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Economic analysis of specialized dairy farms in Croatia according to FADN

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Vesna Očić, Branka Šakić Bobić, Zoran Grgić*

University of Zagreb Faculty of Agriculture, Department of Management and Rural Entrepreneurship, Svetošimunska 25, 10000 Zagreb, Croatia

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*Corresponding author: bsakic@agr.hr

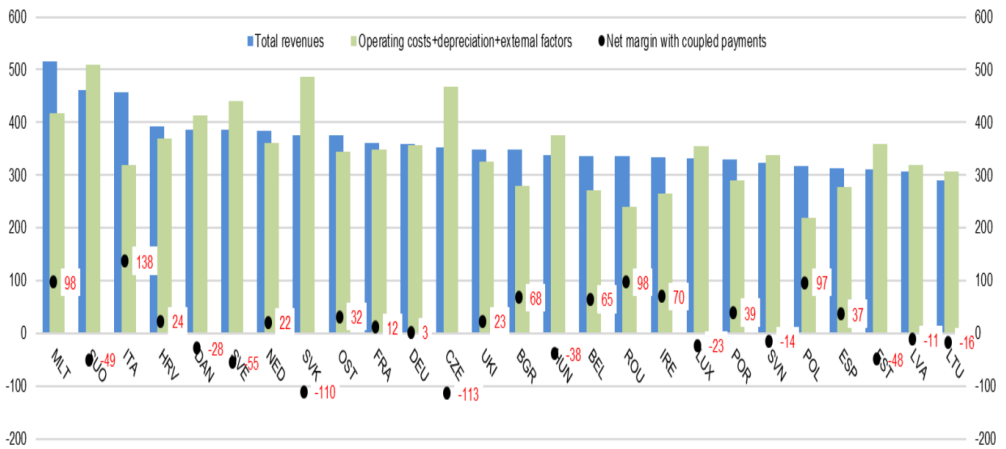
Abstract

The Farm Accountancy Data Network (FADN) enables analysis and comparison of farms business data, and the dairy sector has been selected because of its great importance in the European Union (EU). This paper analyses the economic characteristics of Croatian dairy farms divided into three types (based on herd size), in the period from the year 2014 to 2018. While the number of smaller farms is declining, there is a slight increase in the largest farm type. The amount of milk produced per farm is also growing, but it is still significantly lower than the European average. According to the realized net value added per unit of labour, small and medium-sized dairy farms are below, while large ones are above the European average. The share of direct payments in net value added is higher for all farm types compared to the European average. Relatively low milk yield and selling price, with high operating costs results in lower net production margins and affects the lower competitiveness of smaller farms with lower yields. According to the results of the FADN analysis, the largest Croatian dairy farms Type 3 (with 50 or more cows in the herd) are fully competitive to European farms in terms of economic results. The problem of Croatian dairy farming is that there are only few competitive farms, so different agricultural and rural development measures should support the empowerment of smaller farms, as well as strengthen the competitiveness of the whole dairy sector.

