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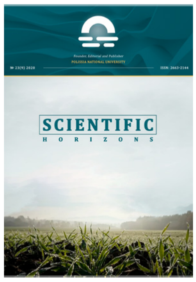

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Status and prospects of beef and veal production in Ukraine in the context of international economic integration

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Abstract. Beef production is driven by the need to ensure the country's food security, meet the processing industry's demand for raw materials, and increase state budget revenues from exports. The purpose of this study was to highlight the status and trends of production in the world and Ukraine, to identify issues and find areas of development considering international economic integration. The methods employed were analysis, synthesis, generalisation, specification, mathematical, and graphical.

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The study identified the upward trend in global beef and veal production, the main producing countries and the predominant stability of their share in global volumes over the decades. It was found that higher beef production does not always allow for higher per capita volumes (e.g., in China and India). Ukraine's production and its share in global volumes are declining, although production exceeds consumption. It was found that the share of agricultural enterprises in the structure of economic entities is decreasing, and there is a direct dependence between their number and production volumes, which prevails in the Forest-Steppe zone. The largest producing regions (Kyiv, Vinnytsia, Kharkiv, Lviv) were highlighted, where priority development in the post-war period is expected. The study found the principal reasons for the decline in production, including a decrease in livestock numbers, negative profitability, and rising average consumer prices. Based on the SWOT analysis results, development prospects were identified and relevant proposals were developed. The reasons for the decrease in the number of cattle and beef were proposed to be distinguished as general, and those related to enterprises and household farms; their interdependence was emphasised. The study stressed the need for state support for producers by providing food aid to the population free of charge and by purchasing products at lower prices depending on their financial level. International economic integration was singled out as one of the key factors of increasing beef production. The study emphasised the need to consider the consumer preferences of the population of countries with which regional trade agreements have been concluded, specifically regarding the production of kosher and halal products. The findings of this study and the proposals provided can be used to develop government measures to increase beef production and increase its share in world exports

Keywords: production volumes; beef; national policy; regional trade agreements; profitability; food aid

INTRODUCTION

The significance of beef production is driven by the need to provide food for the population, while it is also important for raw materials for processing companies in various industries, state budget revenues, job creation, exports, etc. In Ukraine, this development is facilitated by natural and climatic conditions, production of considerable volumes of crops, including fodder crops, the availability of relevant government programmes**,** the benefits of regional trade agreements, etc. Considering the importance of meeting the beef consumption needs of the majority of the population of Ukraine and the world, and the fact that cattle breeding and processing produce meat products, as well as such vital products as milk, cheese, leather, gelatin, etc., there is a need to expand research into the economic aspects of its production.

Investigating the state of livestock production in Ukraine, O. Izhboldina *et al*. (2021) note negative trends in the industry, addressing the decrease in livestock numbers, a considerable decrease in livestock productivity and the quality of products. V. Lavruk *et al*. (2021) argue that the development and gradual revival of livestock production will mainly depend on the effective efficiency of the economic mechanism, as well as the interdependence of its principal components, namely, the establishment of price, credit and tax policies, state regulation, investment, and innovation processes. N. Lialina (2018) notes that one of the key trends at the current stage of development of livestock production in Ukraine is a decrease in the concentration of production for most enterprises, which leads to a decrease in the role of the industry in their economy. This causes a noticeable decline in the efficiency of the industry.

According to O. Kravchenko (2019; 2020), the economic interests of an agricultural producer as a business entity are not satisfied by its share in the retail price structure, which for beef and milk amounted to 30.5% and 32.8%, respectively (January 2019), which is confirmed by the decrease in production. Furthermore, the issue of food security should be considered, and research on food policy in Ukraine and the world is becoming increasingly relevant (Kuts & Bokiy, 2020). Studies on foreign trade in meat are essential as well (Kovalenko, 2021), as it also considerable affects its production.

The authors of this study believe in the importance of the key areas proposed by K. Andriushchenko *et al*. (2021), namely, modernisation of the technical and technological base and production processes according to export priorities, research, training, and implementation of the best world practices in product processing and farming, improvement of innovative developments at food enterprises, development of modern strategies for innovative development of agricultural enterprises, etc.

The issue of efficient beef production is vital not only for Ukraine, as evidenced by research by foreign scientists. B. Abebe *et al*. (2022) note the significance of cattle breeding in Ethiopia as the main source of meat-producing animals for internal and external markets. Compared to other African countries, Ethiopia has a massive number of cattle (about 65 million heads), but the quality and quantity of beef consumed per capita is rather low (8.4 kg per year). It is expected that the increase in production will be driven by population growth, high demand in the internal and external markets, etc. While investigating the issue of beef production, P. Greenwood (2021) notes that beef is a high-quality source of protein, and demand for it in the global market is growing. It is noted that digital and other technologies that allow for the rapid collection and use of data on the environment and cattle productivity should increase the productivity, efficiency, and welfare of animals.

When investigating beef production, researchers also paid attention to the specifics of its quality and consumption. D. Magalhaes *et al.* (2023) studied changes in beef consumption and consumer behaviour trends in Brazil, Spain, and Turkey. The study analysed the impact of economic factors, aspects of trust, health concerns, lifestyle influences on beef consumption, and purchase decision factors. Furthermore, C. Whitton *et al.* (2021) investigated meat consumption in a number of countries, considering gross domestic product. One of the crucial factors that changed consumer behaviour and led to a decline in consumption, mainly among Brazilian and Turkish consumers, was the availability of products. It was presented that lifestyle factors, such as eating out, availability of time for cooking, etc., change consumption patterns and should be carefully considered by the industry, factoring in the cultural differences and consumer needs.

V.-B. Hoa *et al.* (2023) paid particular attention to the product quality factor. They conducted research on the quality, taste, and flavour of meat from Korean cattle of various breeds. It was found that under identical feeding conditions, the breed has a considerable impact on the nutritional quality of beef. The issue of increasing beef production is being raised more often, which requires finding the reasons that hinder it and the factors that will facilitate its development. This determines the relevance of the present study. The purpose of this study was to highlight the status and investigate the trends in beef production in the world and Ukraine, to identify the principal problems and determine the areas of its effective development. It is advisable to determine the prospects for beef production in Ukraine based on the current situation, global trends, and participation in integration processes.

