3892
3. Milk per ha of cultivable land (l)	327	455	1004	1050	304	689
4. Live weight gain (kg): pigs per sow	1428	503	804	1470	631	673
cattle per cow	212	467	798	533	356	554
5. Liveweight gain per ha of cultivable land (kg)	717	645	588	466	600	589
Farms with lower degree of specialization – Degree 2						
I Field crop production (t/ha)						
1. Wheat	4.08	3.34	4.52	5.04	3.67	4.19
2. Maize	3.46	4.04	4.45	5.92	3.48	4.33
3. Sugar beet	-	-	51.00	26.67	42.73	41.17
4. Peppers	-	16.90	12.00	33.33	48.25	25.47
5. Water melon	-	-	-	12.74	16.94	14.14
6. Alfalfa (hay)	3.60	2.30	5.87	6.30	7.78	5.56
II Livestock breeding						
1. Milk (l): per farm	1433	-	450	4410	7485	3519
per cow	2150	-	3150	3176	4162	3346
2. Liveweight gain (kg): pigs	448	1141	2739	1699	2694	1778
cattle	310	740	1674	1292	1124	1028
other animals	118	70	183	400	432	280
total	876	1951	4596	3391	4250	3086
3. Milk per ha of cultivable land (l)	506	-	66	505	689	485
4. Liveweight gain (kg): pigs per sow	364	429	330	1348	1480	703
cattle per cow	463	-	10462	442	313	1008
5. Liveweight gain per ha of cultivable land (kg)	310	483	670	388	391	426

With the increase of used cultivable land size, farms with specialized production have increasing business results, above all the final production value and farm income (table 2). Farms with the largest size of used cultivable land produce the best results. External material costs and depreciation are also higher with the increase of the size of used cultivable land and are the highest in group of 8-10 ha-farm size, and then tend to fall.

T a b. 2. - Business results and costs

Indices	Cultivable land (ha)					Average
	up to 3	3 to 5	5 to 8	8 to 10	over 10	
Farms with higher degree of specialization – Degree 1						
1. Number of farms per group	3	4	4	2	2	3.00
2. Final production value (000 dinars)	43.00	70.08	118.90	147.14	190.69	104.04
3. External material costs and depreciation (000 dinars)	15.78	30.44	58.41	89.04	88.01	50.46
4. Farm income (000 dinars)	27.22	39.64	60.49	58.10	102.68	53.58
5. Off-farm income (000 dinars)	29.82	30.39	10.64	1.62	3.25	17.55
6. Total income (000 dinars)	57.04	70.03	71.13	59.72	105.93	71.13
7. Final production value (d):						
per 100 d of costs	272.50	230.22	203.56	165.25	216.67	206.18
per 100 dinars of fixed assets	29.94	31.85	27.39	20.50	28.00	26.70
8. Farm income per 100 d of costs (d)	172.50	130.22	103.56	65.25	116.67	106.18
9. Farm income (000 d):						
per ha of cultivable land	9.79	8.75	8.23	5.93	8.62	8.11
per active household member	9.07	13.21	24.20	23.24	29.34	18.67
Farms with lower degree of specialization – Degree 2						
1. Number of farms per group	3	2	3	4	4	3.00
2. Final production value (000 d)	32.74	68.52	108.16	129.75	162.77	108.11
3. External material costs and depreciation (000 d)	24.48	39.57	66.86	60.72	73.69	55.00
4. Farm income (000 d)	8.26	28.95	41.30	69.03	88.81	53.11
5. Off-farm income (000 d)	32.57	21.60	43.70	34.07	15.12	28.34
6. Total income (000 d)	40.83	50.55	85.00	103.10	103.93	81.45
7. Final production value (d):						
per 100 d of costs	133.74	173.16	161.77	213.69	220.08	196.56
per 100 d of fixed assets	16.02	29.92	36.31	28.88	35.50	30.61
8. Farm income per 100 d of costs (d)	33.74	73.16	61.77	113.69	120.08	96.56
9. Farm income (000 d):						
per ha of cultivable land	2.92	7.17	6.02	7.91	8.17	7.33
per active household member	3.55	11.58	13.77	17.26	29.60	17.30

Farm groups with a small size of used cultivable land (up to 3 ha and 3-5 ha), because of insufficient income made by household members on farms, are forced to earn the greater share of total income by off-farm work. In the case of the farms' size over 8 ha, off-farm income have irrelevant share in total income.