Key words: economic-financial analysis; FADN; dairy farms

Introduction

The Farm Accountancy Data Network (FADN) is a European data collection system with the aim of determining the annual income of agricultural farms and enable business analysis. FADN data are also important for the development and monitoring of the Common Agricultural Policy (CAP) impact (Council Regulation (EC) No 1217/2009). The system covers only commercial holdings that exceed the minimum threshold, and participation in the system is voluntary. In the year 2018, the Netherland, Denmark and Luxembourg have the highest recorded net value added per AWU (annual unit of work) in EU (59,400; 58,900 and 43,900 EUR/AWU). On the other hand, the lowest recorded values were in Croatia, Poland and Slovenia (7,600; 7,300 and 6,200 EUR/AWU) (EC, 2021). The dairy sector is the second largest agricultural sector in the EU, with more than 12 % of the total agricultural production (European Parliament, 2018). In the 2018 FADN survey, the sample is made up of 14,397 farms, representing 455,581 specialized dairy farms in EU-28 (EC b, 2021). The average net value added per AWU in the year 2018 was 22,500 EUR in the EU-27, and specialized dairy farms were above the European average (around 27,500 EUR). In the period from the year 2007 to 2018, dairy farms faced three significant declines in milk prices: 2009, 2012 and from 2014 to mid-2016, which led to reduced revenues. All these periods were accompanied by a recovery in milk prices, and thus a recovery in revenues (EC a, 2021). The total milk production in the EU is estimated at around 155 million tons a year. The main producers are Germany, France, Poland, Netherland, Italy and Ireland, which together produce almost 70 % of EU milk. In the year 2020, there were around 20 million cows in the EU, with an average production of 7,300 kg of milk per cow (EC, 2022). Milk production in Croatia is decreasing, from the year 2018 to 2020 it fell by 48 million litres (from 616 to 568 million litres) (CBS, 2021). At the end of the year 2020, there were 20,545,460 dairy cows recorded in the EU (1 % less than in the previous year). In the year 2020, which was characterized by the impact of the COVID-19 pandemic, the amount of milk purchased in the EU increased by 1.7 %. Considering the ratios of purchased milk quantities in the analysed period (2018 - 2020), only two countries maintained a negative trend (Austria and Croatia). The share of Croatian milk production in the EU is barely noticeable. After several years of significant decline in milk purchases in the Republic of Croatia, the stabilization of purchases is recorded in the year 2020. There were 981 producers (24 %) that gave up dairy farming, but the quantity delivered per producer increased by the same percentage. In the same year (2020), milk prices in the Republic of Croatia were 2.3 % lower than the average price in the EU (HAPIH, 2021). In many developed countries there are producer subsidies that encourage surplus milk and dairy products, governments pay export subsidies to place surplus production on world markets, and customs and non-tariff barriers are raised by both developed and developing countries to protect their dairy sector from 'unfair' competition (Knips, 2005). In the post-quota period, competitiveness has become a key determinant of the dairy sector's success within the EU. While the old EU member states are recording steady productivity growth on dairy farms, there is no evidence that the newer member states are managing to reduce the productivity gap (Jansik and Irz, 2015). The research of Poczta et al. (2020) showed that in the EU medium-sized and large highly specialized farms play a key role in milk production. Despite their limited profitability, they have a high level of labor productivity thanks to favourable production potential. On the contrary, insufficient potential is among the main constraints faced by other dairy farms in the EU, and they often fail to provide a satisfactory level of income that could increase their investment. In the year 2021, the European Commission published the Report on Dairy Farms based on FADN data from 2018 (EC b, 2021) and according to these data, Croatia is at the end of the EU with an average herd of 15 LU (livestock units) per farm. Only Lithuania (12) and Romania (6) have smaller herd size, while the EU average is 45 LU/farm. Unlike Croatian



Source: European Commission b, 2021

Figure 1. *Revenues, operating costs and net margins in milk production (€/t) in 2018*

farms, Lithuanian ones have more than twice the area per cow (above 2 ha), which is a prerequisite for cheaper and competitive production.

EU averages of milk production and sales prices do not reveal large differences between the member states and regions within countries, as seen when operating costs (normal farm costs necessary to run the business) are considered and the net margin is shown. Relatively low yields and high operating costs per ton of milk result in Croatia's almost lowest net margins (gross margin less depreciation and externalities) among EU member states, although 10 member states recorded losses (Figure 1).

According to data on gross margins (income) in milk production, Croatia has a median above the EU average, i.e. more than a half of farms reach the average gross margin. Unfortunately, Croatia also has the widest range of gross margins from around -400 to over 400 €/t (Figure 2). This means that, although less than half, milk suppliers are in the group below the EU average, and in losses.

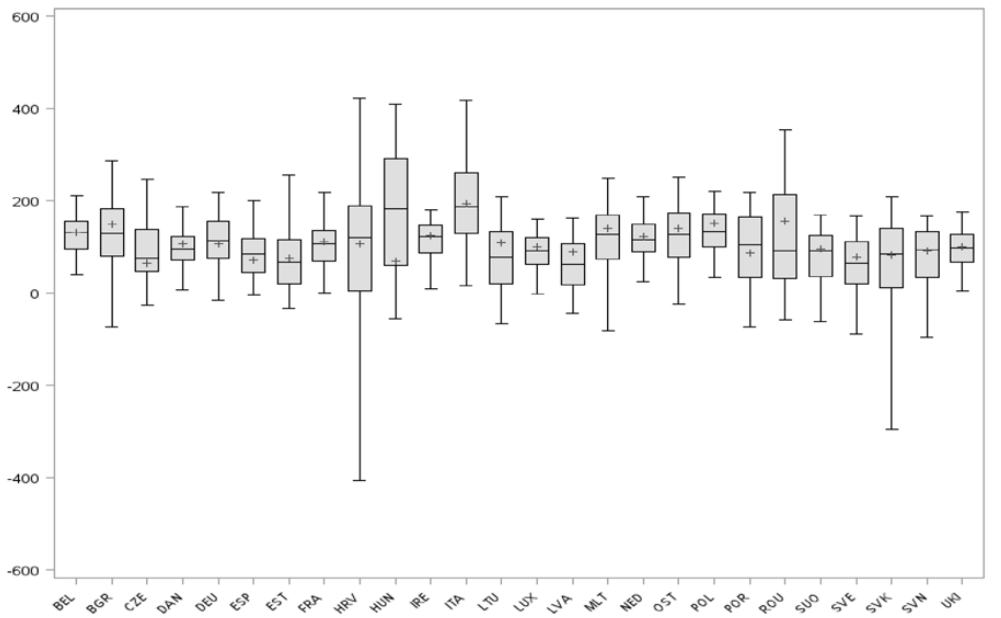
The aim of this paper is to determine the differences in economic results achieved by different types of dairy farms in Croatia, and to compare the results with European results using available FADN data.