MATERIALS AND METHODS

The study employed the methods of analysis and synthesis to assess the development of beef production in Ukraine and the world, the abstract and logical method to draw conclusions, generalization and concretization to develop proposals, mathematical and graphical methods to investigate and display trends and the state of production. The information base of the study included the scientific papers of Ukrainian and foreign scientists, statistical data of the international organisation FAO (n.d.) and the State Statistics Service of Ukraine (n.d.). The study focused on global production volumes, i.e., in total and by country, imports, consumption, production by category of farms, considering zones and regions of Ukraine, production profitability, average consumer prices, population, cattle supply to processing enterprises, etc.

To assess the place and prospects of Ukraine in world production and the world market, the FAO period from 1961 to 2021 was used for all countries, and for Ukraine from 1992. Considering the significance and impact of the hostilities in Ukraine, the pre- and post-war periods were used. This study used the main statistical data on beef production in Ukraine and its regions, as well as global and country-specific data for comparison.

To determine beef self-sufficiency, the study employed the approach to food self-sufficiency proposed by B. Paskhaver (2018). The study analysed the trends and status of beef production in the world and Ukraine, considering the largest producers, natural and climatic conditions, and population. Calculations were made on the supply of live animals to processing enterprises, considering military operations. The study examined the production of beef and veal depending on the structure of producers, specific regional features, factoring in the profitability of production, the dynamics of average consumer prices, population, including migration processes. The prospects of post-war recovery are identified as a result of the analysis of production in recent years. A SWOT-analysis of the prospects for beef production in Ukraine was carried out, the reasons for the decline in cattle numbers were analysed and classified, and recommendations for the development of production were developed.

RESULTS AND DISCUSSION

The significance of agri-food production is becoming increasingly important, specifically due to population growth and climate change. The second of the UN Sustainable Development Goals is to end hunger, and it calls for less food to be thrown into landfills and more support for farmers, as a third of the world's food is wasted, while 821 million people are malnourished (Sustainable Development Goals, n.d.). Ukraine is one of the world's largest producers of wheat, corn, soybeans, sunflower seeds, and other crops, i.e., it produces mainly crop products. Global production of all types of meat reached 361 million tonnes (slaughter weight equivalent) in 2022, up 1.4% in 2022, although slower than the 4.5% growth in 2021 compared to 2020 (Table 1).

***Table 1**. Dynamics of the global meat market, million tonnes, 2020, 2021, 2022*

Indicators	years			changes 2022 to 2021	
	2020	2021	2022	+, -	in %
Production, total	340.3	355.5	360.5	5	1.4

Table 1. Continued

Indicators	years			changes 2022 to 2021	
	2020	2021	2022	+, -	in %
beef	72.0	72.5	73.2	0.7	1.0
poultry meat	136.0	137.8	138.8	1	0.7
lamb	16.1	16.4	16.6	0.2	1.2
Trade, total	41.7	42.1	42.3	0.2	0.5
beef	11.7	12.1	12.4	0.3	2.5
poultry meat	15.5	15.8	16.2	0.4	2.5
lamb	1.1	1.1	1.16	0.06	5.5
Per capita consumption, world (kg/year)	43.4	44.9	45.1	0.2	0.4
Trade – share of production (%)	12.3	11.8	11.7	-0.1	-0.8

***Source**: calculated based on FAO (2022)*

The expansion was mainly driven by the rapid growth in meat production in China and strong growth in Brazil, Australia, and Vietnam. At the same time, the relative static nature of global production was partially offset by a drop in production in the EU, the US, Canada, Iran, and Argentina. Total meat production in China increased to 96 million tonnes, up 4.4% year-on-year. Global trade in meat and meat products reached 42 million tonnes (in slaughter weight equivalent).

At the same time, global beef production (fresh or frozen) increased by 2.6 times from 1961 to 2022, from 27.7 to 73.2 million tonnes, and the growth was quite steady. Therewith, the share of beef in global meat production in 2022 was 20.1%, although in some years it was much higher, e.g., in 1961 it was 38.8% (in 2000 it was 24.3%). Notably, poultry meat was produced the most, with a share of 34%. Major beef producers include countries in North and South America, Asia, and Australia. The top 10 producers accounted for 63.1% of global production in 2022, and the share of each country did not fall below 2%, unlike other countries. More than a third of beef is produced in the US and Brazil, with a share of 17.7% and 13.2% respectively. It is advisable to consider the change in the share of production of the main producing countries in world volumes (Table 2).

