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FACTOR PRODUCTIVITY AND PROFITABILITY OF HORTICULTURAL HOLDINGS IN SELECTED COUNTRIES SPECIALIZING IN FRUIT AND VEGETABLE PRODUCTION IN THE EUROPEAN UNION IN THE PERIOD 2008-2018

Key words: productivity, profitability, fruits, vegetables, FADN

ABSTRACT. The aim of the article is a comparative assessment of the productivity of horticultural farms, taking into account their economic size, in selected EU countries that specialize in horticultural production, i.e. Greece, Spain, Italy, Poland and Romania. The concentration of production and the associated increase in the economic strength of farms, as well as the multiplicity of entities of different sizes in European Union countries made it necessary to take into account the criterion of economic strength as a factor that allows comparisons between countries. In order to achieve the objective, average factor productivity and profitability of horticultural holdings from the EU FADN database in 2008-2018 were examined in static and dynamic terms through the average annual rate of change. The conducted research confirmed that with an increase in the economic size of farms, on average, their efficiency increases, and the production of fruits and vegetables in the studied period was profitable in all countries and economic size groups. The highest land productivity was achieved by Italian farms, the lowest by horticultural farms from Romania. The highest asset productivity was recorded in Spain and slightly lower in Poland, and the lowest in Italy and Romania. The highest labour productivity was in Spanish and Polish agricultural holdings, and the lowest in Italian agricultural holdings. These results were translated into profitability of production, which was the highest in Spanish farms and the lowest in Italian farms. Sales were unprofitable only in Italian and Romanian agricultural holdings.

INTRODUCTION

The productivity of an enterprise (farm) constitutes a balance between all factors of production giving the greatest output with least effort. The concept of productivity is closely related to other economic indicators, among which the economy (efficiency) and efficiency or active action (effectiveness) are of particular importance. In a broad sense, efficiency means increasing production while reducing expenses in the production process [Worobjow 2006] or maintaining them at the same level.

The efficiency of production resource management in agricultural holdings is measured by relating the value capture of production effects and economic results of holdings to the input of production factors involved in their acquisition. Relating respectively the production results facilitates the assessment of production efficiency, and economic results - economic efficiency [Komorowska 2018, p.113]. Economic efficiency is the basic criterion for evaluating the activity of any economic entity – it is a positive feature of activities that give some positively evaluated result regardless of whether it was intended (effective and efficient activity) or unintended (efficient activity). Only effective individuals are able to achieve their goals [Kubik 2015]. Łukasz Kryszak and Bazyli Czyżewski [2020] consider that if the demand for agricultural products is not a significant barrier, which should be assumed for countries on the path of dynamic growth of consumption (e.g. Poland after 1989), then the profitable strategy may be to increase production per hectare, i.e. increase land productivity. However, if the demand for food becomes rigid, then an increase in labour armament and concentration become adequate strategies [Rembisz, Sielska 2014]. Empirical studies by Zbigniew Gołaś [2010] indicate that increasing the technical armament of labour is crucial for labour productivity growth. Increasing land input in agriculture in developed countries is practically impossible. However, it is worth noting that labour productivity is the ratio of output to labor input. Thus, productivity growth may be achieved not only through intensification leading to production growth (which, as mentioned, may result in a price decline), but also through an employment decline in agriculture. As a result of economic development, such a process is observed at the macro level, however, at the micro level, the reduction of employment is difficult, especially in a relatively short period of time [Rembisz 2013]. An improvement of resource productivity in agriculture takes place partly as a result of exogenous technical progress. Besides, it depends on actions taken at a farm level.

The literature suggests that farm size can have a significant impact on many economic aspects of farm operations, including profitability. Joleen Hadrich and Olson Frayne [2011], based on a sample of North Dakota farms, find that larger farms tend to exhibit both higher productivity and profitability. They also find that the effect of changing productivity on profitability is similar for small and large farms. The effect of farm size on profitability, productivity or its change varies depending on the farm size index adopted. Among the

