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PRODUCTION OF LIVE PIGS IN POLAND – CONDITIONS AND PROSPECTS

Key words: pig population, pig farms, production of live pigs, competitiveness

ABSTRACT. The article presents the current situation of Polish farms oriented towards pig breeding, resulting from a drastic reduction in the pig population after 2007 which took place in farms holding up to 200 pigs. The assessment covered the production and economic activity of pig farms, by determining their efficiency and competitiveness against a background of similar farms from Germany, Denmark, the Netherlands and Spain. The results of analyses show that the major factor determining production efficiency and competitiveness of Polish pig farms was the production scale stemming from a very low level of breeding concentration in comparison with farms from countries analysed. In 2013, on average, on Polish farms, there were 41 pigs, while in Denmark, the Netherlands and Germany, there were 3096, 2285 and 587 pigs, respectively. Large Polish farms (economic size of EUR 100-500 thousand SO) were able to compete and very large farms were fully competitive. The major causes of a weak Polish pig production sector have been indicated and include a low level of concentration, no links between pig producers and commercial/meat processing plants as well as the existence of barriers preventing investment in livestock buildings adapted to a greater production scale.

INTRODUCTION

Gross domestic product (GDP), as a basic indicator of prosperity so widely used thus far, is subject to criticism, since it fails to include factors unregistered by the market, as well as free time [Nordhaus, Tobin 1972]. Simultaneously, attention was paid to the following relationship: economic growth measured by GDP *per capita*, which contributes to an increase in residential wealth and meat consumption. Mariola Kwasek states that in the richest countries, such as the USA and Germany, meat consumption in the years 1961-63 and 2007-2009 in kg per capita increased from 90.3 to 123.8 kg and in Germany from 65 to 88 kg. During that same period in Poland, meat consumption increased from 47.4 to 76.3 kg per capita. Pork was dominant in the structure of meat consumption in Germany and Poland. In the years 2007-2009, its share in these countries was 62.4 and 66.6%, respectively. In the USA, the share of pork was lower in that period and stood at 24.4%. What was predominant was the share of beef [Kwasek 2013]. In Poland, meat and offal consumption in kg per capita in the years 2007-2017 ranged between 77.6 in 2007 to 78.5 kg. Average pork consumption in that same period was ~40 kg and its share in meat

consumption accounted for ~51%. [Świetlik 2017]. The adopted date limit - 2007 was the year by which national production of pork fully covered demand. In this very year, the pig population accounted for more than 18 million animals, while in the years 1990-1994 this number constituted more than 20 million animals. Poland had a long tradition in rearing pigs. During the interwar period, it was a major exporter of pork to the United Kingdom [Blicharski, Hammersmeister 2013] and in the postwar period, the production of live pigs continued to play a significant role in Polish agriculture. Since 2008, a dramatic decline in pig population has been observed: in 2016, the pig population was 10.8 million and was by 40.3% lower than in 2007, when the number of animals constituted 18.1 million animals (figure 1). In the same period, there was a negative balance of foreign trade in pork, both in terms of value and quantity, with a more than 15-fold increase in the import of live animals. In addition, 2007 was the last year in which a positive balance of foreign trade in live animals from the pig group was recorded (table 1). The import of live animals was dominated by (more than 70%) piglets and weaners, mainly from Denmark, the Netherlands and Germany.

Despite a long-term tradition in producing live pigs, from a net exporter in foreign trade of pork and live animals, Poland has turned into a net importer. So, it raises the topical question: what were the reasons for such a drastic reduction in the pig population in Poland after 2007? The objective of the article is to attempt to answer this question.

Table 1. Foreign trade in pork and live pigs

Specification	Years					
	2009	2010	2014	2015	2016	2017
Export [thous. t] meat equivalent	336.0	418.0	692.8	719.0	768.8	836.7
Import [thous. t.]	614.0	602.0	847.7	854.1	880.4	907.7
Balance [thous. t quantity]	-278.0	-184.0	-154.9	-135.1	-111.6	-71.0
Balance [mln EUR value]	-524.5	-336.0	-350.2	-197.4	-188.6	-175.9

Trade in pigs (live animals [thous. head] in the years 2007-2013)								
	2007	2008	2009	2010	2014	2015	2016	2017
Export	434.0	418.8	442.2	274.4	85.5	38.9	60.1	82.7
Import	401.7	1,124.6	1,997.5	2,285.3	5,486.1	5,568.7	6,370.9	6,821.5
Balance	32.3	-709.8	-1,155.3	2,011.1	-5,401.6	-5,229.8	-6,310.8	-6,738.8

Source: [GUS 1997-2017, Market Analyses 2011, 2015, 2018]

MATERIAL AND RESEARCH METHODS

The basic source of research materials was statistical data and data from pig farms covered by the Polish FADN system in the years 2008-2016 and 2014 and the European FADN in the years 2014-2016, divided into five groups by economic size. The results of Polish farms will be presented against a background of results of similar farms from selected European Union countries – leading pig producers such as Denmark, the Netherlands, Spain and Germany. Descriptive and comparative methods have been used.

