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SHEEP MEAT PRODUCTION IN AUSTRIA AND POLAND – SIMILARITIES AND DIFFERENCES

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ABSTRACT

The aim of the article was to compare sheep meat production in Austria and Poland. The level of sheep population in both countries was similar. The sources of the materials were a literature review and data obtained from Statistics Austria and Statistics Poland. The research period concerned the years 1992–2018. Methods of data analysis were used, such as constant dynamics indicators, Gini coefficient and Lorenzo curve, Pearson correlation coefficients. A number of differences were found, e.g. in the direction of changes in the size of the sheep population, the scale of total slaughtering and industrial slaughtering, the share of self-supply in total meat production, traditional consumption of lamb during holidays, the average carcass weight of sheep, prices of lamb meat, interdependence of the sheep population with changes in economic parameters. The similarities concerned the level of concentration of the sheep population and their regional slaughtering, prejudices regarding the consumption of lamb, the share of lambs in slaughtering and meat production, the productivity of meat obtained from the slaughter of sheep.

Key words: sheep production, slaughter of sheep, lamb meat, lamb price
JEL codes: Q10, Q11, Q13, Q18

INTRODUCTION

Historically, sheep have played an important role as a versatile species, but since the mid-19th century their importance in Europe has been steadily diminishing [Sandgruber 2002]. Examples of such countries are Austria and Poland. In Austria, the main product obtained from sheep was meat, followed by milk. This is due to the structure of maintained sheep (only 15% were dairy sheep) [Greimel et al. 2002]. The importance of wool was insignificant, as the revenue from its sale covered only the costs of shearing sheep. In Austria, however, sheep play an important role in maintaining the landscape, which is characterized by a high proportion of mountains and meadows. Around 85% of all sheep were kept in the high, low and submontane Alpine areas [Patzelt 1987, Hambrusch and Kirner 2008]. The problem in Austria was the decreasing area of hay pastures in subsequent years where sheep were grazing [Guggenberger et al. 2014]. The regular grazing of sheep on mountain slopes helps to prevent shrubs from entering, strengthens the slopes by kneading the animals' hooves and thus maintains an open cultural landscape. The beautiful landscape in turn is important for tourists visiting the country [Nöbauer 2014].

Sheep production in Poland reached its peak in the 1980s, when the sheep population was around 5 million. The introduction of the market economy had a negative impact on agriculture, especially on sheep production. The most important reason for the lack of profitability

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in this activity was the liquidation of subsidies for wool and the drop in prices of this raw material on world markets [Niżnikowski 2003]. As a result of these changes, meat became the most important product obtained from sheep, while wool lost its importance [Niżnikowski 2011]. Many sheep farmers have taken up more profitable agricultural activities, with only a few sheep producers remaining on the market. As a result, attempts have been made to halt the decline and rebuild the sheep population. The Programme for Improving Fertility and the Programme for Improving the Sheep Population until 2010 developed by the Ministry of Agriculture and Rural Development were implemented [Niżnikowski 2005]. However, their objectives were not achieved, as the budget for the Biological Progress Fund, from which subsidies for sheep producers were paid, was systematically reduced [Berdychowska et al. 2004].

Sheep production in Poland is defined as an activity complementary to other agricultural activities. However, sheep compete in feed with cattle and goats. The sheep have characteristics that make them predisposed to grazing on permanent grassland on poor and difficult to reach soils, which gives them an advantage. Mountain areas are a natural place for breeding sheep, but this activity is carried out throughout the country [Musiał and Musiał 2016]. In the Podlasie region, sheep farm permanent grassland on class V and VI soils. In Wielkopolska, these animals make excellent use of by-products and feed of lower quality, e.g. from sugar beet production. In general, many production systems and technologies are used [Borys 2006, Szymanowska et al. 2014].

The aim of the article was to compare sheep meat production in two countries: Austria and Poland. The level of sheep population in both countries was similar. The comparison will concern aspects related to the meat use of sheep, i.e. industrial and total slaughtering, meat production, meat prices and links between sheep production and selected parameters in agriculture and economy.

MATERIALS AND METHODS

The sources of the materials are literature reviews and data obtained from Statistics Austria and Statistics Poland. The research period was varied. The sheep population was presented in a longer period of time in order to show the changes and tendencies occurring. Data on total slaughterings, meat production, meat productivity and meat prices concern the years 2007–2018. The paper uses methods of data analysis, such as constant dynamics indicators, Gini coefficient and Lorenzo curve, Pearson correlation coefficients. These methods are suitable for analyzing this type of data. The results were presented using descriptive, tabular and graphical methods.