With the increase of the size of used cultivable land, the final production value per 100 d of costs and farm income per 100 d of costs tend to decline and are the lowest on the 8-10 ha-farms, and then start to rise. The trend of the final production value per 100 d of fixed assets tend to oscillate highly with the increase of the farm size, which means that the size of used cultivable land does not have big influence on this parameter.

With the increase of the farm size, farm income per ha of cultivable land has a slight tendency to decline, while farm income per active household member has significant rising trend.

In the case of the farms with various production, the final production value, external material costs and depreciation, farm income tends to rise with the increase of the cultivable land size and is the highest in the group of farms over 10 ha in size. Because of the low farm income, all farm groups are forced to look for other sources of income, their household members working off-farm. Additional sources of income, in group of farms up to 3 ha and group of 5-8 ha-farms, make 50% of total income.

Final production value per 100 d of cost and farm income per 100 d of costs with the increase of the farm size have a rising trend and are the highest in the group of farms over 10 ha in size. Final production value per 100 d of fixed assets rises up to a group of 5-8 ha farms and then slowly declines.

Farm income per ha of cultivable land and farm income per active household member were rising with the size increase of cultivable land and are the highest in farms over 10 ha in size.

A comparison of the groups of the same-size farms but of different degree of specialization showed that Degree 1 farms have higher final production value and higher farm income (except for 8-10 ha farms). External material costs and depreciation are lower in smaller Degree 1 farms (up to 3 ha, 3-5 ha, and 5-8 ha) and in larger Degree 2 farms (8-10 ha and over 10 ha). Although groups of Degree 2 farms make higher off-farm income (except for 3-5 ha farms) total income of Degree 1 farms (except for 5-8 ha and 8-10 ha farms) is still higher.

In farms with specialized production, final production value per 100 d of costs and farm income per 100 d of costs tend to decline with the farm size increase, while in the case of the farms with various types of production these parameters tend to rise. Regardless of manifested trend, the values of observed parameters are higher for smaller Degree 1 farms (up to 3 ha, 3-5 ha and 5-8 ha) and for larger Degree 2 farms (8-10 ha and over 10 ha).

Observed by ha of cultivable land, higher farm income has the same-size Degree 1 farms (except for 8-10 ha farms). Degree 1 farms (except for those over 10 ha) make higher farm income per active household member too.

It can be concluded that with the farm size increase the parameters of business success for farms of both degrees of specialization rise and in most cases are the highest in over-10 ha-farms. If we compare the groups of the same-size farms but of different degree of specialization, we can see that better business results in absolute and relative amount make specialized farms. Studying the influence of farm type on economic result, Arsenović (1998.) concluded that Type 1 farms (vegetables) have significant advantage over Type 2 farms (wheat and livestock products) and Type 3 farms (tobacco). Type 1 farms, besides higher production intensity level and higher market degree, also had higher degree of specialization.

In the case of Degree 1 farms, only the farm income per active household member shows very strong correlation dependency towards the change of used cultivable land size (table 3). The rest of the analyzed parameters manifest a medium correlation. In the case of Degree 1 farms there was a strong correlation between farm size change and farm income per active household member. Final production value per 100 d of costs shows strong correlation but final production value per 100 d of fixed assets and farm income per ha of cultivable land show medium correlation. The conclusion, which tends to emerge, is that in most cases the correlation ratio is higher in Degree 2 farms, which means that observed business result parameters on farms with various types of production depend more on the size of used cultivable land.