***Table 2**. Share of the largest beef producers in the world, 1961, 2000, 2010, 2022*

	1961			2000			2010			2022	
	Countries	%		Countries	%		Countries	%		Countries	%
1	USA	26.8	1	USA	21.2	1	USA	18.2	1	USA	17.7
2	USSR	10.3	2	Brazil	11.6	2	Brazil	14.0	2	Brazil	13.2
3	Argentina	7.7	3	China	8.2	3	China	8.7	3	China	9.7
4	France	5.2	4	Argentina	4.8	4	India	4.8	4	India	4.1
5	Brazil	4.9	5	Australia	3.5	5	Argentina	4.1	5	Argentina	3.3
6	Germany	4.7	6	Russia	3.4	6	Australia	3.3	6	Mexico	3.2
7	United Kingdom	3.3	7	France	2.7	7	Mexico	2.7	7	Australia	3.9
8	Italy	2.4	8	India	2.7	8	Russia	2.7	8	Russia	2.7
9	Canada	2.4	9	Mexico	2.5	9	France	2.4	9	Turkey	2.3
10	Australia	2.3	10	Germany	2.3	10	Canada	1.9	10	France	2.2
11	India	1.8	11	Canada	2.2	11	Germany	1.9	11	Canada	2.1
12	South Africa	1.4	12	Italy	2.0	12	Italy	1.6	12	Pakistan	2.0
13	Mexico	1.3	13	Ukraine	1.3	13	United Kingdom	1.4	13	Germany	1.7
14	Poland	1.2	14	Colombia	1.3	14	South Africa	1.4	14	South Africa	1.5
15	Colombia	1.2	15	United Kingdom	1.2	15	Colombia	1.2	15	Uzbekistan	1.6
16	Uruguay	1.0	16	Spain	1.1	16	Pakistan	1.1	16	United Kingdom	1.4
17	New Zealand	0.9	17	Zimbabwe	1.1	17	Uzbekistan	1.0	17	Zimbabwe	1.2
18	Netherlands	0.8	18	New Zealand	1.0	18	Zimbabwe	1.0	18	Colombia	1.2
19	Ethiopia	0.8	19	South Africa	1.0	19	Turkey	1.0	19	New Zealand	1.1
20	Belgium-Luxembourg	0.8	20	Ireland	1.0	20	New Zealand	1.0	20	Italy	1.0

***Source**: calculated based on FAO (2022)*

Table 1 shows that the US share in world production was the highest in 2022, as well as in 1961, 2000 and 2010, although it has been declining. In 1961, the USSR held the second position (10.3%), but later, among its republics, only Russia entered the top ten largest producers, while Ukraine (from 2020) and Uzbekistan (2010 and 2021) entered the top twenty. Thus, the largest producers have largely stayed so for decades, including the United States, Russia, Brazil, and Argentina, although their positions have shifted somewhat, for instance, with Brazil's growing and Argentina's declining. The shares of Canada, the UK, Germany, and Italy decreased, but they stayed among the top 20 producers. China, India, and Mexico have seen noticeable increases in beef production, and although the latter two countries were among the 15 largest producers in 1961, the opposite is true of China, which has been among the top ten in the following years. This suggests that countries can considerably increase their exports, although the top positions in the global market have been held by the main supplier countries for decades. This, admittedly, also applies to Ukraine, but special attention should be paid to product quality.

Among the largest beef producers are countries with which Ukraine has regional trade agreements, including Turkey, France, Germany, Italy, the UK, and Canada. Considering the benefits of international economic integration, including liberalisation of foreign trade, access to innovative technologies, and foreign direct investment, it is expected that production and trade in these products will increase. Among the EU countries, France and Germany produce the most beef, but their share in global volumes in 2022 was 2.2% and 1.7%, respectively, and 9.3% in the EU-27 as a whole. However, it is also decreasing for them, specifically, in 1961 and 2000, for the countries that became members of the grouping, it was 19.4% and 13.6%, respectively. Italy, Spain, and Poland are also among the largest producers in the association, but each of them has a share of less than 1%.

In 2022, the EU produced 6.7 million tonnes of beef, down 1.1% from 2021. At the same time, with a decline in production in 2022, the EU increased exports of fresh and frozen beef by 1.4% compared to 2021, to 463 thous. t. Around 50% of this beef comes from the UK, with volumes largely unchanged from 2021. Deliveries grew to Asian markets, including Hong Kong and Japan, as well as to North American markets such as Canada and the United States. This and growth in other markets were enough to outweigh losses in other export destinations, especially Algeria.

On the other hand, imports dropped by 21% year-on-year to 236.4 thous t. Volumes declined from all key suppliers, but primarily from the UK and Brazil. Figure 1 shows the main beef producing countries, which accounted for 85% of total EU beef production. This is likely to be caused by the pandemic or a disruption in demand for food services in the EU. Beef production in the EU in the first half of 2023 was 4.5% lower than in the same period a year ago, with cattle slaughter in key producing countries limited. The largest drop in production in the EU was observed in Italy (-23%), followed by key producers France, Spain, Ireland, and Poland. The only major producers to see growth were Germany and the Netherlands. However, in Germany, this growth is contrary to the overall long-term trend of declining production. Overall, the total slaughter of adult cattle (bulls, steers, heifers, and cows) was 8.1 million heads, down 3.6% from the same period a year ago. Therewith, the total slaughter of cows was just under 3 million head, down 3.7% year-on-year.

In several countries, including France, Poland, and Spain, there has been a marked decline in cow slaughter rates. Cow production in France is currently at its lowest level in at least five years, which is likely to contribute to the continued high French prices on the EU market. Livestock slaughter in Poland is also historically low. Conversely, cow slaughter in Spain has increased in recent years and, although lower than last year's record level, stays historically high in 2023. Cow slaughter in Germany stayed relatively stable year-on-year after several years of decline.

Meanwhile, cow slaughter in the Netherlands has increased considerably compared to last year (+13%) and will stay at the same level as in 2021. From a market balance standpoint, considering the reduction in production and trade, it is shown that stocks available for consumption are lower across the bloc. Price inflation is affecting beef consumption in the EU, as it does in the UK, with consumption and retail data from key EU countries pointing to a fall in demand. Domestic consumption of beef in France fell by 2.5% in the first half of 2023, while average prices increased by 9.1%. Purchases of beef by households in Germany from January to July (inclusive) decreased by 6.2% year-on-year, while the average price increased by 6.9%, and the level of meat consumption is declining. Purchases of Italian beef fell by 4% year-on-year in the first half of 2023, to a level that is also lower than in the previous two years. Beef consumption in Spain is also declining.

Cattle prices in the EU have generally been on the decline since March. However, in recent weeks, cattle prices in a range of countries have shown an upward trend. Prices for young bulls and cows in Ireland, France, Germany, and Poland increased, while the price of young bulls also rose in Spain. In other countries, cattle prices continue to be lower, e.g., in the Netherlands and Italy. Ukraine's share of global production has declined significantly, from a high of 3.1% in 1992 to a low of 0.4% in 2022 and has not even reached 1% since 2005. Ukraine ranked 39th among beef producers in the world in 2022, behind even African countries such as Nigeria, Sudan, Ethiopia, Chad, and Zimbabwe, which are not the largest producers of grain and, accordingly, feed. Notably, Ukraine's beef production decreased by 5.3 times between 1992 and 2022, from 1.7 to 0.3 million tonnes, while global production increased by 1.4 times, from 53.3 to 72.4 million tonnes (Fig. 1).