RESEARCH RESULTS AND DISCUSSION

The production of lamb meat depends on a number of factors, such as the way the animals are fed, the breed and the productivity of the slaughterhouse. The most important factor is the number of sheep. Between 1992 and 2018, the Austrian sheep population remained relatively stable, similar to that of the 1940s (Fig. 1). The lowest number of sheep in this country was in 2002 (304,000 sheep), and the highest number in 2018 (406,000 sheep). During the period considered, there were, of course, decreases and increases which lasted several years. In the last four years, the number of sheep in Austria has increased from the period under consideration. The sheep population in Poland in 1992 was still very high (1.5 million head). However, this was a legacy of the previous economic system. The number of sheep kept in Poland fell dramatically and in 1999 the number of sheep kept in Poland equaled the level in Austria. The decrease in the number of sheep in Poland continued, but was not so great. The lowest level was achieved in 2014 (201,000 sheep). From 2015, as a result of the activity of the Chambers of Agriculture, payments have been introduced for animal production, including sheep. In the EU budget perspective (2015–2020), the Ministry of Agriculture and Rural Development included sheep in the production subsidy of EUR 25 per ewe (mother). As a result of this support, the sheep population increased, but the scale of the changes was small. The state of the sheep population in Poland was closely related to the level of support for sheep production [Klepacki 2005, Rokicki 2015, 2017]. In the final year of the analyzed period, there were 267,000 sheep in Poland, which, however, constituted only 18% of the 1992 populations. For comparison, the sheep population in Austria increased by 30% between 1992 and 2018.

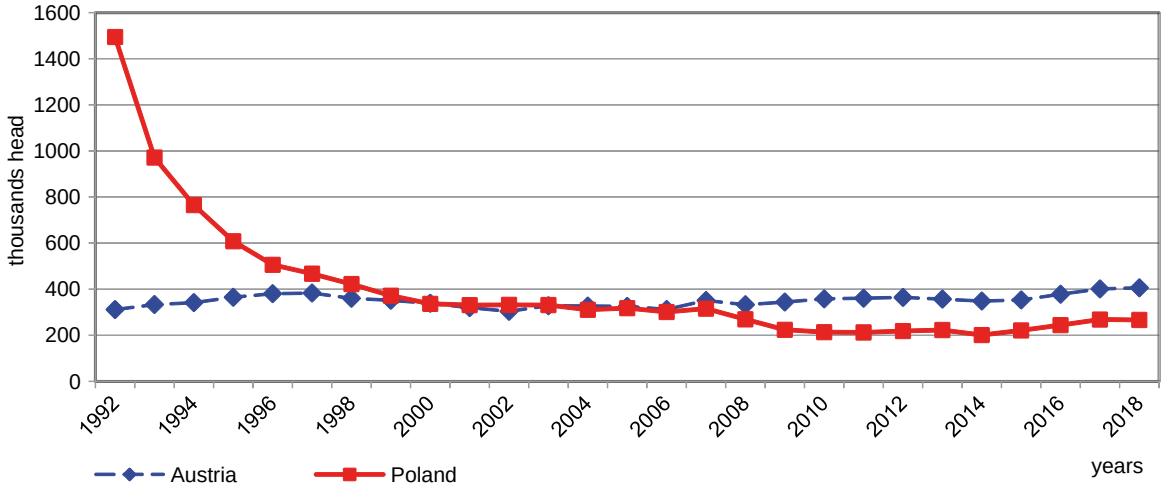

Fig. 1. Population of sheep in Austria and Poland between 1992 and 2018 (stocks on 1 December)
Source: Authors' own study based on Statistics Austria, Statistics Poland.

The Gini coefficient was used to determine the concentration of sheep in the regional approach (Bundesländer and voivodeships). A result close to 1 indicates a very high concentration of livestock, while a result close to 0 indicates a dispersion of animals in many regions. The Gini coefficient calculated for the Austrian sheep population in 2018 from the sample was 0.40 and the estimated coefficient for the population was 0.45. This means an average concentration of the sheep population in several Austrian Bundesländer. Production differentiation is additionally shown by the Lorenzo concentration curve (Fig. 2). In 2008, Gini coefficients were at a similar level, i.e. 0.41 from the sample and 0.46 estimated for the population, respectively. This means that the concentration of sheep in Austria has remained unchanged. Similar calculations were made for the sheep population in Poland. There was a slightly higher concentration of sheep than in Austria. In 2018 the Gini coefficient from the sample was 0.46 (estimated at 0.49), while in 2008 it was 0.47 (0.50). In the case of Poland, there were also no significant changes in the concentration of sheep in voivodeships.