size indicators considered by researchers, the most common are: total production [e.g. Latruffe et al. 2004]; utilized agricultural area [e.g. Hadley 2006, Rios, Shivel 2006, Carroll et al. 2009]; herd size or number of animals [Hadley 2006, Tonsor, Featherstone 2009]; European Size Units (ESU) and then the economic strength of farms expressed in Standard Output (SO) [e.g. Xueqin Zhu et al. 2008a, 2008b, Latruffe et al. 2009, Guth, Smędzik-Ambroży 2020], farm value added [Hallam, Machado 1996] and labour or assets used [e.g. Bojnec, Latruffe 2009]. A considerable range of results can be cited: on the one hand, larger farms perform better (e.g. Laure Latruffe et al. [2004, 2008] for farms in Poland between 1996 and 2000, David Hadley [2006] for different types of production in England and Wales between 1982 and 2002, Ana Rios and Gerald Shively [2006] for coffee farmers in Vietnam in 2004, Xueqin Zhu et al. [2008a] for dairy farms in Germany and Sweden between 1995 and 2004, James Carroll et al. [2009] for cattle, beef, cereal and dairy farms in Ireland in 1996-2006) but, on the other hand, also smaller farms perform better (e.g. Darla Munroe [2001] for Polish farms in 1996, Xueqin Zhu et al. [2008b] for Greek olive farms in 1995-2004). Studies by Aldona Skarżyńska [2011] indicate that, in the case of livestock production (beef and pork), an increase in the scale of production served to improve profitability; however, in the case of crop production, the average scale of production was optimal. When increasing production to the scale identified as large, a faster increase in costs was observed than in revenues.

According to Eurostat's statistical review of the horticultural sector [Eurostat 2017], fruit and vegetable production in EU countries is cultivated on 5.6 million hectares, which accounts for 3.1% of the area devoted to agricultural crops. The area devoted to fruit production accounts for 1.9% of utilized agricultural land (3.4 million ha) and vegetables for 1.2% (2.2 million ha). In 2016, just over 1.5 million EU farms managed fruit orchards, accounting for 14.8% of all EU farms. Most EU farms with fruit orchards were located in three Member States: Romania (21.6% of the total EU), Spain (17.1%) and Italy (14.8%). However, only about one third (35.4%) of the EU farms that managed fruit orchards in 2016 (about 537.4 thousand farms) were specialized in fruit and citrus fruit cultivation. Holdings specialising in fruit and citrus accounted for 5.2% of all EU farms in 2016, with the majority located in Spain (28.3%), Italy (15.7%), Romania (12.6%), Greece (10.9%) and Poland (10.5%).

In 2016, approximately 823,000 farms grew vegetables across the EU, representing 8.0% of all farms with agricultural land in the EU. These farms are mainly located in Romania (26.0%), Poland (14.4%) and Spain (13.1%). Specialization in fresh vegetable production is less widespread than for fruit. Considering that the classification of specialised horticultural farms also includes farms producing flowers and ornamental plants, in addition to fresh vegetables, there were only 191,000 farms in the EU that were classified as specialised horticultural farms; about half of these specialised farms were located in Spain (16.6%), Poland (13.6%), Italy (11.2%) and Romania (11.0%).

The total value of EU fruit and fresh vegetable production at basic prices was EUR 57.4 billion in 2017. This represented 13.9% of the value of all agricultural goods and services produced in the EU. The value of vegetables produced in the EU in 2017 was EUR 34.5 billion and fruit was EUR 22.9 billion. Spain (24.4%) and Italy (18.5%) together were responsible for about two-fifths of the total value of EU fruit and vegetable production in 2017. However, the relative share of fruit and fresh vegetable production in the total value of agricultural output was highest in Greece (32.2%). Polish and Romanian fruit and vegetable producers have a significant share in EU fruit and vegetable production. In Poland, the value of fruit and vegetable production in 2017 was EUR 3,839.5 million, which represented 6.7% of the value of EU-28 production, while in Romania it was EUR 3024.5 million, which represented 5.3% of the value of EU-28 production. The aim of this paper is a comparative assessment of the productivity of horticultural farms, taking into account their economic size, in selected EU countries that specialize in horticultural production, i.e. Greece, Spain, Italy, Poland and Romania.

MATERIAL AND METHODS

On the basis of data from the European Farm Accountancy Data Network (FADN), the productivity of the factors of horticultural production and its profitability were presented. Factor productivity was measured by the value of production per 1 ha of arable land, 1 euro of total assets involved and 1 full-time employed person expressed in FWU (Family Work Unit – representing own unpaid labour) and AWU (Average Word Unit – representing both paid and unpaid labour), and profitability by the profitability index, which is the quotient of the value of production to costs [Jabłońska et al. 2017]. Profitability of the sales ratio is the product of the difference of farm revenue volume and its costs to the revenue volume. To determine the financing strategy used by horticulturists, it was checked whether the so-called „golden balance rule" is applied by them. In the analyses, the arithmetic mean for the entire multi-year period (2008-2018) was used and the average annual change in the analyzed measures for the studied period was determined.