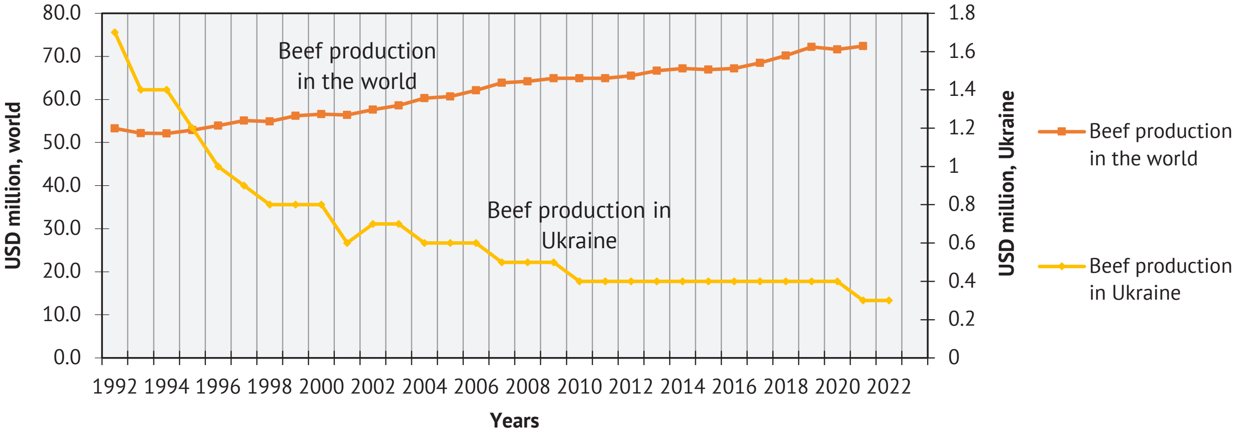

***Figure 1.** Beef production in the world and Ukraine, 1992-2022*
***Source**: calculated based on FAO (2022)*

The figure suggests that the trend of beef production in the world and Ukraine is markedly different, but the presence of demand in the Ukrainian and global markets and consumption by the majority of the population should stimulate an increase in beef production in Ukraine. In 2022, the Ukrainian meat market increased beef imports to 2.8 thousand tonnes, up 34.2% from 2021. In 2022, Ukraine supplied 22.4 thous. t of frozen cattle meat worth USD 78.5 million. The main deliveries were made to China – 4.9 thous. t for USD 21.9 million (28%); Azerbaijan – 4.6 thous. t for USD 17.6 million (22.5%); Kazakhstan – 3.2 thous. t for USD 11.2 million (14.9%). Specifically, Ukraine exported 5.7 thous. t of fresh or chilled cattle meat worth USD 5.3 million. Ukraine was supplied with 1.9 thous. t of frozen meat (70% of total supplies).

The world's largest beef producers are the US, Brazil, China, and the EU. In 2022, they produced 50.1% of the world's beef. Brazil, the US, India, and Australia were the largest exporters of beef, accounting for 54.2% of all beef exports. The average level of beef consumption in 2022 was 9.2 kg per person. Argentina consumed 5.1 times more beef per person than the global average, while the US and Brazil consumed 4.3 times more. In India, this figure is 8.7 times lower, while in China it is almost 30% lower. The key exporters of beef to Ukraine were Brazil – 2327 thous. t, the USA – 1637 thous. t; India – 1336 thous. t, Australia – 1245 thous. t, and EU countries – a total of 901 thous. t (Table 3).

It is essential to know how much beef the main producing countries produce per capita (Table 4).

***Table 3.** Beef production, consumption and exports in 2022*

Main producing countries	Production		Consumption per 1 person per year, kg	Main exporting countries	Export	
	thous. t	%			thous. t	%
USA	12961.4	17.7	37.7	Brazil	2327	19.3
Brazil	9666.1	13.2	37.1	USA	1637	13.5
China	7103.1	9.7	6.3	India	1336	11.1
EU	6956.7	9.5	14.1	Australia	1245	10.3
Argentina	2416.5	3.3	48.9	EU total	901	7.5
India	732.3	4.1	1.0	Argentina	750	6.2
Pakistan	1464.6	2.0	9.0	New Zealand	651	5.4
Mexico	2343.3	3.2	14.9	Canada	589	4.9
Australia	2855.9	3.9	26.1	Uruguay	528	4.4
Russia	1977.2	2.7	13.2	Mexico	368	3.0
Other countries	23140.0	31.6	X	Other countries	1751	14.5
Total	100.0	100	9.0	Total	12083	100

***Source**: calculated based on FAO (2022)*

Table 4. *Comparison of the shares of beef production in global volumes and per capita in the main beef producing countries, 2022*

Countries	Share in global production, %	Produced per capita, kg
USA	17.7	37.6
Brazil	13.2	44.5
China	9.7	4.8
India	4.1	3.1
Argentina	3.3	65.8
Mexico	3.2	16.5
Australia	3.9	74.4
Russia	2.7	10.2
Turkey	2.3	17.1
France	2.2	22.0
Canada	1.9	36.5
Pakistan	2.0	5.1
Germany	1.7	13.1
South Africa	1.5	17.5
Uzbekistan	1.6	29.2
United Kingdom	1.4	13.1
Zimbabwe	1.2	50.4
Colombia	1.2	14.7
New Zealand	1.1	145.8
Italy	1.0	12.3

Source*: calculated based on FAO (2022)*

Notably, the highest beef production per capita among the top 20 producers is observed in New Zealand, which ranked only 19th in terms of total volumes, as well as Australia, Argentina, even Zimbabwe, Brazil, and the United States. However, such prominent producers as China and India, which occupy the third and fourth positions, produce the least per capita of the countries represented – only 4.9 kg and 3.0 kg, respectively, and slightly more Pakistan – 5.3 kg. This is the basis for researching demand in this market and increasing exports. For Ukraine, the situation is still better, with 7.1 kg of beef produced per capita.