A similar analysis was made for the slaughter of sheep by Bundesländer in Austria and by voivodeships in Poland. In the case of Austria, the Gini coefficient for 2018 was 0.52 for the sample and 0.58 for the estimate, and 0.49 and 0.55 for 2008 respectively. This means a higher concentration of slaughterings in one or more federal states. For Poland, the Gini coefficient for sheep slaughtering in 2018 was 0.44 from the sample and estimated at 0.47, while in 2008 it was 0.51 and 0.54, respectively. This means a decrease in the concentration of slaughters only in a few voivodeships and their distribution to other regions. In the case of slaughter in both countries, this was possible outside the place of purchase of the lambs. The companies in operation bought lambs in many regions and slaughtered them in a slaughterhouse known to them and with which they cooperated. The concentration levels of the sheep population and slaughterhouses in Austria and Poland were at a similar level. In both countries, the concentration ratio was also higher for sheep slaughtering than for cattle. In the countries surveyed there was a relatively stable structure for the parameters surveyed, with very small changes.

In terms of sheep meat consumption, an interesting aspect was the tripling of sheep meat consumption in Austria from around 300 g per capita in 1985 to over 1 kg at the beginning of the 20th century. One of the reasons for this was the immigration to Austria of certain ethnic groups consuming lamb. Despite the fact that the consumption of this meat per capita increased three times, it was still small. However, the importance of beef decreased in the given period, the consumption of poultry meat grew steadily and pork remained at a similar level [Willerstorfer 2012]. In 2017, the consumption of lamb meat in Austria was approximately 1.1 kg per capita. It was a very small percentage compared

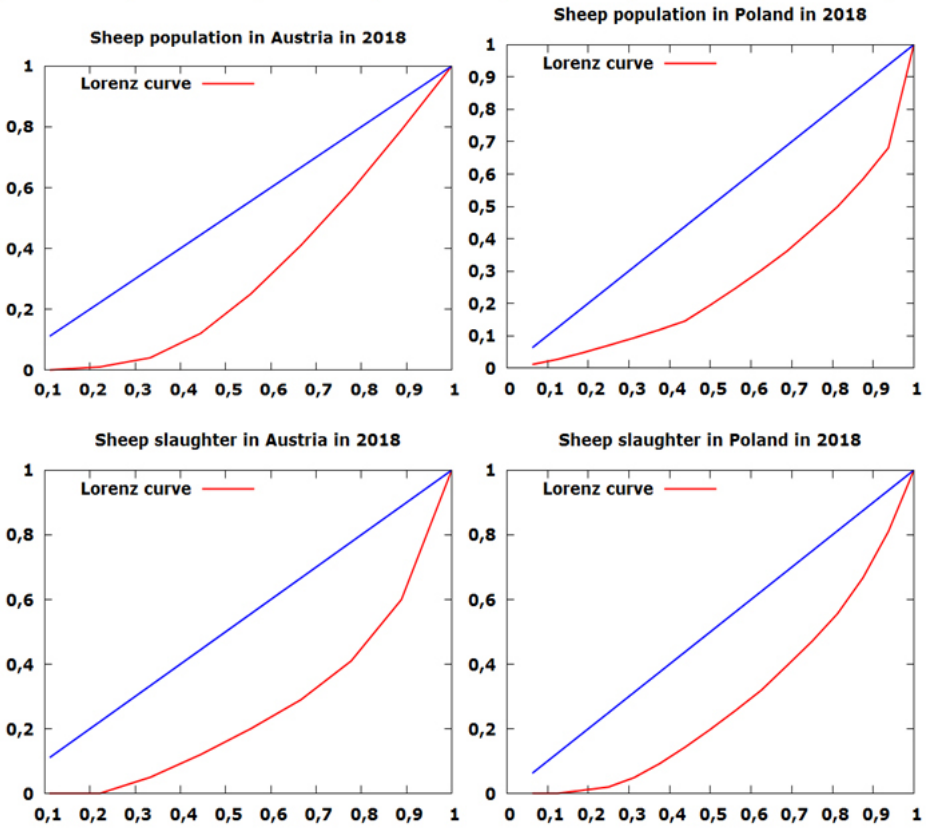

Fig. 2. Lorenzo concentration curves for sheep population and sheep slaughtering in the Austrian Bundesländer and in Polish voivodeships in 2018

Source: Authors' own study based on Statistics Austria, Statistics Poland.