The following research hypothesis was adopted: "The main factor determining the production efficiency and competitiveness of pig farms is production scale". In order to determine the level of competitiveness of farms, the competitiveness index (WK) was used, according to Werner Kleinhanss[1] [2015]. In this study, competitiveness was defined as a farm's ability to grow. This is a different approach from the traditional definition of competitiveness described as obtaining an advantage (cost, price, quality, etc.) in relation to competitors [Stankiewicz 2003]. The adopted competitiveness index allows to determine different levels of competitiveness[2], enabling a more comprehensive assessment of developmental abilities of farms [Ziętara, Mirkowska 2018]. Therefore, determining competitiveness of farms as the ability to develop under market conditions of a given country is well-founded.

CHANGES IN THE PIG POPULATION IN POLAND AND SELECTED COUNTRIES

In the years 1990-2007, the pig population in Poland was stable at a level of about 18 million, with small fluctuations of about 5% (figure 1). After 2007, a constant downward trend was observed resulting in 10.8 million animals in 2016 (a decrease of 40.3% in relation to 2007).

At the same time, a growing territorial differentiation of the pig population can be observed. In 1990, five leading voivodeships bred 55% of the national pig population, while, in 2016, five voivodeships bred 71.1% of the pig population, including the Wielkopolskie voivodeship – 35.3%. There was a very low pig population in the following voivodships:

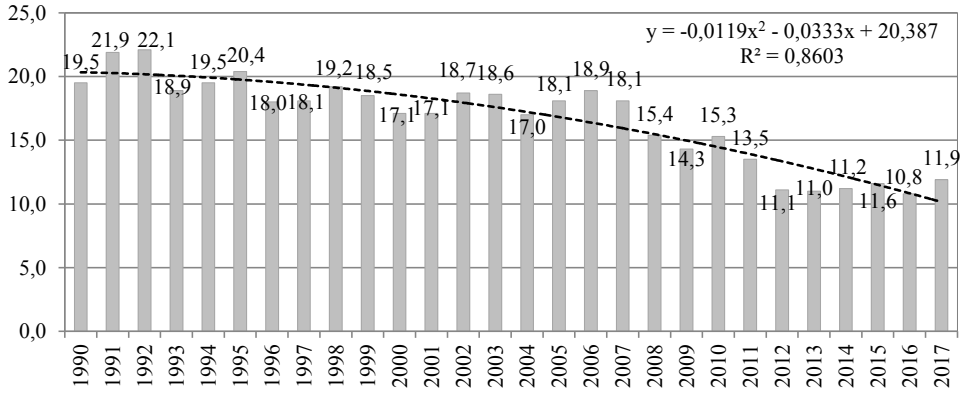

Figure 1. Pig population in Poland in the years 1990-2017
Source: [GUS 1997-2017]

[1] The competitiveness index is defined by the ratio of farm income to the costs of using own production factors: labour, land and capital.

[2] A value of the index lower than 1 means that farms have no ability to develop, are not competitive, a value higher than 1 and lower than 2 points to an ability to compete, those farms with a competitiveness index equal to 2 or more are fully competitive.

Lubelskie, Małopolskie, Podkarpackie and Świętokrzyskie [Ziętara, Mirkowska 2018]. The rate of decline in the pig population was different, depending on the scale of breeding defined by the number of head/farm. The relevant figures are presented in table 2.

In herds of up to 200 head in the period analysed, the pig population decreased by 8,155 million head i.e. by 63.4%, while in herds of 200 head and more, the pig population grew by 1,955 million, i.e. by 36.61%. These figures clearly indicate the role of production scale in shaping the pig population in Poland.