T a b. 3. - Effect of the size of used cultivable land on business results

Indices	Correlation coefficient	Function type
Farms with higher degree of specialization – Degree 1		
1. Final production value (d): per 100 d of costs	0.72	$y=2.5254x^2-44.472x+379.42$
per 100 d of fixed assets	0.60	$y=0.1409x^2-2.7487x+38.51$
2. Farm income (000 d): per ha of cultivable land	0.58	$y=0.0809x^2-1.4075x+13.32$
per active household member	0.96	$y=4.0519x^{0.8077}$
Farms with lower degree of specialization – Degree 2		
1. Final production value (d): per 100 d of costs	0.90	$y=0.0833x^2+8.7369x+117.82$
per 100 d of fixed assets	0.71	$y=-0.4652x^2+8.0338x+0.4977$
2. Farm income (000 d): per ha of cultivable land	0.77	$y=3.1477\ln(x)+0.8257$
per active household member	0.94	$y=0.2143x^2-0.175x+4.9291$

In the case of farms with specialized production observed business result parameters start to increase when farms reach adequate size, or have permanent rising trend. Final production value per 100 d of costs, final production value per 100 d of fixed assets and farm income per ha of cultivable land, have a rising trend only when they reach the size of 8.80 ha, 9.75 ha and 8.70 ha of cultivable land (figs. 1 to 3). If we evaluate farm managing only through these parameters,

that would mean that specialized production gives positive economic effects only when farms reach the size of 9 ha or over 9 ha. Farm income per active household member has a permanent rising trend with the increase of farm size (fig. 4).

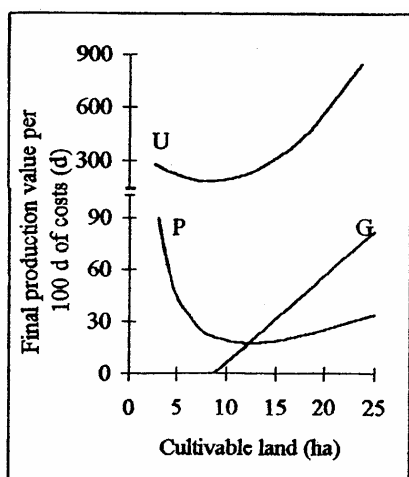


Fig. 1.- Effect of the size of cultivable land used on the final production value per 100 d of costs of Degree 1 farms

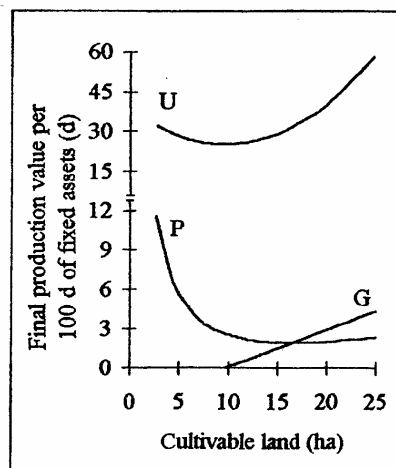


Fig. 2. - Effect of the size of cultivable land used on the final production per 100 d of fixed assets of Degree 1 farms

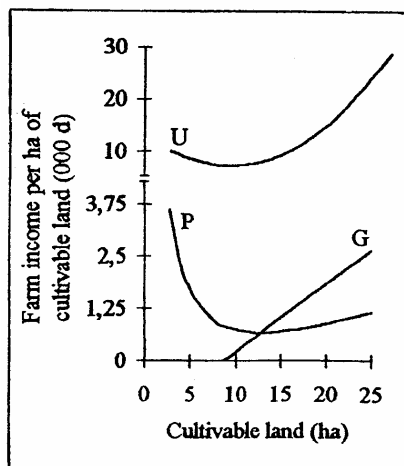


Fig. 3.- Effect of the size of cultivable land used on farm income per ha of cultivable land of Degree 1 farms