to the total consumption of meat per capita of 64 kg (only meat for human consumption). The domestic consumption of meat in Austria was around 850,000 t. The degree of self-sufficiency was 108% for total meat. Pork dominated with the consumption of 37.2 kg per capita, which corresponds to the level of self-sufficiency of 101%. Beef and poultry were ranked second in terms of consumption per person of 12 kg each and self-sufficiency of 140 and 68% respectively [Grüner Bericht 2018]. For lamb meat, the self-sufficiency rate was only 80%. This situation in sheep production and the expected decline in the volume of beef were good conditions for trade in lamb on the Austrian domestic market. Sheep meat constituted a small percentage of the turnover and meat from young animals was offered. Lamb consumption was low because of its bad image, due to the sheep meat that was offered in previous years. The ordinary consumer does not distinguish between lamb and sheep [Ringdorfer 2003]. Nowadays, around Easter, Austrians eat 230 t of lamb meat. The consumption of lamb meat during the Christmas period [Kattinger 2017] is also very popular.

In Poland, trends in the consumption of lamb meat are similar to those in Austria. Similarly, offering old sheep for sale in earlier periods has led to reluctance on the part of some customers. In addition, lamb meat for Poles is one of the most expensive, so they are more likely to eat pork (40.5 kg in 2017) and poultry (30 kg). Less popular is beef (2.2 kg). In Poland, the total annual consumption of meat per capita was 78.5 kg. Lamb meat was eaten only at 40 g, i.e. within the limits of statistical error. In Poland, there is no tradition of eating lamb meat during major holidays [FAMMU/FAPA 2016, GUS 2018].

In both countries, economic slaughter for the needs of the farmer's family is possible. In addition, some animals were exported to other countries. Especially in Poland, such a situation was frequent. The remaining animals were placed on the domestic market and had to be slaughtered in professional slaughterhouses. In Austria, many more sheep were slaughtered industrially than in Poland (Fig. 3). Similar trends can be observed in both countries. In general, more and more sheep were slaughtered (in Austria, the increase between 2009 and 2018 was 26%, and in Poland as much as 188%), and declines and increases occurred in similar years during the period under consideration. Additionally, in Poland, the importance of live lamb exports was systematically decreasing in favor of meat sales on the domestic market. In Austria, most of the animals were destined for the domestic market. The demand for lamb meat in Austria was very stable.

Industrial slaughterhouse is also broken down by month (Fig. 4). In Austria, increased slaughter rates

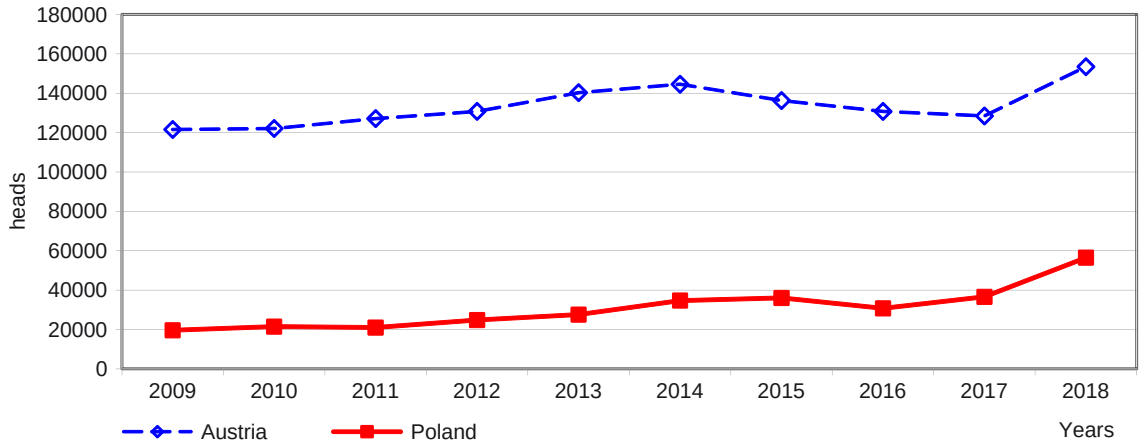

Fig. 3. Industrial slaughter of sheep in Austria and Poland in 2009–2018

Source: Authors' own study based on Statistics Austria, Statistics Poland.