Materials and methods

The paper uses a descriptive method to compare the production and economic indicators of specialized dairy farms over the last five years. Data from the Standard Results 2014-2018 were used, which represent the weighted averages of agricultural farms in the FADN sample. The analysed farms were divided into three groups: specialized dairy with less than 15 cows (Type 1), specialized dairy with herd between 15 and 50 cows (Type 2) and specialized dairy with 50 or more cows (Type 3). In Type 1, data from 98 to 117 farms, depending on the year, were analyzed, representing a population of 4,637 to 6,107 farms. The Type 2 sample consisted of 73 to 92 farms, representing a population of 2,828 to 3,044 farms, and Type 3 14 to 19 farms, representing a population of 199 to 201 farms, depending on the year. According to the FADN methodology, the survey covered only commercial farms that exceed the minimum threshold of EUR 4,000 of the value of production at farm.

Results and discussion

In Croatia, during the implementation of the FADN survey, the number of farms in the sample for Type 1 ranged from 105 (2014) to 98 (2018). Except for 2017, there was a slight decline in this type of farm, which includes producers with smaller herd. A similar trend has also been recorded for Type 2, in which the number of farms is falling from 91 (2014) to 76 (2018), with slight oscillations. Type 3 shows the opposite trend, and in the analysed period the number of farms increased from 14 (2014) to 18 (2018). This is in line with data of the Croatian Agency for Agriculture and Food (HAPIH, 2021), which indicated a constant decline in the number of milk suppliers from 7,329 in 2016 to only 4,002 in 2020, but with a simultaneous increase in milk deliveries per producer.



Source: European Commission b, 2021

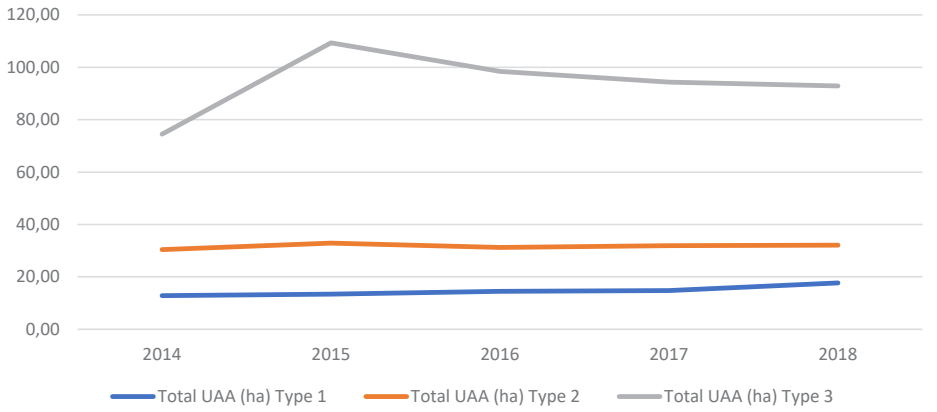
Figure 2. *Weighted values of gross margin with related payments by EU member states (€/t) in 2018*

The total utilized agricultural area (UAA) represents the total area owned and leased by owner and/or members of the farm, excluding forests and other non-agricultural land (roads, farmyards, etc.). The UAA in Type 1 shows constant growth and ranged from 12.84 ha in 2014 to 17.70 ha in 2018. The increase with slight oscillations is also visible in Type 2, while in Type 3 there is a large increase of UAA in 2015, followed by slight decline, but at significantly higher levels compared to 2014 (Figure 3). The average size of the farm in the EU is 37 ha (2018), and the least recorded UAA are for some Mediterranean countries such as Malta, Greece, Cyprus and Italy, as well as Slovenia, Croatia, Romania, Poland, Portugal and Austria. When analysed by the type of farming, the dairy type uses above-average UAA (45 ha). Based on previously mentioned, it can be concluded that Type 1 dairy farms have only 39 % of the average EU dairy farms UAA, Type 2 have 71 %, while Type 3 with 106 % is above the EU average (EC, 2021).

Analysing the share of leased land in the total UAA, it can be concluded that more than half of the UAA is leased. For Type 1 the share ranges from 59 % (2015) to 63 % (2016 and 2017), for Type 2 from 54 % (2016) to 58 % (2015), and for Type 3 from 65 % (2017) to 83 % (2014). This is in line with the situation recorded in the EU-27 where on average more than half of the utilized agricultural land is leased (on average 56 %) (EC, 2021).