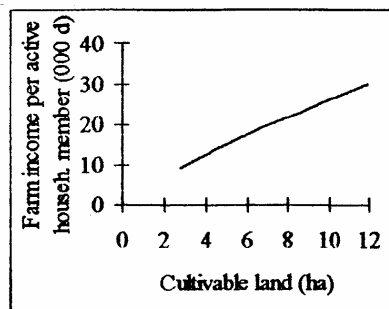


Fig. 4. - Effect of the size of cultivable land used on farm income per active household member of Degree 1 farms

In the case of farms with various types of production, final production value per 100 d of costs has a permanent rising trend with the increase of the size of used cultivable land (fig. 5). Final production value per 100 d of fixed assets with

the increase of farm size has a rising trend up to the farm size of 8.63 ha, then it decreases (fig. 6). That can be explained by the fact that farms of 5-8 ha in size have the greatest final production value per 100 d fixed assets, which is by 26% higher than in farms of 8-10 ha in size. Farm income per ha of cultivable land and farm income per active household member also has a rising trend (figs. 7 and 8).

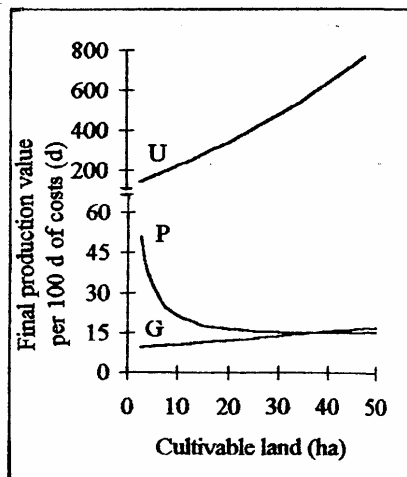


Fig. 5.- Effect of the size of cultivable land used on the final production value per 100 d of costs of Degree 2 farms

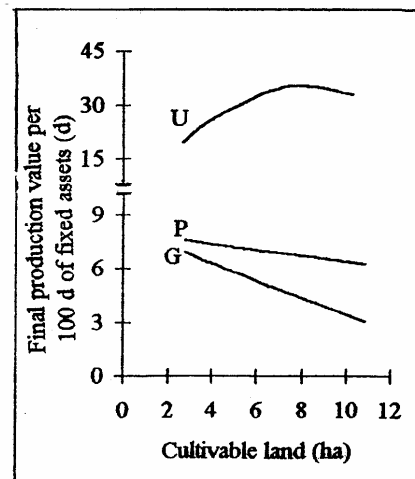


Fig. 6. – Effect of the size of cultivable land used on the final production value per 100 d of fixed assets of Degree 2 farms

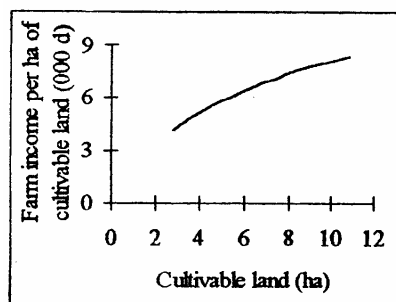


Fig. 7.- Effect of the size of cultivable land used on farm income per ha of cultivable land of Degree 2 farms

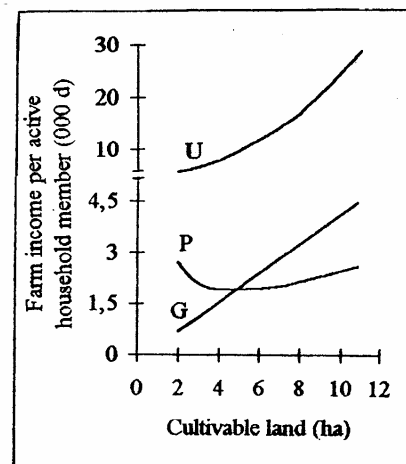


Fig. 8. – Effect of the size of cultivable land used on farm income per active household member of Degree 2 farms

Farms with higher degree of specialization make higher total, final and partially market production values, in total amount and per ha of cultivable land, compared to the same-size farms but lower degree of specialization. More specialized farms make higher final production values per 100 d of costs and final production value per 100 d of fixed assets (except for 8-10 ha-farms and over 10 ha-farms) than less specialized farms. Farm income per 100 d of costs is higher in Degree 1 farms of adequate size (except for 8-10 ha-farms and over 10 ha-farms). Also, farm income per ha of cultivable land and farm income per active household member is higher in adequate size farms that are more specialized.