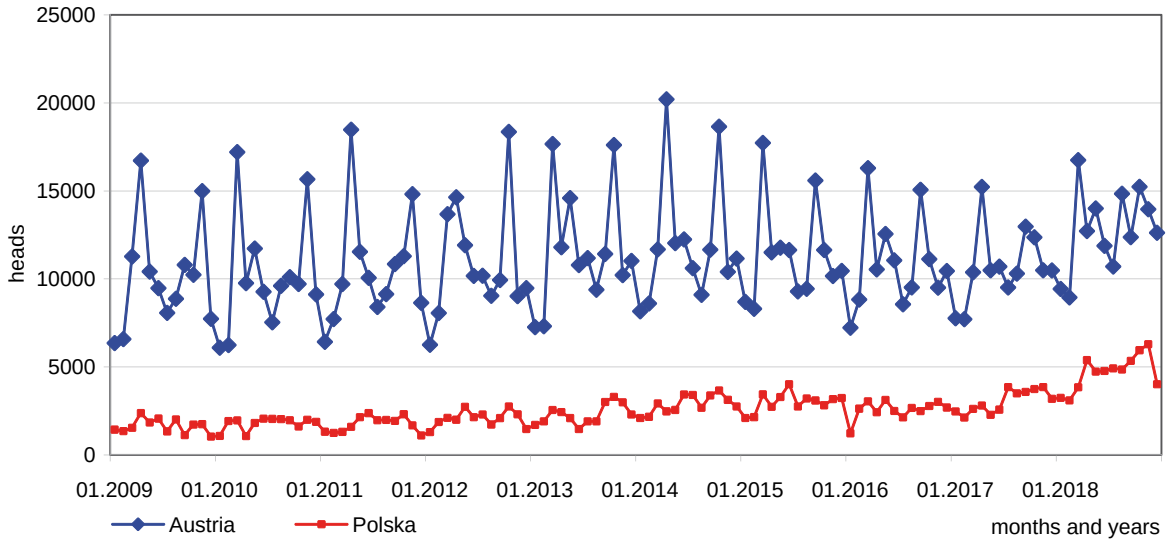

Fig. 4. Monthly industrial slaughter of sheep in Austria and Poland in 2009–2018

Source: Authors' own study based on Statistics Austria, Statistics Poland.

were recorded in the immediate run-up to the major holidays: Christmas and Easter. In Poland, no such regularity was observed. Both countries are very Catholic and celebrate solemnly served holidays. In Poland, however, there is no tradition of eating lamb on holiday days. Interestingly, most slaughters were recorded in the summer months, such as June and July. This may be due to increased consumption of lamb during vacations, directly at the places of rest. Then there is an opportunity to try something different and exquisite.

Taking into account the total number of sheep slaughtered, it was much higher than only the industrial slaughter (Fig. 5). In Austria, half of the sheep were slaughtered outside industrial slaughterhouses, and in Poland the proportion of such sheep was as high as 65%. This high proportion of self-slaughtering testifies to the high consumption of lamb meat by farmers and their families. The statistics on lamb meat consumption are largely determined by them. Meat production was closely correlated with the number of slaughtered animals, which means some stabilization in terms of consumers' market preferences. In both countries, mainly lambs were slaughtered. In Austria, their share in the total number of slaughtered sheep in each year was 75–80% in terms of number of heads and 66–72% in terms of meat production. Similar results were achieved in Poland. Total slaughter of sheep in Austria increased by 20% in terms of number of slaughtered animals and by 17% in terms of meat over the period considered. In Poland, decreases of 50% and 45% were recorded respectively.

To compare consumer markets, information on the average weight of the carcass being slaughtered and the meat yield obtained is also important. In Austria the carcass weight was much higher than in Poland, because in the years under study it ranged from 22.63 to 25.29 kg (Fig. 6). In Poland it was from 12.97 to 14.47 kg respectively. Since the structure of the slaughtered sheep in both countries was around 75% lamb, it can be concluded that the average carcass weight of the slaughtered lambs in Austria was much higher. The animals were fattened to a weight of over 40 kg, which was rare in Poland. For export purposes, lambs weighing even less than 20 kg and most often in the range of 22–25 kg were exported. On the Polish market, lambs weighing 30–40 kg were sold most often. Fattening above 40 kg was less popular. The average meat yield at slaughter was almost identical in both countries, except for the years 2013–2014, when Austria achieved a much higher result (50%).

