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Pig farming: challenges and perspectives

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Abstract: Global pork production in 2022 increased by 1% compared to the previous year. The largest producer of pork is still the People's Republic of China with 46%, followed by the EU with 18% and the USA with a 10% share in total production. In the previous period, there were major disruptions in the market due to the emergence of two 2020 COVID-19 viruses and the emergence of the African swine fever (ASF) virus in Ukraine in 2012. The virus COVID-19 disrupted the market for two years with a declining impact from 2022, but the ASF virus is not reducing its impact even today since its appearance. In Serbia, the largest number of euthanized pigs due to ASF was in 2023, as well as in neighboring Croatia. Smaller farms were the most affected because they did not have good biosecurity measures, and large pig breeders were endangered and at risk because of them. In 2024, the occurrence of ASF was recorded in four districts (15 villages) as well as in one municipality of the city of Belgrade. Since the beginning of this year, we have had AFSderegistered in four districts, for 31 populated places the decision on the area infected with the AFS virus has been revoked. When we talk about the market, the cost price per kg of warm carcass side in 2022 is the highest in Italy (€2,894/kg of warm carcass side) with a share of pig feeding costs of 62.89% and a share of labour costs of 5.18% per kg of warm carcass side, while in Brazil (Midwest) the price of producing a kg of warm carcass side is significantly lower and amounts to 1,412 euros per kg with a share of pig feeding costs of 77.20% and a share of labour costs of 2.83% in the cost price of a kg of warm carcass side. Serbia is one of the few countries in Europe that has not introduced a system of evaluating carcass sides on the slaughter line and paying fattening animals according to the estimated share of meat in the carcass side, i.e. the meatiness of fattening animals, but mostly fattening animals are paid per kg of live weight. Introduction of unbiased assessment of meatness on the slaughter line in Serbia would significantly improve pig production in Serbia and increase the economy of pork production.

Keywords: pig production; risks in pig production; virus; costs; market

TRENDS AND SITUATION OF PIG FARMING IN THE WORLD AND IN SERBIA

The global pork production in 2022 is estimated at more than 121 million tons of meat and it is 1% higher than in 2021. The largest producers of pork are China with 46%, the European Union with a share of 18% and the United States of America with a share of 10%. In the year 2022, the EU recorded a production of 22.6 million tons,

which is a decrease of 6% compared to the previous year, of which 82% is produced by seven member states. Spain (23%) and Germany (20%) have the largest share in production, followed by France (10%), Poland and the Netherlands (8%), Denmark (7%) and Italy (6%). All other member states together produce 4,034 thousand tons of meat, or 18% of the total production (FAO, 2024). The number of slaughtered pigs recorded a decrease of 5.1% compared to 2021 and amounted to 236,826 thousand heads.

In Serbia, looking at 2013 as the base year when the number of pigs was 3,144,000, compared to 2022, we have a decrease in number of pigs by 15.2% when the total number was 2,667,000 heads of pigs (Statistical Office of the Republic of Serbia, 2024). The trend is extremely bad because there are fewer and fewer agricultural farms engaged in pig production and one of the reasons is the low price of fattening animals in certain years. In Table 1, we see that we have an increase in the total number of pigs from 2013-2015, then a decline until 2019, when an increase in the total number of pigs is recorded, as well as in 2020, after which we again have a decrease in the total number of pigs due to the increase in grain prices and low prices of fattening animals. In our country, there are natural resources so that we can grow more than ten million fattening animals per year.

The largest exporters on the world market are still the EU, the United States of America, Canada and Brazil. By far the largest export market of crosses from the EU during 2023 was China, given the restrictions related to African swine fever. However, due to changes in the internal market of China in the period January-September 2023, exports to that country from the EU decreased by 18.4% compared to the period January-Septem-

ber 2022, exports to Hong Kong also decreased by 14.4%. Exports to the EU and to other markets decreased, including Japan (-21.4%), the Philippines (-40.7%), South Korea (-31.7%), the United States of America (-34.5%) and Australia (-41.5%), the total EU export estimated at 3.27 million tons is lower by 20.4% compared to the period January-September 2022.

Figure 1 shows the numerical status of individual categories of pigs in the Republic of Serbia from 2013 to 2022 (000 head).