RESULTS

European horticultural farms have a high production potential. The basic indicators of this potential are those depicting the level and relations between production factors. Horticultural production is also very labour intensive. High demand for labour input and high labour costs force horticultural farm owners to use it more and more efficiently. High labour and capital inputs in horticultural farms provide an additional message justifying the analysis of their financial situation [Poczta et al. 2018].

The changing economic conditions and increasing competition on the market force entities to rationally manage their resources. Therefore, a high efficiency of management is desirable, which can be defined as the relationship of the obtained results to the expenditure incurred for this purpose. The economic efficiency of management is assessed by comparing the value of the obtained production with the value of outlays incurred for its creation, or by analyzing the degree of utilization of the basic production factors, i.e. land, work and capital. The need to assess the efficiency of the use of production resources of the enterprise is necessary to know the actual income obtained and determine the development opportunities of horticultural farms [Paszko 2009].

The production of fruits and vegetables on average was profitable during the studied period. Only in class 2, in Italy, was there a decrease in profitability by 4% and in Romania in group 5 by 39%. In Greece, the average annual rate of change indicated a year-to-year decrease in production profitability during the period under study (except for a 2% increase in class 5). In Spain, the trend was the opposite, with only class 2 showing an average annual decrease in profitability of production of 0.04%. In Italy, class 3 and 4 showed an average annual decrease in profitability of production of 1.6% and 1.3%. In Poland, profitability of production remained on the same level in classes 2 and 5, while it increased by 2% and 1% in classes 3 and 4 (see Table 1) .

Profitability of sales was characterized by higher values in smaller economic classes than in larger ones in Greece and Spain. In Poland, the highest sales profitability was recorded in class 5 at 20% and in Romania in class 2 at 32%. Unfortunately, in Italy, profitability of sales was characterized by negative profitability of about 10% in class 2 and 3 and 5% in class 4. Profitable sales were only recorded in class 5 and 6.

Such results may have been influenced by the non-conservative farm asset management policy, as in almost all countries, in all groups, no application of the so-called "golden balance rule", i.e. coverage of fixed assets by equity, was recorded (except for classes 4 and 5 in Poland). Based on the data, it is observed that Italian farms are the most indebted, and Polish and Greek farms to the least degree.

The obtained economic results of farms depend on the productivity of owned resources. The highest average land productivity in the research period depended on the size class of horticultural farms and it was 46032.55 in class 2 in Italy, 40885.62 in class 5 in Poland, 36089.88 in class 3 in Spain, 27924.92 in class 5 in Greece, and 14865.88 in class 4 in Romania. The range of economic results obtained from the owned acreage is more than 3-fold. During the studied period, land productivity decreased, on average, by 15% in class 2 in Greece, by 3 and 4% in classes 2 and 4 in Italy, and by 36 and 26% in classes 4 and 5 in Romania. The highest average annual increase in land productivity, during the period studied, was 38% in class 3 and 34% in class 6 in Italy. In other researched countries, it most often increased together with farm economic size on the level of a few percent.

The productivity of owned assets in the studied countries (except Romania) increased

Table 1. Average factor productivity and profitability of horticultural farms in selected EU countries in 2008-2018 in static and dynamic terms

Selection		Land productivity		Asset productivity		Labour productivity		Own labour productivity		Production profitability		Sales profitability		Golden balance rule	
Country	Economic size class*	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Greece	(2)	20,976.06	0.85	0.31	0.98	2.19	1.16	2.30	1.21	1.52	0.9	0.34	0.85	0.95	0.998
	(3)	18,338.54	1.03	0.329	1.006	3.825	1.079	3.848	1.099	1.360	0.987	0.257	1.021	0.966	1.001
	(4)	22,045.76	1.057	0.375	0.962	5.142	1.024	4.250	1.031	1.303	0.997	0.238	1.197	0.970	1.009
	(5)	27,924.92	1.758	0.502	1.471	10.16	1.08	8.77	1.349	1.169	1.02	0.103	1.124	0.954	1.003
	Average	22,321.32	1.17	0.38	1.10	5.33	1.09	4.79	1.17	1.34	0.99	0.23	1.05	0.96	1.00
Spain	(2)	28,285.8	1.128	0.149	1.142	2.219	1.084	2.327	1.112	1.60	0.996	0.367	1.019	0.690	1.004
	(3)	36,089.88	1.067	0.235	1.133	3.502	1.034	3.381	1.074	1.467	1.013	0.311	1.113	0.732	0.989
	(4)	28,747.47	1.075	0.243	1.110	4.104	1.015	3.296	1.061	1.466	1.039	0.303	-0.224	0.768	0.964
	(5)	19,162.85	1.072	0.269	1.043	6.023	0.985	3.659	1.007	1.301	1.006	0.225	1.083	0.718	0.962
	(6)	17,002.67	1.028	0.427	0.953	28.265	1.153	6.533	1.083	1.260	1.038	0.188	1.394	0.518	1.025
	Average	25,857.73	1.07	0.26	1.08	8.82	1.05	3.84	1.07	1.42	1.02	0.28	0.88	0.69	0.99
Italy	(2)	46,032.55	0.971	0.223	0.972	2.021	0.984	2.148	1.018	1.112	1.083	-0.097	-2.566	0.602	0.971
	(3)	28,348.49	1.383	0.193	0.967	2.022	1.004	2.068	1.029	0.961	1.001	-0.097	-4.135	0.528	0.949
	(4)	33,372.52	0.965	0.195	0.968	2.362	0.970	2.164	0.971	1.008	0.984	-0.049	-0.845	0.511	0.912
	(5)	31,816.16	1.057	0.260	1.015	4.756	1.002	3.045	1.013	1.163	0.987	0.117	0.488	0.504	0.933
	(6)	31,926.26	1.344	0.325	1.216	13.706	1.052	4.083	1.085	1.164	1.199	0.010	-2.861	0.482	0.986
	Average	34,299.20	1.14	0.24	1.03	4.97	1.00	2.70	1.02	1.08	1.05	-0.02	-1.98	0.53	0.95