Another aspect of comparison is the prices obtained for lambs per kg of carcass weight (Fig. 7). Farmers in Austria received significantly higher prices. In addi-

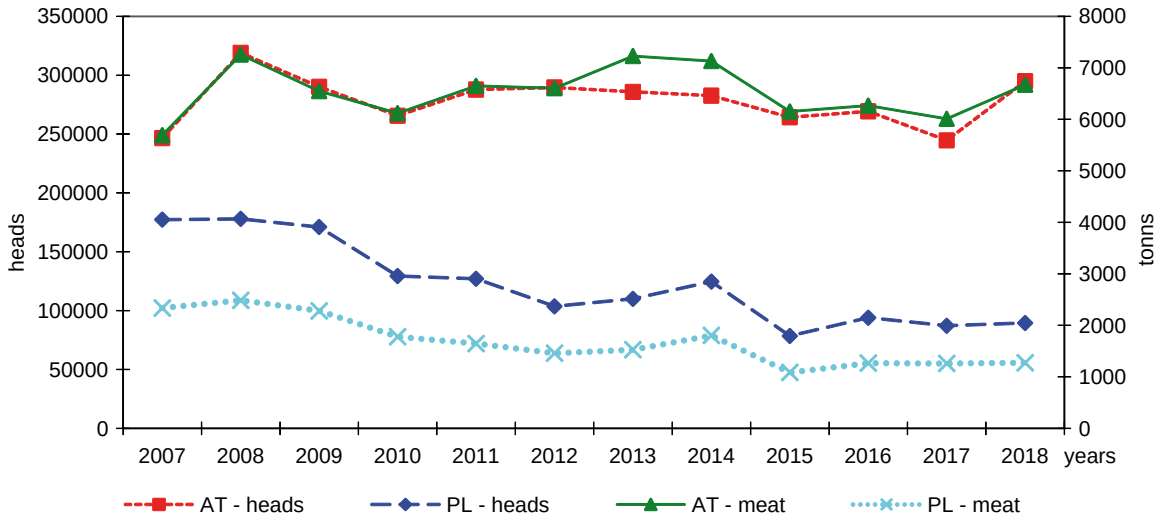

Fig. 5. Total slaughter in pieces and sheep meat production in Austria and Poland in 2007–2018

Source: Authors' own study based on Statistics Austria, Statistics Poland.

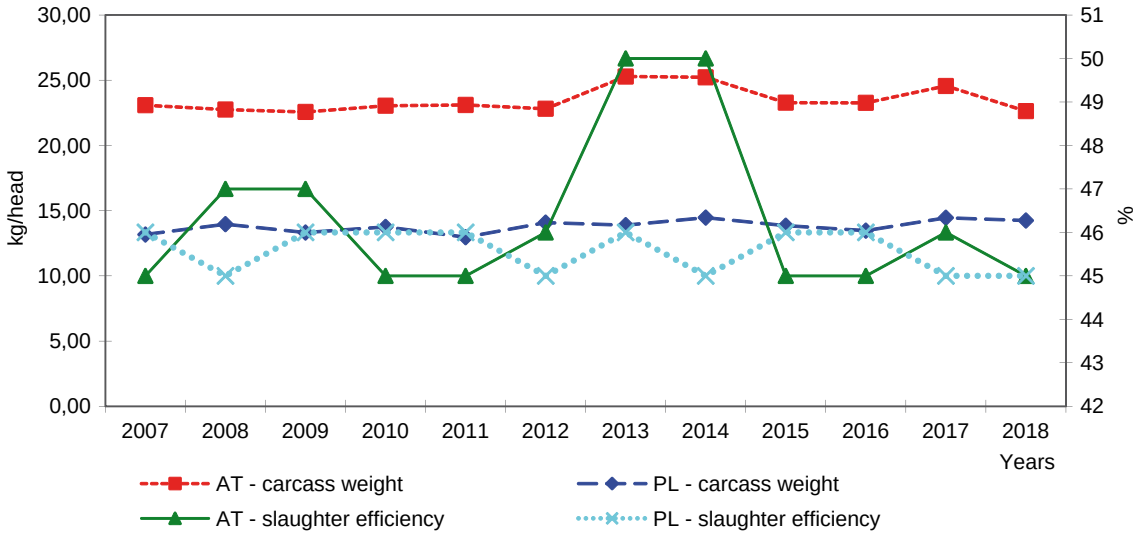

Fig. 6. Average carcass weight and slaughter yield of sheep in Austria and Poland 2007–2018
Source: Authors' own study based on Statistics Austria, Statistics Poland.

tion, in Austria prices were actually rising steadily. In Poland, since 2012, there have been alternating periods of declines and increases. As a result, the difference between prices per kg of carcass in Austria and Poland increased. The smallest difference was EUR 1.21 in 2011 and the largest was EUR 2.09 in 2017. The average price per kg of lamb carcass in Austria during the period considered increased by 24% and in Poland by 26%. However, the difference did not decrease, but deepened, due to a different starting point. Prices in a given country are usually adjusted to the capabilities of the society. However, in the case of good quality but expensive lamb meat, it is difficult to ascertain the adjustment of the price to the wealth of domestic consumers' portfolios.