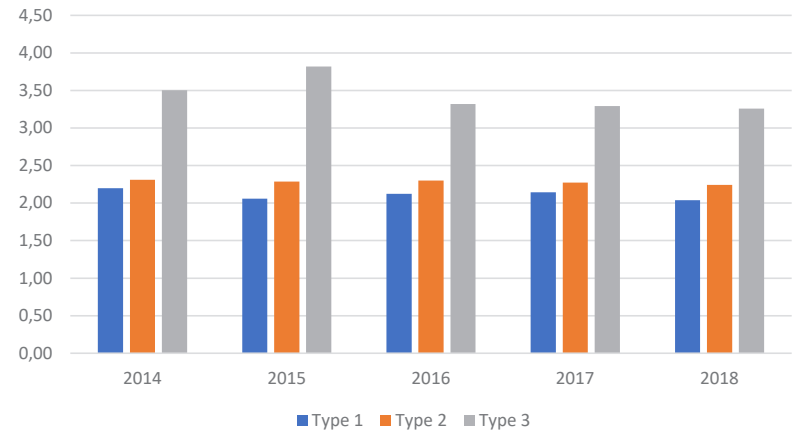
Type 1 farms used 2.04 (2018) to 2.20 (2014) units of work (AWU), Type 2 farms 2.24 (2018) to 2.31 (2014) and Type 3 farms 3.26 (2018) to 3.82 (2015) AWU (Figure 4). In the Republic of Croatia 1 AWU is defined as 1,800 working hours per year. For the year 2018 the average was 1.6 units of labour per farm in the EU-27, while the dairy type used slightly more (1.85) labour (EC, 2021). Croatian dairy farms use more units of work compared to the same type of farms in the EU-27, 10-76 % more, depending on size. The most likely cause is the substitution of capital with labour, since the cost of paid agricultural labour in Croatia is much lower than in the rest of the European Union (3.94 EUR/hour of paid labour in Croatia compared to an average of 9.89 EUR/hour in the EU-27). Lower costs of paid agricultural labour at specialized dairy farms were recorded in only seven EU countries (Bulgaria, Greece, Latvia, Lithuania, Poland, Romania and Slovenia) according to the FADN Public Database.

As expected, the number of LU increases with an increase in the size of the farm, and all types show a tendency to slightly increase the number of dairy cows LU. On average, Type 2 farms had three times as many LU as



Source: Standard results 2014 to 2018

Figure 3. *Total used agricultural area of dairy farms, ha*



Source: Standard results 2014 to 2018

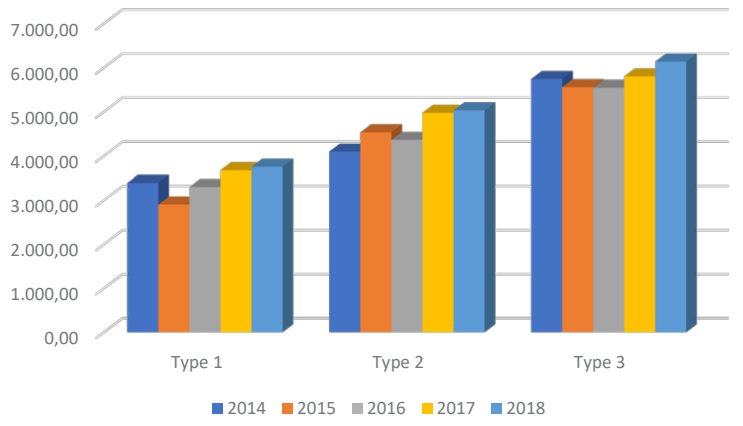
Figure 4. *Annual labour units (AWU) of dairy farms*

Type 1, and Type 3 farms nine times as many. At the same time, if the number of used labour units (AWU) per LU of dairy cows is observed, it shows that the most labour units are consumed at smaller Type 1 farms (on average 0.29 AWU/LU), and the least by the largest Type 3 farms (0.05 AWU/LU), which means that their labour productivity is much higher.

Analysing the achieved milk price, it has been observed that Type 2 achieved lower milk prices compared to the other two types of farms, and the average price was in range from 32.54 EUR/100 kg (Type 2) to 36.40 EUR/100 kg (Type 3). The average EU milk price in the year 2018 was 34.31 EUR/100 kg, and Croatian producers of Type 1 and 3 achieve higher milk prices than the EU average (5 to 6 % more), while Type 2 producers have lower prices (5 % lower) than the European average (HAPIH, 2021).