When it comes to the number of animals, the trend in the last two decades is negative. We have a significant decrease in the number of breeding sows and other categories of pigs compared to 2015. The breed composition on registered agricultural holdings, with non-planned crossbreeds and without control, has changed significantly, and thus the production of piglets, i.e. fattening pigs, per breeding sow per year has increased. The change is accelerated by incentives for the purchase of quality breeding animals through the Directorate for Agrarian Payments, that is, the Ministry of Agriculture, Forestry and Water Management or through local self-government. In addition, centers for animal reproduction and artificial insemination help to a significant extent with the production and distribution of seeds

Table 1. Number of pigs in Serbia since 2013 (in 000)

Categ. pig/ Year	Fattening pigs, 80-109 kg	Fattening pigs, 110 and more kg	Selected gilts, 30-80 kg	Breeding pigs - gilts: pregnant gilts	Breeding sows	Breeding pigs - sows: pregnant sow	Breeding pigs - boar	Pigs, total
2013	314	272	107	32	355	175	20	3144
2014	312	280	157	33	346	171	23	3236
2015	329	339	119	25	354	149	28	3284
2016	286	284	111	23	356	143	20	3021
2017	305	259	101	20	350	157	20	2911
2018	268	257	103	28	343	154	21	2782
2019	266	283	92	23	350	171	25	2903
2020	313	288	106	29	346	151	19	2983
2021	298	281	81	20	331	135	22	2868
2022	290	273	81	23	301	134	17	2667

Source: Statistical Office of the Republic of Serbia (2024)

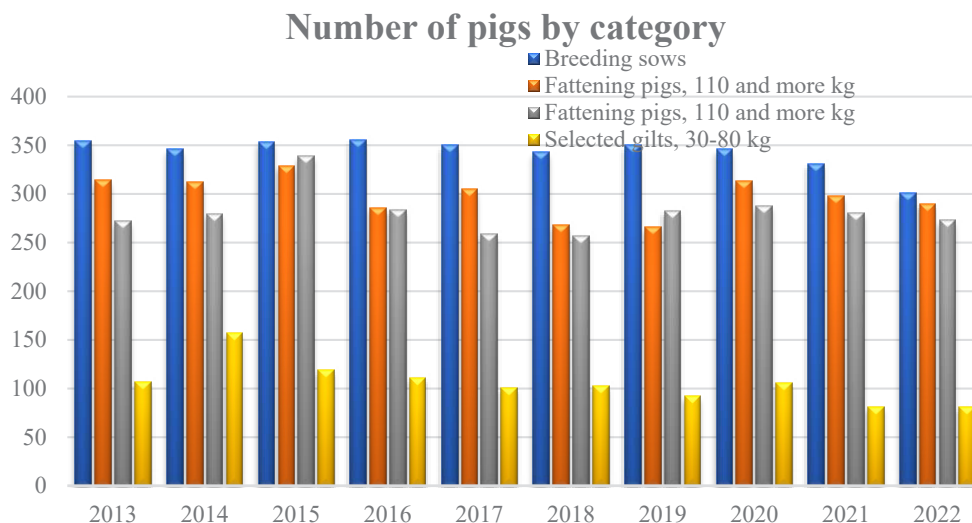


Figure 1. Numerical status of certain categories of pigs in the Republic of Serbia from 2013 to 2022 (000 head)

Source: Statistical Office of the Republic of Serbia (2024)

from the highest quality boars. In Serbia, there is a great potential for breeding a significantly larger number of pigs, i.e. preconditions for an economically justified increase in production, due to the available domestic raw material base for animal nutrition and due to preserved old and newly installed production capacities in the complete production chain, from farms to processing capacities (Radović et al., 2023). In our country, pork production is very important because the share of pork makes up 58.7% of the total production of all types of meat in our country (Radović et al., 2022).

THE PERSPECTIVE OF PIG FARMING

The world's population is expected to increase by 2 billion people in the next 30 years, from 7.7 billion currently to 9.7 billion in 2050 (Radović et al., 2019). The production of pork meat is, in addition to the production of poultry meat, the most intensive branch of livestock production. Those two meat productions to the greatest extent should provide enough animal protein for the growing population. Proteins have long been regarded as the most important component of meat.