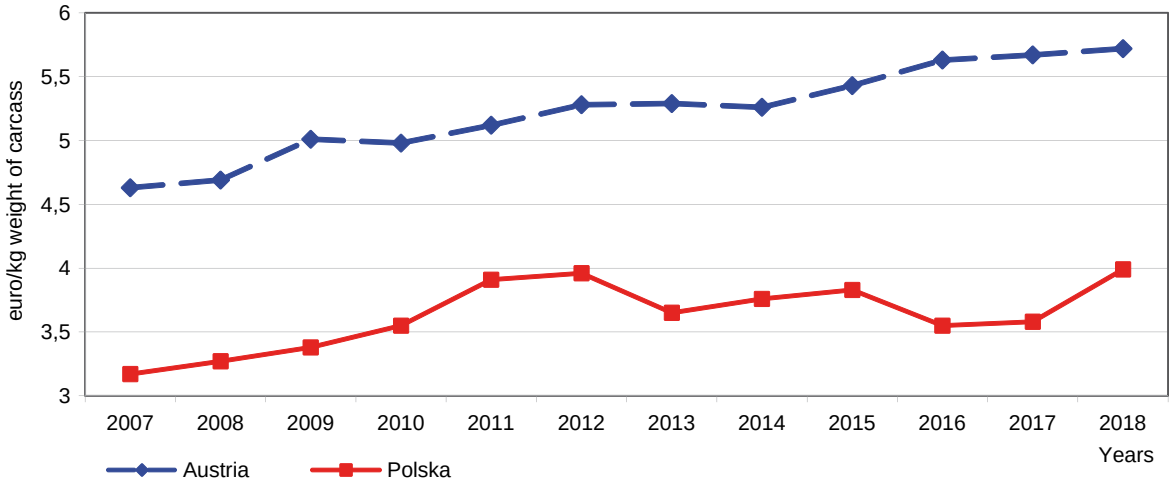

Fig. 7. Average annual prices of meat from heavy lambs in Austria and Poland in 2007–2018
Source: Authors' own study based on Statistics Austria, Statistics Poland.

Pearson's linear correlation coefficient was used to determine the correlation between sheep population, meat production and number of slaughterings of sheep and economic parameters. The tests were carried out separately for Austria and Poland. The analysis period covered the years 1999–2018. Table 1 presents the results and shows the *p*-value. The significance threshold was set at $p = 0.05$. The tests carried out confirmed that the values *X* and *Y* were correlated at the given materiality level. Significant correlations were marked with bold in the text.

A strong positive correlation was found between the size of the sheep population and economic parameters in Austria. In the case of Poland, there was a negative correlation. In both countries the economic parameters were systematically improving, but in Poland the number of headcount decreased and in Austria the number of headcount increased. The situation was strongly influenced by the appropriate conditions for sheep farming, mainly in the economic sphere. In both countries, the stocking density changed in the opposite direction to that of the sheep population, but only the results in Austria were relevant. In this country, cattle competed for access to grassland. In Poland, some of the meadows were unsustainable (on arable land), which made it possible to adapt the area to the needs of production. An analysis of the relationship between the sheep population and other agricultural parameters was also considered. The number of sheep per 100 ha of UAA was correlated with the number of head, while in the case of grassland, e.g. in Austria, the area remained relatively constant. The level of plant fertilization would also be a misleading parameter. Austria had a high percentage of organic farms that did not use artificial fertilizers. The same was true for plant protection measures. Therefore, these parameters were not analyzed after the substantive assessment. Correlation of meat production and number of slaughtering with economic and agricultural parameters was significant only in Poland. The lack of significant results for Austria may be due to the fact that fewer lambs are used for meat during the growing period of the herd.

There is no tradition of eating lamb in Poland and Austria. With greater promotion of this type of meat, domestic demand may increase, which will increase the sheep population. In Austria, the sheep population and lamb meat production will increase very slowly. In Poland, it is expected to maintain the existing state [Rokicki 2017, Grüner Bericht 2018].