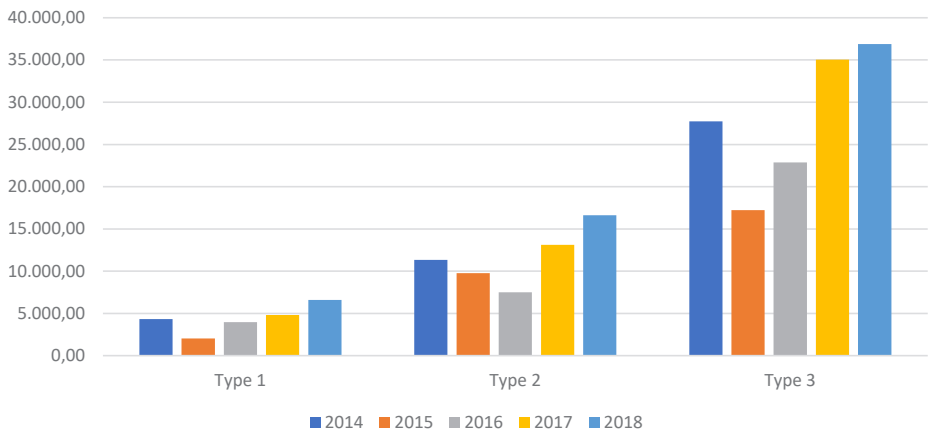
In the analysed period, there was an increase in milk production per cow, with fluctuations for some years. The highest milk quantities per cow were produced in Type 3 (an average of 69 % more than Type 1) (Figure 5). Over the same period, milk production in the EU increased from 6,636 kg/cow (2014) to 7,162 kg/cow (2018), and our dairy farms produce 16-50 % less milk per cow compared to the EU average (EC a, 2021).

In the analysed period, the net added value (FNVA=(total revenues increased for subsidies paid (excluding investment) and less intermediate consumption) - average depreciation costs) ranged from 4,164.82 EUR (2015) to 13,443.13 EUR (2018) in Type 1, from 17,207.27 EUR (2016) to 37,287.81 EUR (2018) in Type 2, and from 65,826,61 EUR (2015) to 120.200,11 EUR (2018) in Type 3. Type 2 generated almost three times the net added value of Type 1, and Type 3 ten times more. For all farm types, the lowest net added value was recorded in 2015/2016, after which it rises. This decline can be interpreted by the abolition of milk quotas in 2015, which led to the destabilization of the sector and consequently lower revenues. The average FNVA of the EU is 35,300 EUR, and Croatia is among the four countries with the lowest net added value (Croatia, Romania, Poland and Slovenia). Vegetable and floriculture farms recorded the highest net added value (around 94,000 EUR), while dairy farms are also above the EU average with around 50,000 EUR net added value/farm (EC, 2021). By comparing our farms with the EU average, Type 1 and 2 farms achieved significantly lower net added value (27 % and 75 % of the EU average in 2018, respectively), while Type 3 recorded almost 2.5 times the net added value compared to the EU average.



Source: Standard results 2014 to 2018

Figure 5. *Dairy cows milk yield (kg/cow)*



Source: Standard results 2014 to 2018

Figure 6. *Farm net value added/ AWU (EUR)*

The net added value/AWU ranged from 2,023.79 EUR in 2015 to 6,595.05 EUR in 2018 at Type 1 farms, from 7,484.92 EUR (2016) to 16,618.31 EUR (2018) in Type 2 and from 17,232.24 EUR (2015) to 36,898.30 EUR (2018) in Type 3 (Figure 6). In the EU-27, specialised dairy farms are above the EU average (around 27,500 EUR) (EC, 2021). According to the net added value per unit of work, the Type 1 and 2 farms are below the European average (24 % and 60 % of the EU-27 average), and Type 3 farms above it (34 % higher in value than the European average).

Family Farm Income per unit of family work (FFI/FWU) represents Farm Net Value Added, plus balance subsidies and taxes on investment, minus wages paid, minus rent paid, minus interest paid per annual work unit of unpaid (family) labour and is the preferred income concept for this analysis because it corresponds most closely to the concept of the profit from farming that is available to support the living standard of farmers. Type 2 had three times higher FFI/FWU values compared to Type 1, while Type 3 recorded fifteen times higher income compared to Type 1. Type 1 in Croatia achieved 28 % of the European average of this type of farm (23,356 EUR/FWU, FADN Public Database) in 2018, and Type 2 only 78 %. Type 3 achieved four times higher amounts than the European average (Figure 7), and as such fully meets the farmers standard of living.