Table 2. Changes in the structure of the pig population in Poland in the years 2007-2016

Specification	Pig population [thous. head]			
	2007	2010	2012	2016
Pig population	18,100.00	15,278.10	11,581.32	11,900.00
Pig population in herds of up to 50 head	6,208.30	3,936.47	2,710.02	2,023.00
Pig population in herds of 50-200 head	6,552.20	4,161.43	2,849.00	2,582.30
Pig population in herds of ≥ 200 head	5,339.50	7,180.71	6,022.30	7,294.70
Reduction in the pig population in herds of up to 200 head	-	-4,662.60	-7,201.48	8,155.20
Reduction rate [%]	100.00	-36.50	-56.43	-63.40
Increase in the pig population in herds of > 200 head	-	1,841.21	682.8	1,955.20
Increase rate [%]	100.00	34.50	12.78	36.61

Source: [GUS 1997-2017, GUS 2011]

Changes in the number and structure of farms with this type of production correspond to changes in the pig population. In 2005, there were 701.7 thousand pigs while in 2016 - 172.2 thousand (a decrease of 75.4%). Simultaneously, the average herd size per farm increased, from 25.8 head in 2005 to 69.1 head in 2016. The increase constituted 167.8%. The structure of pig farms changed, too. The share of farms keeping 10 and more head increased from 46.6% in 2005 to 60.2% in 2016. The share of the pig population in these farms increased from 92.6 to 97.4% [Mirkowska, Ziętara 2019]

In Poland, the share of farms with herds of up to 200 head in 2013 amounted to 97%, and those with herds of 200 head or more only constituted 3%. In Denmark and the Netherlands, the share of this group of farms was more than 80%. The structure of the pig population was equally adverse in Poland. Herds of 200 head or more possessed ~50% of the Polish pig population, while in other countries this share constituted more than 96%; in Denmark and the Netherlands it was almost 100% [Mirkowska, Ziętara 2019].

There were also great differences in the concentration level of pig breeding. This is evidenced by the figures regarding average herd sizes. In 2005, average herd size in Poland was 25 head, while in countries such as Denmark and the Netherlands it was: 1500 and 1167 hea, respectively, thus 60 and 47 times higher than in Poland. In other countries, it ranged between 197 head (Spain) and 303 head (Germany). In 2013, these differences became more profound. In this year, the average herd size in Poland was 41 head, while in Denmark and the Netherlands: 3096 and 2208 head, respectively. In comparison with Poland these figures reflected a 75-fold and 54-fold higher number [Mirkowska, Ziętara 2019].

In the countries analysed, there was a higher degree of farm specialisation than in Poland, broken down by those oriented towards the "production" of piglets and fattening. We must also highlight the notable differences in stocking density of pigs per 100 ha of UAA. In Denmark and the Netherlands, it ranged between 474 head (Denmark) and 679 head (The Netherlands)[3]; in Germany, it was about 160 head. In Spain, there was an upward trend, from 85.3 in 2005 to 111.3 head/100 ha of UAA in 2016. In Poland, in those years, there was a decline in stocking density, from 114 to 75.6 head [Ziętara, Mirkowska 2018].

COMPETITIVENESS OF POLISH PIG FARMS DEPENDING ON PRODUCTION SCALE IN THE YEARS 2008-2016

The subject of analysis were farms specialising in pig production, covered by the Polish FADN monitoring in the years 2008-2016. The relevant figures describing their competitive situation in relation to production scale are shown in table 3. For farms with up to 12 sows, selling up to 200 fatteners per year, the competitiveness index was lower than 1 and ranged between 0.32-0.82[4]. These farms were devoid of development opportu-

Table 3. Features of Polish pig farms depending on production scale in the years 2008-2016

Years	Production scale by number of sold fatteners [head/farm]						
	≤ 80	80-120	120-200	200-400	400-700	700-1000	≥1000
Number of sows [head/farm]							
2008	13.4	9.4	12.6	17.8	30.0	40.2	84.6
2012	12.6	9.1	10.3	17.6	28.1	39.7	69.6
2016	27.3	6.5	11.7	17.0	25.7	45.6	66.9
Farrowing rate [number of reared piglets/sow]							
2008	18.7	16.8	17.6	16.5	17.5	18.1	19.4
2012	18.3	16.9	16.3	16.9	17.4	18.4	18.8
2016	19.5	17.5	16.4	16.8	18.2	19.4	21.2
Farm income [thous. PLN/farm]							
2008	-	17.28	34.28	49.12	8.85	155.46	282.91
2012	-	37.2	53.39	93.78	153.35	206.22	382.71
2016	-	29.79	43.98	71.62	128.51	179.02	328.33
Competitiveness index (Wk4)							
2008	0.42	0.32	0.56	0.67	0.99	1.57	2.15
2012	0.58	0.58	0.78	1.11	1.60	1.92	2.80
2016	1.29	0.53	0.82	1.01	1.68	2.16	3.47

Source: [Goraj et al. 2010, 2014, Bocian et al. 2018]

[3] The high stocking density of pigs in these countries resulted from a large scale of breeding (large herds) conducted based on purchased industrial feedstuff, with a very loose relation to land. Animal faeces from these farms were used by other farms, most often by those having no livestock.