However, the importance of polyunsaturated fatty acids in meat is increasingly emphasized. Essential fatty acids found in the human brain are not found in plants only in meat. For this reason, meat is irreplaceable for humans, i.e. for normal and balanced nutrition. In this regard, the lack of polyunsaturated fatty acids in the diet presents a greater problem, from the point of view of people's health, than the lack of protein (Radović et al., 2018). Selection can influence the content of intramuscular fatty tissue, i.e. the content of fat in meat. Modern pork production is based on several breeds or genotypes of pigs, which, through selection for economically important traits, have a genetic basis for high production results. Most economically important traits (fertility traits, daily gain, food consumption, yield and meat quality) form a group of quantitative traits. These traits are conditioned by the action of a large number of genes, which have an additive effect, where each contributes to the formation and expression of a certain trait and quantitative traits are strongly influenced by environmental factors (Radović et al. 2020). Many researchers have examined the influence of variability, degree of heredity and dependence of growth intensity, fat thickness, individual carcass parts and meatiness. Breeds with different manifestations of traits were obtained by

selection for different traits, e.g. extremely fertile, fat breeds, meat breeds or combined breeds. Given that the requirements of the slaughterhouse industry are carcass sides with a higher proportion of meat and a lower proportion of fatty tissue, because this is an economically important property, which directly affects the economy of production. The goal of the production of purebred and hybrid pigs is higher fertility, higher growth, better conversion and the production of fattening pigs with the majority of meat in half with good meat quality required by the slaughterhouse and the consumer. Selection for a larger amount of meat in the carcass side is usually carried out by indirect selection for the thickness of the bacon. Given that bacon thickness is a heritable trait with a heritability of 0.4 to 0.6 (Kosovac, 2002; Chen et al., 2002 and Radović et al., 2003), selection can relatively quickly affect the reduction of bacon thickness and thus increase in fleshiness. Novel technologies (genomic selection, increased genotyping and phenotyping) will allow for genotyping all selection candidates, reducing the generation interval and emphasizing the need for inbreeding control, more efficient breeding structures, and higher selection intensities (Egbert et al., 2016).

In Serbia, evaluation of meatiness is carried out using ultrasonic devices *in vivo* and *in vitro* on the slaughter line using automatic devices for evaluating meatiness or by manual measurement using the two-point method. The pig genotype, in addition to the nutrition, has the greatest effect on carcass quality and meatiness. The prerequisite for work on the genetic improvement of pig quality is knowledge of the variability of the production properties of the breeding animals. Regardless of the significance of the evaluation of the carcass quality and meat quality on the slaughter line, there is a problem in our country that in most slaughterhouses no automatic or semi-automatic devices for their assessment are used. For more than 20 years the economic environment in the country has been too dynamic and insecure, which has put domestic pig breeding in difficult situations. In the process of joining the European Union, Serbia must implement the qualification

of pig carcasses under the (S)EUROP system. This system is mandatory for each Member of the EU (Zapryanova, 2019). In our country, the Rulebook (OG SFRY, 1985), according to which the total mass of muscular tissue without the belly-rib meat is determined, is still applicable. Due to the above, the content of meat determined according to the Rulebook (OG SFRY, 1985) is lower by 8 to 12% compared to evaluation using FOM. The average estimated meatiness (EC, 2006) in 2020 was 56.55% (Radović et al., 2020), while in 2022 it was 58.38% determined on 11,259 animals, which is an increase of 1.83%. It should be noted that in Serbia there is still no system for evaluating carcass sides at the slaughter line and that these results are primarily encouraging and indicate good meatiness as a result of selection. It takes almost 4 times less energy to gain a kilogram of muscle mass than to gain 1 kg of fat tissue. If we produce meatier pigs, it means that we have saved money. In our country, the incentive measures of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia for high-quality breeding pigs, fattening pigs, measures to improve production in pig farming and the introduction of meatiness assessment at the slaughter line in the coming period should improve production and stop the trend of reducing the number of breeding pigs in the total number of pigs and later to lead to a slight increase in the number of pigs.