Subsidies plays a significant role in maintaining the farm income, and the highest recorded subsidies in 2018 were recorded at specialised dairy farms (average 20,500 EUR/farm) (EC, 2021). For all three types of dairy farms, the highest amounts of total subsidies excluding investment (average total subsidies excluding investment subsidies, including direct payments, premiums, coupled subsidies and other subsidies) were recorded in 2018, while 2015/2016 recorded the lowest values. Compared to the European average, Type 1 received less support than the average, Type 2 approximated the EU-27 average and Type 3 almost three times the average (Figure 8). The share of total subsidies (excluding investment) in net added value (FNVA) ranged from 38 % in 2016 to 71 % in 2015 (Type 1), and with the exception of 2016 is always above 50 %. In the Type 2 it ranges from 40 % in 2015 to 61 % in 2014 and in the Type 3 from 36 % in 2016 to the highest 57 % in 2014. In this type (Type 3) for all years except 2014, the share of subsidies in the FNVA was below 50 %, so it could be concluded that the largest farms were the least dependent on subsidies.

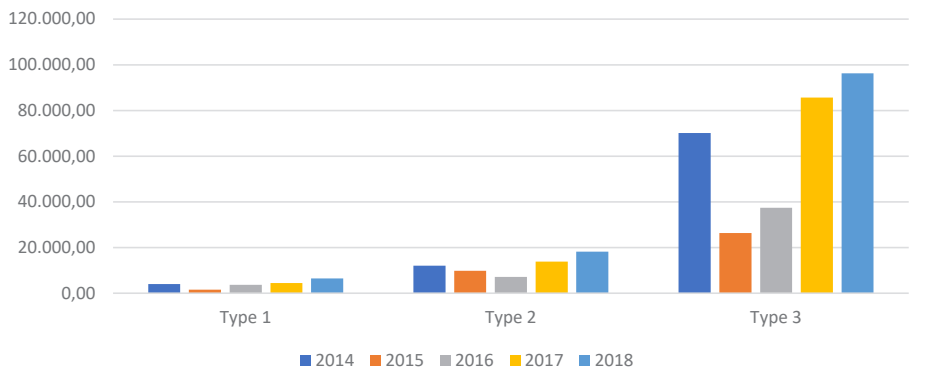


Figure 7. *Family farm income/FWI (EUR)*

Source: Standard results 2014 to 2018

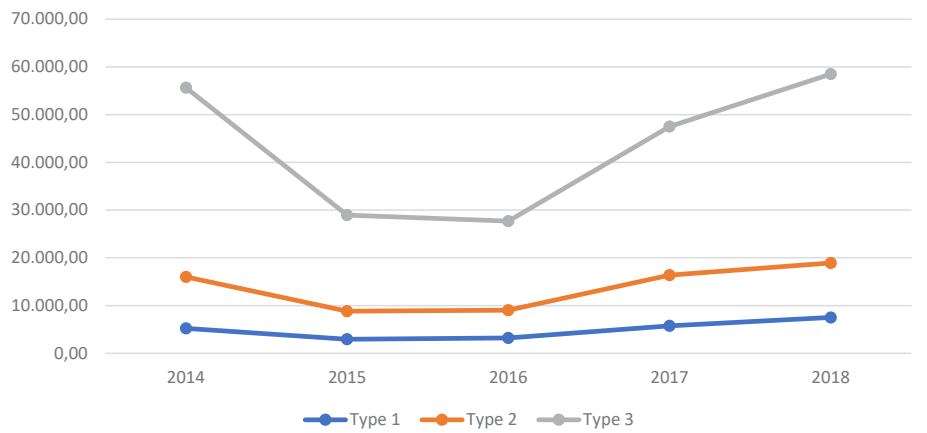


Figure 8. *Total subsidies, excluding investment (EUR)*

Source: Standard results 2014 to 2018

The average share of direct payments in the NET added value of the EU-27 is 28 %, the highest in Lithuania (70 %), the lowest in the Netherlands (9 %), while in Croatia it was about 39 %. When analysed per type of farm, it could be concluded that the share of direct payments in the FNVA was high for the types of farms recording low incomes. Specialised dairy farms were at the level of European average (28.5 %) by the share of direct payments in the FNVA. The share of direct payments in net added value was inversely proportional to the economic size: the smaller the farm in terms of economic size, the higher the share of direct payments. This characteristics applied to all member states (EC, 2021). In Croatia, this share ranged from 26 to 76 % in Type 1, from 44 to 66 % in Type 2 and from 32 to 52 % in Type 3. Also, a certain pattern could be obesreved, albeit with large annual fluctuations, that larger Type 3 farms had an average lower proportion of direct payments (an average of 47 % compared to 55 % in the other two types). Croatian dairy farms had a higher share of direct payments in net added value compared to the European and Croatian averages (Table 1).