In the context of declining global food security, a special place is occupied by Ukraine, where agriculture is currently the leading sector of the economy. Active Russian hostilities have had a direct impact on global food and agricultural markets. Despite a steady decline in the industry's performance, Ukraine stays an active player in the global beef and veal production market (Table 5).

Table 5. *Supply of live cattle to processing enterprises in the pre-war and post-war years (2021 and 2022)*

	Farms of all categories			Enterprises			Household farms		
	2022	2021	2022 in % to 2021	2022	2021	2022 in % to 2021	2022	2021	2022 in % to 2021
Live weight of farm animals, thous. t	2954.8	3329.8	88.7	2182.4	2359.3	92.5	772.4	970.5	79.6
cattle	388.4	475.1	81.8	127.4	134.7	94.6	261.0	340.4	76.7
market share, %	13.1	14.3	92.1	5.8	5.7	102.2	33.8	35.1	96.3
Live weight of farm animals sold for slaughter, thous. t	3059.1	3391.2	90.2	2166.0	2318.5	93.4	893.1	1072.7	83.3
cattle	455.1	526.8	86.4	135.2	131.9	102.5	319.9	394.9	81.0
market share, %	14.9	15.5	95.8	6.2	5.7	109.7	35.8	36.8	97.3
Average live weight of cattle sold for slaughter, kg	284	293	96.9	377	380	99.2	257	273	94.1
Slaughter weight of farm animals sold for slaughter, thous. t	2206.7	2438.3	90.5	1608.1	1720.4	93.5	598.6	717.9	83.4

Table 5. Continued

	Farms of all categories			Enterprises			Household farms		
	2022	2021	2022 in % to 2021	2022	2021	2022 in % to 2021	2022	2021	2022 in % to 2021
beef and veal	268.4	310.5	86.4	80.7	77.9	103.6	187.7	232.6	80.7
market share, %	14.9	15.5	95.8	6.2	5.7	109.7	35.8	36.8	97.3

Source*: calculated according to data from the State Statistics Service of Ukraine (n.d.)*

The calculations suggest that the downward trend continues: the total supply of live animals to processing enterprises in the post-war year was 7.9% lower, while the supply to enterprises increased by 2.2% and to household farms decreased by 3.7%. The catastrophic drop in the purchase of animals from the population is linked to the active military operations, which suggests that people are abandoning animals to cover their own beef needs. Positive dynamics is observed only in calves under 1 year of age by 6.4% (by 1.8% in enterprises); bulls over 2 years of age by 12.5% in enterprises and heifers over 2 years of age in the population by 23.4%. An interesting fact is the positive dynamics of changes in the average live weight of one head of cattle purchased by processing enterprises in the pre-war and post-war years (Table 6).

Table 6. *Dynamics of changes in the average live weight of one head of cattle purchased by processing enterprises in the pre-war and post-war years*

	Purchased – total				incl. in: enterprises				incl. in: population			
	heads	average weight per head, kg			heads	average weight per head, kg			heads	average weight per head, kg		
		2021	2022	2022 to 2021, %		2021	2022	2022 to 2021, %		2021	2022	2022 to 2021, %
Cattle	135568	469	470	100.2	120201	470	476	101.3	15367	464	438	94.4
of which:												
cows	81058	512	507	99.0	73121	514	526	102.3	7937	490	428	87.3
calves up to 1 year of age	6206	102	150	147.1	5810	94	142	151.1	396	216	203	94.0
bulls aged 1-2 years	27217	442	425	96.2	22583	436	415	95.2	4634	469	495	105.5
bulls older than 2 years	10037	453	451	99.6	9361	456	451	98.9	676	416	452	108.7
heifers aged 1-2 years	5621	440	457	103.9	5312	444	453	102.0	309	373	524	140.5
heifers older than 2 years	5429	455	465	102.2	4014	469	475	101.3	1415	414	414	100.0

Source*: calculated according to data from the State Statistics Service of Ukraine (n.d.)*

Studies have shown that the average live weight of one head of cattle purchased by processing companies increased by 0.2% in the post-war year. This is especially true for calves under 1 year of age by 47.1%. An increase is also observed in heifers aged 1-2 years and heifers over 2 years old (by 3.9% and 2.2%, respectively). In enterprises, there was a 1.3% increase in cows, a 2.3% increase in calves under 1 year old, a 51.1% increase in calves under 1 year old, and a 2.0% and 1.3% increase in heifers over 2 years old, respectively. In household farms, the study observed an increase of 5.5% in bulls aged 1-2 years, 8.7% in bulls over 2 years, and 40.5% in heifers aged over 2 years. The positive dynamics in beef and veal production amid the hostilities gives hope for an accelerated post-war recovery in the livestock sector and the livestock industry as a whole. It is also advisable to determine the level of self-sufficiency of Ukraine in beef and veal (Table 7).

Table 7. *Level of self-sufficiency in beef and veal in Ukraine*

	Years							
	2016	2017	2018	2019	2020	2021	2022	2023*
Production, thous. t	376	364	359	370	345	311	268	247
Imports, thous. t	16	13	14	14	18	17	12	11
Consumption fund, thous. t	346	318	318	324	337	299	264	235

Table 7. Continued

	Years							
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023***
Per 1 person, kg	8.1	7.5	7.5	7.7	8.1	7.3	7.7	6.5
Consumption to production, %	92.0	87.4	88.6	87.6	97.7	96.1	98.4	95.1
Imports to consumption, %	4.6	4.1	4.4	4.3	5.3	5.7	4.5	4.6

Note: **For 11 months of 2023*
Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

The above data shows that in 2016-2023, production of beef and veal exceeded consumption at all times. There was a 2.5% decrease in initial stocks and a 16.0% decrease in beef production in 2021 compared to 2019. The war years only intensified the downward trend (Table 8).