CHALLENGES IN PIG PRODUCTION

If we have industrial production, good genetics, quality nutrition and good environmental conditions, we still have two basic challenges left, which is to preserve a healthy supply and preserve a healthy market. The pig farming sector was significantly destroyed by the appearance of African swine fever (ASF) in Ukraine (2012), Belarus (2013) and the countries in the Baltic region: Lithuania, Latvia, Estonia and Poland (2014). After that, the disease was confirmed in Moldova in 2016, and in 2017, ASF virus infection was diagnosed for the first time in one of our

neighboring countries (Romania, 2017). In the same year, the presence of the virus and the occurrence of the disease was also confirmed in the Czech Republic. And finally, in 2018, ASF was diagnosed in Hungary, Bulgaria and Belgium, but also in a country far away from us, China. The first case of ASF in Serbia was confirmed in 2019. All of the above significantly affected pig production globally and caused major problems on the world market in connection with the ban on the import of pigs from countries where the virus was detected, as well as the export of pigs and meat from infected areas. In 2024, the occurrence of ASF in Serbia was recorded in four districts (15 villages) as well as in one municipality of the city of Belgrade. Since the beginning of this year in our country, we have had ASF de-registration in four districts, for 31 populated places the decision on the area infected with the ASF virus has been revoked (Source, Ministry of Agriculture-Veterinary Directorate www.vet.minpolj.gov.rs). Turbulence in the domestic market is a consequence of the closure of eastern markets, mainly the impossibility of exporting from Germany to China, but also the sudden recovery and increase in production in China as the largest producer and importer of pork. In addition to a series of market disruptions due to ASF, the market is dis-

rupted by another virus, COVID-19, which during 2020 and 2021 combined with the ASF virus further complicates pig production. In that period, we had major changes in the market due to the emergence of Covid and the global pandemic, which in turn greatly affected the entire economy in Europe. In addition, the year 2021 brought significant increases in all production costs, with an emphasis on energy and animal feed prices, which continued in 2022. The continuation of the problem of pig production in 2022, apart from these two viruses, the increase in the price of energy, raw materials and mineral fertilizers was a major drought that affected almost all of Europe and affected the entire production of corn, the main energy feed for fattening pigs, as well as changes in the market due to war events in the east of Europe. During the COVID-19 virus pandemic, the state limited the price of meat, i.e. the price of a kg of thigh meat, thus making business more difficult, which led to a decrease in the number of sows. In the period from 2021 to 2022, due to the crisis in the prices of raw materials, the prices of animal feed increased by an average of 34%. The increase was particularly significant in the countries of Northern Europe, about 55% in Finland and Sweden. With feed costs accounting for between 56% of production costs in Finland

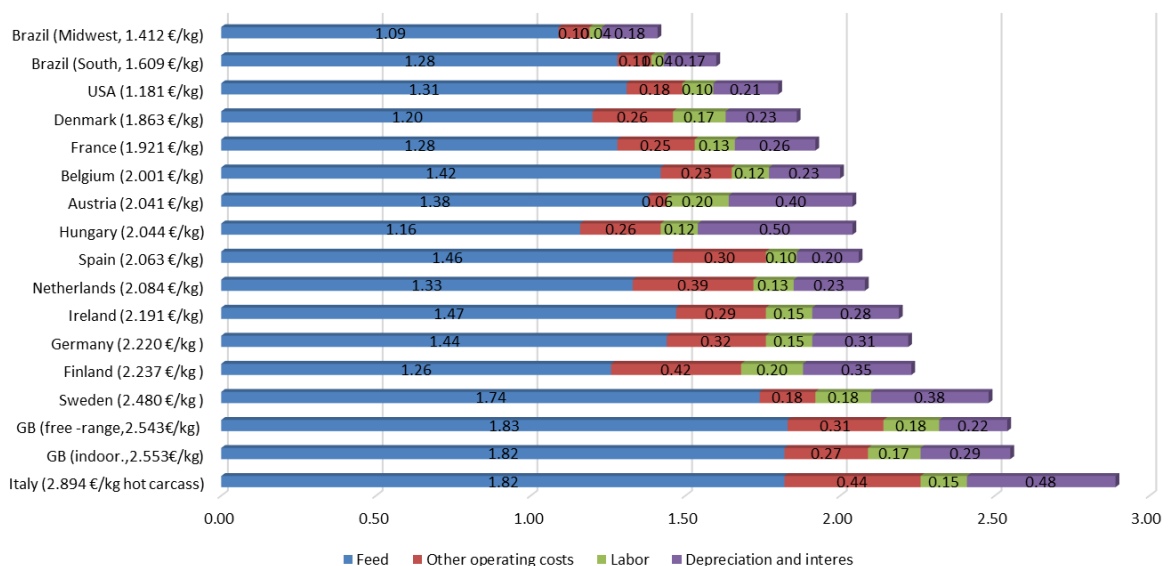


Figure 2. Cost structure of pig production in 2022 (€/kg hot carcass). Source: IFIP based on InterPIG data

and up to 80% in southern Brazil, the impact of higher feed prices on production costs was significant. On average across all countries, production costs increased by 27%.