Table 1. Cont.

Country	Economic size class*	Land productivity		Asset productivity		Labour productivity		Own labour productivity		Production profitability		Sales profitability		Golden balance rule	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
Poland	(2)	14,527.38	1.118	0.257	0.964	3.425	0.975	3.547	0.983	1.175	1.005	0.138	3.266	0.908	0.996
	(3)	19,217.67	1.063	0.296	0.989	5.364	0.978	4.901	0.982	1.244	1.020	0.194	1.132	0.951	0.984
	(4)	25,214.37	1.029	0.338	0.974	7.144	0.977	5.673	0.994	1.157	1.010	0.134	1.117	1.045	0.999
	(5)	40,885.62	1.039	0.468	1.008	15.19	0.922	7.121	0.977	1.256	1.006	0.203	1.044	1.249	0.991
	Average	24,961.26	1.06	0.34	0.98	7.78	0.96	5.31	0.98	1.21	1.01	0.17	1.64	1.04	0.99
Romania	(1)	12,751.8	1.024	0.214	0.921	2.150	0.738	3.111	0.860	1.169	0.961	0.112	-0.058	0.801	0.995
	(2)	12,465.64	1.004	0.312	1.031	2.816	0.958	3.022	1.012	1.508	1.030	0.324	1.117	0.796	1.017
	(3)	12,056.23	1.071	0.311	1.399	2.829	0.690	3.838	1.182	1.231	1.211	0.089	0.092	0.801	0.983
	(4)	14,865.88	0.650	0.239	0.832	6.785	0.609	6.680	0.243	1.237	1.540	0.124	5.103	0.873	1.014
	(5)	7,100.17	0.739	0.111	1.003	11.059	0.799	3.975	0.673	0.609	1.392	-0.754	0.326	0.773	0.926
	Average	11,847.95	0.90	0.24	1.04	5.13	0.76	4.13	0.79	1.15	1.23	-0.02	1.32	0.81	0.99

A – average 2008/2018, B – annual average rate of change 2008/2018

* The designations of economic size classes correspond to the annual income received: (1) EUR 2,000 - < 8,000, (2) EUR 8,000 - < 25,000, (3) EUR 25,000 - < 50,000, (4) EUR 50,000 - < 100,000, (5) EUR 100,000 - < 500,000

Source: own study based on EU FADN data

with the size of the class of horticultural farms. It reached the highest level in class 5 in Greece (0.50), Poland (0.47) and Spain (0.43). The lowest asset productivity was recorded in class 2 in Spain (0.15) and Romania in class 5 (0.11). The average annual rate of change in asset productivity in the studied countries was also characterized by an average increase with the increase in the economic strength of farms. Even a few percent average annual decrease in asset productivity in smaller economic classes of farms was observed, with the exception of Spain, where the average annual rate of productivity growth remained at a level from 4 to 14% (the smaller the class, the higher the rate), and in class 6, with the greatest economic strength of farms, a 5% decrease in asset productivity was recorded.