Mirić (1968) gives numerous reasons in favor of specialization and others in favor of various types of production. The main reasons reported in favor of production specialization are natural conditions, better trained personnel, nearness of large personnel manufacturing facilities, changes in market demands, economic policy steps, and state of traffic. Reasons reported in favor of various productions are natural conditions, nearness of large consumer centers, removing or decreasing of seasons' influence on agricultural production, the acceleration of turnover of the capital, lowering the risk of production, and market changes. Arsenović and Krstić (2002) found out that orientation to specialized production on polled farms in Semberija gives better business results.

The conclusion is that in the existing socio-economic conditions in the given region, better business results are achieved by adequate-size-farms, which have specialized production. Viewed over the long term, should we plan specialized or various types of production, we can not give a precise answer because a great number of factors influence farm business, which in the existing circumstances can not always be anticipated.

C o n c l u s i o n

Farms in Serbian agricultural production structure have the greatest production capacities. Farms alone differ among themselves (besides other things) in size of used cultivable land and in degree of production specialization.

It has been found that farms with higher degree of specialization have decreasing relative business result parameters with the farm size increase (final production value per 100 d of costs and farm income per 100 d of costs), while farms with lower degree of specialization have increasing parameters.

Comparing the same-size farms of different degree of specialization, it has been found that Degree 1 farms in most cases have higher values of business result parameters in absolute and relative amount. In the existing socio-economic conditions better business results are produced by farms that have specialized production than same-size farms with various types of production.

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PROMENA POSLOVNIH REZULTATA POD UTICAJEM VELIČINE
GAZDINSTVA I STEPENA SPECIJALIZACIJE PROIZVODNJE

Lj. Bastajić¹

R e z i m e

Zemljoradnička gazdinstva u Srbiji u strukturi poljoprivredne proizvodnje raspolazu sa najvećim proizvodnim kapacitetima. Sama gazdinstva se izmedju ostalog razlikuju i po veličini korišćenog obradivog zemljišta i po stepenu specijalizacije proizvodnje.

Istraživanje ekonomskih efekata promene veličine gazdinstava u zavisnosti od stepena specijalizacije proizvodnje izvršeno je na bazi anketom obuhvaćenih 30 zemljoradničkih gazdinstava različite veličine, preko metoda uporedne analize, regresione analize, korelacione analize i analize proizvodne funkcije.

¹ Mr Ljubomir Bastajić, asistent, Poljoprivredni fakultet, 11081 Beograd-Zemun, Nemanjina 6, Srbija i Crna Gora

Istraživanjem su obuhvaćeni najvažniji pokazatelji uslova i rezultata poslovanja gazdinstava. Gazdinstva su klasifikovana prema veličini korišćenog obradivog zemljišta i prema stepenu specijalizacije proizvodnje.

Kod gazdinstava većeg stepena specijalizacije sa povećanjem veličine gazdinstva dolazi do smanjenja relativnih pokazatelja rezultata poslovanja (vrednost finalne proizvodnje na 100 d troškova i dohodak gazdinstva na 100 d troškova), dok kod gazdinstava manjeg stepena specijalizacije ovi pokazatelji rastu.

Poredjenjem gazdinstava iste veličine, a različitog stepena specijalizacije, utvrđeno je da gazdinstva stepena 1 u većini slučajeva imaju veće vrednosti pokazatelja rezultata poslovanja u apsolutnom i relativnom iznosu. Može se reći da u postojećim društveno-ekonomskim uslovima bolje rezultate poslovanja ostvaruju gazdinstva koja imaju specijalizovanu proizvodnju u odnosu na gazdinstva iste veličine koja imaju raznovrsnu proizvodnju.

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