There was an increase in the number of sows in Serbia in 2019 and 2020. After that, due to the emergence of COVID-19, the impossibility of exporting to Russia and China due to the emergence of ASF and the conflict in Ukraine, EU exporters for these markets placed their surpluses on the region and Serbia at significantly lower prices and in this way stifled and hindered the production of pigs in our country. In addition to the above, in pig production, there was a significant increase in all production costs, with an emphasis on the prices of energy products and the increase in the prices of cereals, i.e. animal feed, and the price of fattening animals is low due to surpluses and imports from the EU.

When we talk about the price market of the cost of kg of warm carcass side (Figure 2.) in 2022, in the observed countries, the highest established cost price of kg of warm carcass side is in Italy (€2,894/kg of warm half meat), with a share of pig feeding costs of 62.89% and with a share of labour costs of 5.18% in a kg of warm carcass side, while in Brazil (Midwest) the production price of a kg of warm carcass side is significantly lower and amounts to 1,412 euros per kg with a share of pig feeding costs of 77.20% and a share of labour costs of 2.83% in the cost price kg of warm carcass side. Clerc L. (2022) for 2021 states a lower cost price of €2,115/kg of carcass sides in Italy as well as a lower price in Brazil (Midwest) of €1,145/kg of warm carcass sides. She states that the price of feed for pigs has a share of 50-83% in the cost price of a kg of pork. The lowest share of 50% in the price of a kg of piglets was in Finland (pig feed price of €0.82 in a total price of €1,639 per kg of piglets) and the highest share of pig feed cost of 83% was in Brazil (South), where the price of pig nutrition amounted to €1.06 in the total cost price of €1,274 per kg of pork.

In addition to the mentioned factors important for pig production at the beginning of the chapter and the two basic challenges, there are also addi-

tional challenges that will affect the future of pig farming, which are primarily related to ecology, i.e. preservation of the environment, because intensive pig production, in addition to cattle breeding, is targeted as a serious polluter in the total agricultural production. The next challenge is that there is pressure from various NGOs for the welfare and protection of pigs. The last and most recent challenge is the vegetarian lobby and the production of an artificial product that is meant to be a substitute for meat. Such an artificial product that should be a substitute for meat should not have the word MEAT in its name. In addition to the above-mentioned challenges, an additional challenge for pig breeders and the slaughterhouse industry is the harmonization of the assessment of meatiness on the slaughter line at the level of the EU and member states, as well as a challenge for our country, which has yet to introduce the SEUROP system for assessing the meatiness of pigs on the slaughter line.

Preservation and improvement of animal husbandry, animal genetic diversity, preservation of autochthonous and development of new breeds, preservation of genetically diverse populations provide society with a greater range of options to meet future challenges and development of agriculture (Radović et al., 2021).

CONCLUSION

It is necessary to invest in food production, increase the number of pigs, increase biosecurity measures on the farm and introduce innovative technologies in the production of pigs, as well as introduce a mandatory SEUROP meat evaluation system on the slaughter line. The goal of every country that takes even a little care not to become completely dependent on imports is to preserve its production. It would significantly improve pig production in Serbia and increase the economy of pork production. In addition to the above, it is necessary for the economy safety of breeders:

1. Diversification: Pig farmers may explore diversification strategies such as value-added products (e.g., specialty meats, processed pork

products), agritourism activities (e.g., farm tours, on-farm events), or vertical integration (e.g., owning or partnering with processing facilities) to increase revenue streams and mitigate risks.

2. Export Opportunities: Growing demand for pork products in emerging markets presents opportunities for pig farmers to expand their businesses through export markets. However, this also requires compliance with international trade regulations and standards.

3. Sustainability Initiatives: Adopting sustainable practices not only helps pig farmers reduce environmental impact but also enhances their reputation with consumers and stakeholders who are increasingly concerned about animal welfare, environmental stewardship, and food safety.

4. Value Chain Collaboration: Collaboration along the pork value chain, including farmers, processors, retailers, and consumers, can lead to improved efficiency, quality control, market access and innovation.

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