Table 8. *Annual balance of beef meat in Ukraine in 2019-2023, thous. t*

Indicators	**2019**	**2020**	**2021**	**2022**	**2023***
Initial stocks	41	42	40	39	38
Import	14	18	17	12	11
Production	370	345	311	268	247
incl. agricultural enterprises	102	85	78	81	80
household farms	268	261	233	188	167
General offer	383	365	329	281	259
Export	58	27	29	16	23
Consumption	324	337	299	265	235
Losses	1	1	1	1	1
Ending stocks	42	40	39	38	37
Total demand	383	365	329	281	259
Consumption per capita	7.7	8.1	7.3	7.7	6.5
Consumption to production, %	87.6	97.7	96.1	98.4	95.1

Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

Imports of these products in the pre-war period (from 2019 to 2021) increased by 21.4%, while exports dropped by half. In 2022, the decline in these indicators will only intensify. Beef meat consumption per capita also decreased by 0.8 kg (13.11%) in 2021 compared to 2016, and in 2023 the figure became critical – 6.5 kg. The above data shows that in 2016-2023, production of beef and veal consistently exceeded consumption. Notably, beef and veal production in Ukraine in 2021 decreased by 2.3 times compared to 1961, and by 6.4 times since 1990, with a 7.2 times and 23.2 times increase in enterprises, respectively, but a 1.5 times and 1.3 times increase in household farms, but then decreased in comparison to 2000, 2010, 2015, 2019-2021. Active hostilities have also substantially reduced this figure, almost by half.

Although livestock keeping in household farms appears to be less costly, and its decline was smaller than in enterprises, it is worth considering the processes of migration, urbanisation, and the keeping of small numbers of livestock by household farms. However, under difficult conditions, livestock preservation by household farms is more likely than by large-scale enterprises, and therefore the activities of all categories of farms are significant. It is interesting to observe the production of beef and veal in the pre-war and post-war periods, in the context of further post-war recovery and Ukraine's place in the world market (Table 9).

Table 9. *Livestock production (all categories of farms)*

	Year				average for 2018-2021	average growth rate	2022	2022 in % to:	
	2018	**2019**	**2020**	**2021**				**2021**	**average for 2018-2021**
Livestock (end of year), thous. heads									
Cattle in total	3333	3092	2874	2644	2986	0.926	2312	87.4	77.4
including:									
cows	1919	1789	1673	1544	1731	0.930	1341	86.9	77.5

Table 1. Continued

	Year				average for 2018-2021	average growth rate	2022	2022 in % to:	
	2018	2019	2020	2021				2021	average for 2018-2021
Cattle in fattening	1414	1304	1201	1100	1255	0.920	971	88.2	77.4
Production, thous. t									
Meat – total (slaughter weight)	**2354.9**	**2492**	**2478**	**2438**	2441	1.012	**2169**	88.9	88.8
including: beef and veal	358.9	370	345	310.5	346	0.953	242	78.1	70.0

Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

The overall growth rate of meat production (in total) in the pre-war period was 1.2%, which is clearly insufficient for both post-war recovery and the livestock sector's recovery from the protracted crisis. Today, overcoming current challenges and risks is becoming an arduous task for Ukraine. Beef production is largely dependent on the support of European and global partners, and it will also determine our country's place in the global market. Notably, the structure of beef and veal producers has changed considerably (Table 10), with the share of enterprises ranging from 91.1% (1990) to 30.1% (in 2022), while it increased for farm enterprises – from a minimum of 0.8% (1990) to a maximum of 2.3% (2022), and household farms (69.9% in 2022).

Table 10. *Beef and veal production by category of farms, %*

Farm category	Years										
	1960	1970	1980	1990	2000	2010	2015	2019	2020	2021	2022
Enterprises	78.3	85.1	85.4	91.1	40.5	24.5	24.4	27.5	24.6	25.1	30.1
incl. Farm enterprises	-	-	-	-	0.8	1.4	2.1	2.3	2.2	2.3	2.3
Household farms	21.7	14.9	14.6	8.9	59.5	75.5	75.6	72.5	75.4	74.9	69.9

Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

However, the authors of this study do not consider this to be a basis for positive conclusions, as output has been declining, with a direct dependence on the share of enterprises in production (Fig. 2).

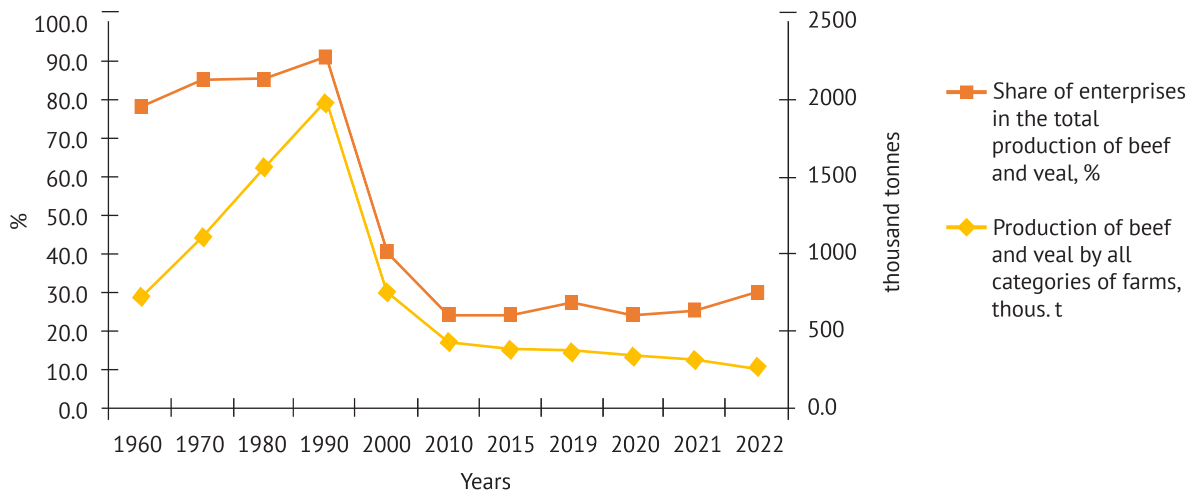

Figure 2. *Beef and veal production and share of enterprises in total production, 1960-2022*
Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