Conclusions

The Farm Accountancy Data Network (FADN) provides an uniform methodology of data collection and analysis and therefore enables business analysis and comparison of European Union farms. Since the dairy sector in the EU is of great importance and holds more than 12 % of the total agricultural production, the dairy topic is interesting for the Croatia since the share of Croatian milk production in the EU-27 is barely noticeable, and milk production is still falling so there is a space for improvement. At the same time, the number of milk suppliers falls with an increase in delivered quantities per producer, so it is interesting to analyse the FADN data and compare the Croatian with the EU farms. In this paper, three types of dairy farms in Croatia were analysed (Type 1 with up to 15 cows in the herd, Type 2 with 15 to 50 cows in the herd and Type 3 with 50 or more cows in the herd). In the analysed period (2014 to 2018), the number of farms in Type 1 and 2 decreased, while the number of farms in Type 3 slightly increased. All three types of farms showed an increase in the utilized agricultural area, but Types 1 and 2 were still lower than the European average (39 % and 71 % of the average European dairy farms UAA), while Type 3 farms were about twice the European average. More than half of the UAA was leased, which was in line with the situation in the EU-27. Milk production per cow increased, and it was mostly produced in the largest Type 3 farms. However, Croatian dairy farms have not yet reached the EU average milk production per cow and depending on the type, they produced 16-50 % less milk per cow. The main reason for this was the relatively large number of milk suppliers with a smaller number of cows and lower intensity of production, mostly limited by agricultural land to produce animal feed. Own fodder, or own land for its production, is the main limiting factor for intensive milk production due to the underdeveloped fodder market. Furthermore, Type 1 and 3 farms achieved a higher selling price of milk compared to the European average, while Type 2 farms achieved a 5 % lower selling price in 2018. Total farm revenue ranged from 21,462.07 EUR at Type 1 to 276,190.83 EUR at Type 3. For all farm types the total revenues were faced with increasing trend, but Type 1 generates only a quarter of the EU-27 dairy farm income, Type 2 just over half, while Type 3 farms generate twice as much revenue as EU-27 farms. The Croatian dairy farms used more units of work than the European average (10 % to 76 % more, depending on the farm type). Analysis of the net added value/unit of work showed that the Type 1 and 2 farms were below the European average while the Type 3 farms were above it (34 % higher than the European average). In the European Union, dairy farms receive the highest average support per farm. Compared to the European average, Type 1 received less support, Type 2 was roughly equal to the European average, while Type 3 exceeded almost three times the European average. However, when analysing the share of total subsidies (excluding investment) in net added value, Type 3 had the lowest share and was the least dependent

Table 1. Total subsidies, excluding investment (EUR) (Standard results 2014 to 2018)

Type 1		**2014**	**2015**	**2016**	**2017**	**2018**
Total direct payments	EUR	4.625,58	3.184,24	2.172,58	6.677,24	7.730,83
Farm net value added	EUR	9.520,00	4.164,82	8.424,09	10.332,06	13.443,13
Share of direct payments in FNVA	%	49 %	76 %	26 %	65 %	58 %
Type 2		**2014**	**2015**	**2016**	**2017**	**2018**
Total direct payments	EUR	14.616,29	11.974,71	7.504,09	19.629,46	20.293,91
Farm net value added	EUR	26.194,26	22.348,66	17.207,27	29.780,07	37.287,81
Share of direct payments in FNVA	%	56 %	54 %	44 %	66 %	54 %
Type 3		**2014**	**2015**	**2016**	**2017**	**2018**
Total direct payments	EUR	50.976,80	32.427,48	24.064,26	57.144,93	60.547,46
Farm net value added	EUR	97.230,99	65.826,61	75.977,51	115.430,15	120.200,11
Share of direct payments in FNVA	%	52 %	49 %	32 %	50 %	50 %

Source: Standard results 2014 to 2018

on subsidies. Croatian dairy farms of all sizes had a higher share of direct payments in net added value than the European and Croatian averages (47 % and 55 %).

The relatively low milk yield and selling price of milk, with relatively high operating costs, resulted in lower net production margins and affects the competitiveness of some farms, especially smaller farms with lower yields.

Based on the results obtained, it could be concluded that the largest Croatian dairy farms of Type 3 (those with 50 or more cows in the herd) were competitive with the European ones in terms of achieved economic results. The problem of Croatian dairy farming was that there are only few such large farms, and those that were not competitive prevailed. Therefore, different measures of agriculture and rural development should support the empowerment of smaller farms that could thus cope with European competition, and strengthen the competitiveness of the dairy sector, which is nowadays based on a smaller number of large farms.