CONCLUSIONS

The sheep population in Austria and Poland in the last dozen or so years has been at a similar level, but in Austria a slight increase in the population of these animals can be observed, while in Poland a decrease can

Table 1. Pearson's linear correlation coefficients between sheep population and economic parameters

Tested parameters	Pearson's linear correlation coefficients			
	Austria		Poland	
	R	*p*	*R*	*p*
Correlation coefficients between the sheep population and				
GDP	0.797	0.001	–0.802	**0.001**
GDP per capita	**0.781**	**0.001**	**–0.798**	**0.001**
Final consumption of households	**0.790**	**0.001**	**–0.825**	**0.001**
Final consumption of households per capita	**0.770**	**0.001**	**–0.825**	**0.001**
Export of goods and services	**0.760**	**0.001**	**–0.726**	**0.001**
Import of good and services	**0.778**	**0.001**	**–0.748**	**0.001**
Stocking density per 100 ha UAA	**–0.594**	**0.006**	–0.235	0.319

Source: Authors' own study based on Statistics Austria, Statistics Poland.

be observed. The level of sheep population concentration in both countries was similar (Gini coefficient was around 0.40–0.47), i.e. these animals were kept in higher numbers in several Austrian Bundesländer or Polish voivodeships respectively. The concentration was slightly higher in the case of sheep slaughtering, because Gini coefficients in both countries in 2018 were in the range of 0.44–0.52. The concentration of slaughtering decreased in Poland and increased in Austria. Differences in the concentration of the sheep population and the number of slaughterings resulted from the purchase of lambs from several regions by purchasing entities and slaughtering in the cooperating slaughterhouse located in one region.

The annual consumption of lamb meat in both countries was low. In Austria it was about 1.1 kg per capita, and in Poland it was within the limits of a statistical error, i.e. below 100 g. In Austria, there was a tradition of eating lamb meat during Easter, while in Poland there was no such approach. In both countries, there were consumer prejudices against this meat, which can be eliminated by appropriate promotional campaigns.

The level of industrial slaughter indicates the marketability of the animal production in question. In Austria, more animals were marketed. In both countries there were similar changes in the number of slaughters. In the countries surveyed, around 75% of the slaughtered sheep were lambs, which was a very positive aspect. Analyzing the monthly changes, greater seasonality occurred in Austria, where the largest number of slaughters took place in the months immediately preceding the main religious holidays. There was no such concentration in Poland. Meat production was closely correlated with the number of slaughtered animals.

In Austria, larger animals were slaughtered because the average carcass weight was 25 kg, while in Poland it was only 13–14 kg. The standards and expectations of consumers were different. In Poland the maximum expected weight of lamb did not exceed 40 kg – in export to Italy, it was even below 25 kg. In Austria, lambs weighing more than 40 kg were slaughtered. Interestingly, the different carcass weight did not affect the meat yields obtained from these animals. In both cases they amounted to 45–46%.

The prices obtained for lambs per 1 kg of carcass were significantly higher in Austria, where there was a continuous increase in prices, while in Poland the trend was generally increasing, but there were periods of decline. The biggest difference in prices between countries was as much as EUR 2.09 per kg carcass weight. The higher wealth of citizens in Austria also had a significant impact on the price.

Different results were achieved in both countries when comparing the relationship between the sheep population and economic parameters. In Austria, the sheep population increased with the improvement of economic parameters. The economic situation in Poland was good, but the number of sheep was decreasing at that time. Farmers replaced sheep production with more profitable agricultural activities or abandoned agriculture. In Austria, sheep farming production was more closely linked to landscape conservation and therefore developed. Austria was also characterized by a greater stabilization of agriculture.

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PRODUKCJA MIĘSA OWCZEGO W AUSTRII I POLSCE – PODOBIEŃSTWA I RÓŻNICE

STRESZCZENIE

Celem artykułu było porównanie produkcji mięsa owczego w Austrii i Polsce. Poziom pogłowia owiec w obu tych krajach był na zbliżonym poziomie. Źródła materiałów stanowił przegląd literatury oraz dane pozyskane z austryjackiego Bundesanstalt Statistik Österreich oraz polskiego Głównego Urzędu Statystycznego. Okres badań dotyczył lat 1992–2018. Wykorzystano metody analizy danych jak wskaźniki dynamiki o podstawie stałej, współczynnik Giniego i krzywa Lorenza oraz współczynniki korelacji liniowej Pearsona. Stwierdzono występowanie wielu różnic, np. kierunku zmian wielkości pogłowia owiec, skali ubojów ogółem i ubojów przemysłowych, udziału samozaopatrznia w produkcji mięsa ogółem, tradycji spożywania jagnięciny w okresie świąt, średniej masy tuszy owiec, cen mięsa jagnięcego, współzależności pogłowia owiec ze zmianami parametrów gospodarczych. Podobieństwa dotyczyły natomiast poziomu koncentracji pogłowia owiec i ich ubojów w regionach, uprzedzeń dotyczących spożywania jagnięciny, udziału jagniąt w ubojach i produkcji mięsa, wydajności mięsa uzyskiwanej przy ubojach owiec.

Słowa kluczowe: produkcja owczarska, ubój owiec, mięso jagnięce, cena mięsa jagnięcego