Beef production by enterprises is more efficient due to greater opportunities to apply modern technologies and technical equipment, attracting highly qualified personnel, etc. At the regional level, beef and veal production in Ukraine is mainly concentrated in the Forest-Steppe zone (Table 11), accounting for more than 43% of the total in 2019-2022. In 2010, 2015, and 2022, the lowest production was in the Steppe, but the value did not fall below 22.1%, and in 1990 and 2000 – in Polissia.

Table 11. *Zonal distribution and main beef and veal producing regions in Ukraine, %*

Years	Region			Region's largest producers
	Steppe, %	Forest-Steppe, %	Polissia, %	
1990	30.1	41.1	25.4	Kyiv (130.2 thous. t), Vinnytsia (118.0 thous. t), Chernihiv (110.2 thous. t)
2000	29.2	40.4	27.1	Khmelnytskyi (43.6 thous. t), Kyiv (41.8 thous. t), Chernihiv (37.1 thous. t)
2010	24.9	37.3	32.6	Lviv (33.1 thous. t), Ivano-Frankivsk (26.7 thous. t), Vinnytsia (23.1 thous. t)
2015	25.8	42.1	32.1	Lviv (27.9 thous. t), Ivano-Frankivsk (27.8 thous. t), Kharkiv (23.2 thous. t)
2019	24.8	44.2	31.0	Ivano-Frankivsk (26.3 thous. t), Kharkiv (25.0 thous. t), Lviv (24.9 thous. t)
2020	24.3	43.7	32.0	Ivano-Frankivsk (25.9 thous. t), Kyiv (24.4 thous. t), Lviv (24.4 thous. t)
2021	23.9	43.6	32.5	Ivano-Frankivsk (25.7 thous. t), Kyiv (22.9 thous. t), Lviv (21.6 thous. t)
2022	22.1	43.3	34.6	Ivano-Frankivsk (25.8 thous. t), Kyiv (21.6 thous. t), Lviv (22.4 thous. t)

Source: *calculated according to data from the State Statistics Service of Ukraine (n.d.)*

The largest producers are Lviv and Ivano-Frankivsk regions, especially in 2010, 2015, 2022, as well as Kyiv, Vinnytsia, Kharkiv, etc. Therewith, production volumes in these areas are declining. This decline in beef and veal production is conditioned by a decrease in the number of cattle, specifically, as of 1 January 2022, compared to 1961 and 1991, by 6.7 times and 9.3 times, respectively. The largest number was in Khmelnytskyi, Odesa, and Zakarpattia regions, accounting for 24% of the total in Ukraine, as well as in Lviv, Zhytomyr, Vinnytsia, and Ivano-Frankivsk regions. That is, almost half of the country's livestock (49.7%, 815.5 thous. heads) is kept in 7 regions. Moreover, the share of enterprises fell to 38.0% (2022), although in 1991 it was 85.6%.

As for the level of profitability of cattle meat production, with the exception of 1990-1994 and 2017, it was negative, and in 2020 it was -24.2% (Level of profitability of agricultural production in enterprises), which was also primarily caused by a decrease in production volumes. It is also worth noting the increase in average consumer prices (Consumer Price Indices for 2021. Statistical Collection) for beef in Ukraine, specifically, while in January 2021 the price was 149.51 UAH/kg, in December it was 182.84 UAH/kg. In December, the highest prices were in Kyiv, Kyiv, and Kirovohrad regions, at 206.54 UAH/kg, 200.48 UAH/kg, and 193.80 UAH/kg, respectively, and the lowest in Chernihiv, Chernivtsi, and Poltava regions, at 169.38 UAH/kg, 168.98 UAH/kg, and 168.08 UAH/kg, respectively, which does not contribute to the increase in demand.

When investigating self-sufficiency, it is also worth considering the change in the population, because while in 2000 it was 49 million people, in 2020 it was about 42 million people, and this trend continues. Thus, in 2020, the population in Ukraine decreased by 314,062 people, with a decrease in all regions except Kyiv, where the growth was 7,486 people. Each region experienced a natural population decline. At the same time, in 2020, despite the overall population decline, there was a migration increase, specifically in Kyiv, Ivano-Frankivsk, Kharkiv, Odesa, Lviv, Poltava, and Khmelnytskyi regions. The ongoing hostilities in Ukraine have also led to migration processes, and thus, when reviving livestock production, it is essential to focus mainly on regions with a prospect of growing demand for agri-food products, including livestock. As a result of this study, a SWOT analysis (Table 12) was also carried out on the prospects for further beef production in Ukraine, which helped to identify its strengths and weaknesses.