The most important measures that could help in this are the availability of state agricultural land, support for the renewal of high-quality livestock and the possibility of obtaining high-quality fodder. Dairy production has been designated as a priority activity in tenders for the use of state agricultural land, there are loans from the Ministry of Agriculture as well as support of the dairy industry for the herd renewal. Also, producer organizations are encouraged that can help smaller producers in accessing the animal feed market, in the form of own and service processing of raw materials for animal feed mixtures, as well as high-quality voluminous fodder.

Acknowledgements

The authors thank the Croatian national FADN office for providing FADN data for this study.

Ekonomska analiza specijaliziranih mliječnih gospodarstava u Hrvatskoj prema FADN-u

Sažetak

Sustav poljoprivrednih knjigovodstvenih podataka (FADN) omogućava poslovnu analizu i usporedbu poljoprivrednih gospodarstava, a sektor mlijeka i mliječnih proizvoda odabran je jer ima veliki značaj u Europskoj uniji. U ovom su radu analizirana ekonomska obilježja specijaliziranih mliječnih gospodarstava podijeljenih u tri tipa, u periodu od 2014. do 2018. godine. Dok broj manjih gospodarstava opada zapaža se lagani porast najvećih gospodarstava. Također raste proizvedena količina mlijeka po gospodarstvu, ali je još uvijek značajno niža u odnosu na europski prosjek. Prema ostvarenoj neto dodanoj vrijednosti po jedinici rada mala i srednja mliječna gospodarstva nalaze se ispod, dok su velika iznad europskog prosjeka. Udio izravnih plaćanja u neto dodanoj vrijednosti je viši kod svih tipova u odnosu na europski prosjek. Relativno niska muznost i prodajna cijena mlijeka, uz relativno visoke operativne troškove rezultira nižim neto maržama proizvodnje i utječe na slabiju konkurentnost jednog dijela, pogotovo manjih farmi s manjim prinosima. Prema rezultatima FADN analize najveća hrvatska mliječna gospodarstva Tipa 3 (s 50 i više grla u stadu) po ostvarenim ekonomskim rezultatima u potpunosti su konkurentna europskima. Problem hrvatskog mljekarstva je što takvih gospodarstava ima malo, pa različitim mjerama poljoprivrede i ruralnog razvoja treba poduprijeti osnaživanje manjih gospodarstava, kao i ojačati konkurentnost cijelog mljekarskog sektora.

Ključne riječi: ekonomsko-financijska analiza; FADN; mliječna gospodarstva

References

1. European Commission (EC). (2021): EU Farm Economics Overview based on 2018 FADN data, Brussels. Available at: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/eu-farm-econ-overview-2018_en.pdf
2. Council Regulation (EC) No 1217/2009 setting up a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the European Community
3. Standard results of FADN system of the Republic of Croatia for 2014 to 2018. Ministry of Agriculture. Available at: https://app.fadn.hr/index.php?r=front%2Findex
4. FADN Public Database. European Commission (EC). Available at: https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html
5. European Commission (EC). (2022): Milk and dairy products, Brussels. Available at: https://ec.europa.eu/info/food-farming-fisheries/animals-and-animal-products/animal-products/milk-and-dairy-products_en
6. European Parliament. (2018): The EU dairy sector: Main features, challenges and prospects, Brussels. Available at: https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630345/EPRS_BRI(2018)630345_EN.pdf
7. Croatian Bureau of Statistics (CBS). (2021): Statistical information 2021, Zagreb. Available at: https://podaci.dzs.hr/media/erdfes4y/statinfo2021.pdf
8. Croatian Agency for Agriculture and Food (HAPIH). (2021): Cattle breeding: Annual report 2020, Osijek. Available at: https://www.hapih.hr/wp-content/uploads/2021/06/Godisnje-izvjesce-Govedarstvo-2020-web.pdf
9. Knips, V. (2005): Developing countries and the global dairy sector part I global overview, Food and Agriculture Organization of the United Nations (FAO) > Pro-Poor Livestock Policy Initiative > PPLPI Working Papers. http://dx.doi.org/10.22004/ag.econ.23768
10. Jansik, C., Irz, X. (2015): Competitiveness makes a difference in the European dairy sector. *EuroChoices* 14 (3), 12-19. https://doi.org/10.1111/1746-692X.12104
11. Poczta, W., Średzińska, J., Chenczke, M. (2020): Economic situation of dairy farms in identified clusters of European Union countries. *Agriculture* 10 (4), 92. https://doi.org/10.3390/agriculture10040092
12. European Commission (EC a). (2021): Milk market observatory, Brussels. Available at: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/eu-milk-yield-herds_en.pdf
13. European Commission (EC b). (2021): EU Dairy Farms Report Based on 2018 FADN Data, Brussels. Available at: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/fadn-dairy-report-2021_en.pdf