[4] The exception were farms with the lowest scale of sale of fatteners (less than 80 head) which in 2016 kept 27 sows with an orientation towards rearing piglets. In this year, the competitiveness index in these farms was 1.26.

nities. Farms selling 200-400 and 400-700 fatteners annually in the years 2012 and 2016 showed their ability to compete. Their competitiveness index ranged between 1.01-1.68. 2008 was unfavourable due to low prices of live pigs. Farms selling more than 1000 fatteners annually can be considered fully competitive. There is also a strong link between production scale and the number of sows bred and fatteners sold and the number of reared piglets in a year and farm income level. The correlation rate was: 0.84 (piglet rearing) and 0.94 (farm income), respectively. These figures allow for the positive verification of the adopted research hypothesis.

COMPETITIVENESS OF POLISH PIG FARMS AGAINST A BACKGROUND OF SELECTED COUNTRIES

The competitiveness indices shown in table 4 indicate that in classes 2-4 there are no farms with an ability to compete and develop. Only Polish and Spanish farms in class 5 were able to compete, where the values of the index were 1.16 and 1.45, respectively. In class 6, in these countries, farms were fully competitive. The values of competition indices was 2.26 and 3.66, respectively. Danish and Dutch farms in classes 5 and 6 had no ability to compete. The values of the index on these farms were very low and did not exceed 0.16 (Danish in class 5 and 6 and Dutch in class 5). Also, German farms in class

Table 4. Competitiveness of pig farms depending on production scale in Poland and in selected EU countries in the years 2014-2016

Specification	Economic size of farms [thous. EUR]				
	8-25 (2)	25-50 (3)	50-100 (4)	100-500 (5)	≥ 500 (6)
Competitiveness index					
Poland	0.14	0.40	0.65	1.16	2.26
Denmark	-	-	-	0.16	0.16
Spain	-	-	0.98	1.45	3.66
The Netherlands	-	-	-	0.16	0.90
Germany	-	-	0.07	0.66	1.07
Pig population [SD/farm]					
Poland	14.31	30.96	62.14	172.40	838.57
Denmark	-	-	-	237.40	1,107.15
Spain	-	-	68.74	292.20	1,047.56
The Netherlands	-	-	-	270.70	1,071.77
Germany	-	-	55.01	212.90	593.19
Share of subsidies in farm income [%]					
Poland	98.63	51.12	42.37	31.64	32.74
Denmark	-	-	-	154.74	215.40
Spain	-	-	16.83	13.77	5.68
The Netherlands	-	-	-	25.89	9.03
Germany	-	-	276.88	56.03	70.23

Source: own study based on European FADN data

5 had no ability to compete[5]. Minimum ability was shown by farms from this country in class 6, where the value of the competition index was 1.07.

A significant factor determining the level of farm income are all types of subsidies received by farmers under the Common Agricultural Policy. The share of subsidies in income is negatively correlated with the economic size of farms. In Polish farms, this share was between 97 (class 2) and 32% (class 5 and 6). It was highest in German farms in class 4, where it amounted to 277% and in Danish farms in classes 5 and 6, 155 and 215%, respectively. The lowest share of subsidies in farm income was in Spanish farms, where it ranged from 17 (class 4) to 6% (class 6) and in Dutch farms in class 6 - 9%. This was a result of their small area.

BARRIERS TO THE DEVELOPMENT OF PIG BREEDING IN POLAND

There are multiple reasons for the unfavourable situation in the production of live pigs in Poland and underpin production potential, which constitutes only 50%. Aleksander Dargiewicz [2018] presented a comprehensive specification of these causes. The most important ones are:

- administrative barriers preventing access to land for entrepreneurs breeding pigs on a larger scale (farm breeding); this also applies to lessees,
- long-term administrative procedures related to obtaining permits for investment in livestock buildings for pigs, which largely result from the absence, in most communes, of spatial management plans and residential protests,
- threat of infectious diseases and the consequent need for specific protection related to biosecurity, which entails the incurrence of additional costs. Smaller farms are unable to meet these requirements,
- increasing animal welfare requirements also lead to increased costs of production, organisational barriers resulting from a very low level of concentration of pig breeding.