Labour productivity was assessed with the division into own labour and total labour. Without exception, labour productivity reached much higher values in classes with the greatest economic strength. It was at a level of 28.27 in Spain (class 5), 15.19 in Poland (class 5), 13.71 in Italy (class 6), 11.06 in Romania (class 5) and 10.16 in Greece (class 5). Interestingly, on average, labour productivity grew annually in the "old" EU countries, while in Poland it declined by several percent. In Romania, on the other hand, labour productivity declined as much as 39% in class 4 or 31% in class 3. The productivity of own unpaid labour, like total labour productivity, grew with the increase in economic class size. However, only in Poland the decrease in own labour productivity was recorded in all economic size classes of horticultural farms. In Romania, in class 2 and 3, there was an average annual increase in own labour productivity by 1 and 18%, respectively.

The conducted research confirmed that with an increase in the economic size of farms, on average, their efficiency increases, and the production of fruit and vegetables in the studied period was profitable in all countries and economic size groups. The highest land productivity was achieved by Italian farms, the lowest by horticultural farms from Romania. The highest average asset productivity was recorded in Spain and a little lower in Poland, and the lowest in Italy and Romania. The highest average labour productivity was in Spanish and Polish agricultural holdings, and the lowest in Italian agricultural holdings. These results were translated into profitability of production, which was the highest in Spanish farms and the lowest in Italian farms. Sales turned out to be unprofitable only in the case of Italian and Romanian agricultural holdings.

CONCLUSIONS

Although more than a decade has passed since Poland (2004) and Romania (2008) joined the EU, we can still see that the level of convergence in these countries is insufficient. Although the "old" EU countries specializing in fruit and vegetable growing belong to the group of countries which, at the beginning of the analysed period, compared to the other EU15 countries, struggled the most with the negative effects of the financial crisis, it was not noticeable at the level of productivity and economic efficiency of horticultural farms.

Although sales were not profitable in the smallest classes of Italian farms sales, other indicators were much better in countries representing the "old" Union. Spanish horticulturists had the most stable economic situation. The greatest discrepancy was noted among Romanian horticultural farms. It may result not only from the shortest period of functioning within EU structures, but also from the highest fragmentation of farms. Romania, as the only one among the researched countries, had farms classified in class 1, while the affiliation of farms to classes 4 and 5 was recorded only in several periods.

In spite of the recorded differences in the values of factor productivity and profitability of production and sales, the conclusion can be made, confirming the previous research, that with an increase in the economic size of farms, their efficiency on average increases.

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PRODUKTYWNOŚĆ CZYNNIKÓW PRODUKCJI I RENTOWNOŚĆ GOSPODARSTW OGRODNICZYCH W WYBRANYCH KRAJACH SPECJALIZUJĄCYCH SIĘ W PRODUKCJI OWOCÓW I WARZYW W UNII EUROPEJSKIEJ W LATACH 2008-2018

Słowa kluczowe: produktywność, rentowność, owoce, warzywa, rachunkowość rolna FADN

ABSTRAKT

Celem artykułu jest analiza porównawcza produktywności gospodarstw ogrodniczych, z uwzględnianiem ich wielkości ekonomicznej, w wybranych krajach UE, które specjalizują się w produkcji ogrodniczej, tj. Grecji, Hiszpanii, Włoszech, Polsce i Rumunii. Koncentracja produkcji i wiążący się z tym wzrost siły ekonomicznej gospodarstw oraz mnogość występowania podmiotów różnej wielkości w krajach Unii Europejskiej, spowodowały konieczność uwzględnienia kryterium siły ekonomicznej jako czynnika umożliwiającego porównania między krajami. Dla realizacji celu zbadano średnią produktywność czynników produkcji oraz rentowność gospodarstw ogrodniczych zgromadzonych w bazie EU FADN w latach 2008-2018 w ujęciu statycznym i dynamicznym poprzez średnioroczne tempo zmian. Badania potwierdziły, że wraz ze wzrostem wielkości ekonomicznej gospodarstw wzrasta średnio ich efektywność, a produkcja owoców i warzyw w badanym okresie była rentowna we wszystkich krajach i grupach wielkości ekonomicznej. Najwyższą produktywność ziemi osiągały gospodarstwa włoskie, a najniższą gospodarstwa ogrodnicze z Rumunii. Najwyższą produktywność aktywów odnotowano w Hiszpanii i niewiele niższą w Polsce, a najniższą we Włoszech i Rumunii. Najwyższa produktywność pracy występowała w gospodarstwach hiszpańskich i polskich, a najniższa we włoskich. Wyniki te przekładały się na rentowność produkcji, która była najwyższa w gospodarstwach hiszpańskich, a najniższa we włoskich. Sprzedaż okazała się nierentowna tylko w przypadku gospodarstw włoskich i rumuńskich.

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