In 2016, the share of farms keeping 200 head or more was only 4.5%. The low level of concentration of live pig production is the reason for the very weak tendering position of producers in relation to purchase (commercial and meat processing) companies. The level of integration, both horizontal and vertical, is also very low.

From the analyses carried out thus far, it can be concluded that under current economic and environmental conditions, development opportunities are held by farms breeding pigs in a professional manner, which is inseparably linked to a larger production scale. The condition for the development of this type of farms is to eliminate existing barriers.

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[5] Farms without the ability to compete may function for some time in a situation where their owners (users) accept incomplete payment of own used production factors.

SUMMARY AND CONCLUSIONS

The studies carried out allow us to formulate the following observations and conclusions:

1. After 2007, in Poland, there was a drastic (by 40%) reduction in the pig population; it took place in farms keeping herds of up to 200 head.
2. In foreign trade in live pigs after 2007, there was a negative balance, mainly due to the import of live animals (piglets and weaners). In 2017, the net import of this group of animals amounted to 6,738.8 thousand head. 2007 was the last year in which the balance was positive and amounted to 32.3 thousand head.
3. The level of concentration of pig breeding in farms in Poland is very low compared to leading pig producers such as Denmark, the Netherlands and Germany. In 2013, on average, Polish farms kept 41 pigs, while in the above-mentioned countries – 3096, 2285 and 584 pigs, respectively. In 2016, the average pig herd size in Poland was 69.1 head.
4. Regional differentiation in the pig population increased. In 1990, in five leading voivodeships, it was 55%, and in 2016 already 71.1% of the pig population. The leading voivodeship in pig breeding was the Wielkopolskie voivodeship, in which 35.3% of the total pig population was kept in 2016. The drastically low level pig population is in the southern voivodeships: Małopolskie, Podkarpackie and Świętokrzyskie.
5. Large differences also concerned stocking density per 100 ha of UAA: in 2016, average stocking density in Poland was 75 head/100 ha of UAA, while in the Netherlands and Denmark it was 679 and 474, respectively. Back then, in Poland, the highest stocking density was in the Wielkopolskie voivodeship (227 head), while in some districts of this voivodeship, Średzki and Gostyński, it amounted to 547 and 445 head/100 ha of UAA, respectively. These figures point to the enormous development potential of pig breeding in Poland.
6. Polish farms keeping up to 25 sows are devoid of development opportunities. Such opportunities are possible for those farms which keep about 40 sows. On the other hand, farms keeping 70 and more sows can now be considered fully competitive. This limit value will increase in the future.
7. The studies confirmed the adopted research hypothesis that the main factor determining the efficiency of pig production is production scale.
8. The primary prerequisite for restocking the pig population in Poland is to effectively remove existing barriers to investing in livestock buildings adapted to a larger production scale, which enables the professional production of live pigs.

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PRODUKCJA ŻYWCA WIEPRZOWEGO W POLSCE – STAN I PERSPEKTYWY

Słowa kluczowe: pogłowie świń, gospodarstwa trzodowe, produkcja żywca wieprzowego, konkurencyjność

ABSTRAKT

W artykule przedstawiono aktualną sytuację polskich gospodarstw nastawionych na chów trzody chlewnej spowodowaną drastycznym spadkiem pogłowia po 2007 roku, który wystąpił w gospodarstwach utrzymujących do 200 sztuk świń. Ocenie poddano produkcyjną i ekonomiczną działalność gospodarstw trzodowych, określając ich efektywność i konkurencyjność na tle analogicznych gospodarstw z Niemiec, Danii, Holandii i Hiszpanii. Wyniki otrzymane z analiz wskazują, że głównym czynnikiem decydującym o efektywności produkcji i konkurencyjności polskich gospodarstw trzodowych była skala produkcji, będąca skutkiem bardzo niskiego poziomu koncentracji chowu w porównaniu do gospodarstw z badanych krajów. W 2013 roku średnio w gospodarstwach polskich utrzymywano 41 sztuk trzody chlewnej, natomiast w Danii, Holandii i Niemczech odpowiednio: 3096, 2285 i 587 sztuk. Polskie gospodarstwa duże (o wielkości ekonomicznej 100-500 tys. euro SO) były zdolne do konkurencji, a bardzo duże były w pełni konkurencyjne. Wskazano również podstawowe przyczyny słabości polskiego sektora produkcji trzody chlewnej, za które uznano niski stopień koncentracji i brak powiązań producentów żywca z zakładami handlowymi i przetwórstwa mięsnego oraz istnienie barier utrudniających inwestowanie w budynki inwentarskie dostosowane do większej skali produkcji.

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