Table 12. *SWOT analysis of beef and veal production in Ukraine*

Strengths	Weaknesses
Availability of suitable natural conditions for raising livestock; Favourable natural and climatic conditions for growing crops, including fodder; historically established system of cattle breeding in all regions of Ukraine; availability of highly qualified personnel; availability of state development programmes; consumption of products by the majority of the Ukrainian population	Insufficient and unbalanced fattening of cows; insufficient technological and technical equipment; lack of breeding work with the herd; simple reproduction of the industry due to low profitability of production; insufficient competitiveness of enterprises; deformed production structure (dominated by individual farms); curtailment of production; insignificant share in meat consumption by the population
Opportunities	**Threats**
Introduction of a system for monitoring prices for products; favourable pricing policy for producers, coordination of standard production costs, price levels and incomes; attraction of foreign investment; preferential lending to producers; leasing for equipment supply; introduction of new technologies in the production of feed and livestock products; intensification of integration processes between meat producers and processors; creation of cooperative associations; increase in exports to the world market; improvement of customs and tariff protection of Ukrainian producers	High cost of fodder and other material and technical resources; lack of support for the promotion of meat products on the foreign market; weak commercial and integration processes; and reduced competitiveness; growth of low-quality imports; bankruptcy of enterprises; military operations

Source: *compiled by the authors of this study based on personal findings*

Thus, it is necessary to promote the increase in production, considering the identified strengths, weaknesses, opportunities, and threats. It is advisable to take appropriate actions by the state through direct and indirect influence on production, including through direct payments, the tax system, etc. Considering the significant decline in beef and veal production due to a decrease in the number of cattle, the reasons for this are identified, which are proposed to be distinguished as general and those related to enterprises and household farms (Fig. 3).

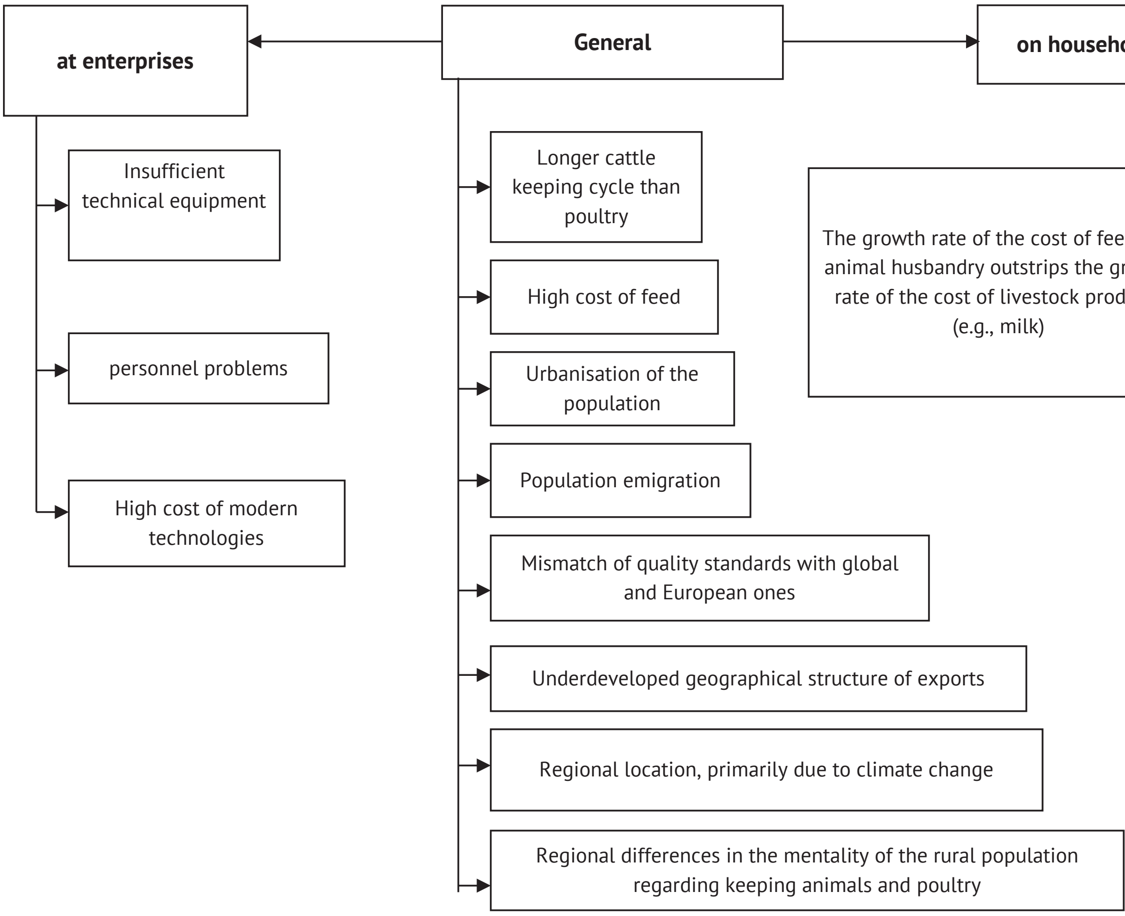

Figure 3. *Reasons for the decline in cattle numbers*
Source*: developed and constructed by the authors of this study based on personal findings*

Some of these issues can be addressed at the micro level, namely, through the involvement of highly skilled workers, while others require government intervention, primarily through the adoption of relevant regulations. Furthermore, the impact factor should also be considered, as the resolution of common causes affects businesses and household farms. For instance, lower feed costs should help to increase beef production in all categories of farms, while harmonisation of quality standards with European ones should increase beef exports, which will lead to a rise in production.

Considering the significance of exports for increasing production volumes, it is advisable to attach particular importance to raising quality standards, harmonising them with global and European standards, establishing joint ventures with business entities from countries that are significant exporters on the world market, and having trade agreements and free trade zones in place between countries. Thus, Ukraine has trade agreements with dozens of countries, both individual countries and integration groups, including the EU, EFTA, Canada, the UK, Turkey, Israel, etc. While integration implies free trade and the removal or reduction of trade barriers, it also requires considering non-tariff barriers and country-specific features. Thus, while for EU countries it is primarily European quality standards, for the latter two it is the consumption of halal and kosher products. In an effort to expand its position in the markets of Eastern countries and given the growing consumption of kosher products in developed countries, it is advisable to stimulate the production of halal and kosher beef.

Considering the state and trends of beef and veal production in Ukraine and the world, the study outlined certain areas of promotion of its post-war development as follows: attracting foreign investment on favourable terms; establishing joint ventures, including with the support of research institutions, advisory services for training, providing advice on efficient beef production, livestock maintenance, feeding optimisation, etc; state support, which includes direct payments (the amount of which will depend on the number of livestock, land availability, location, climate zone, and region) and indirect funds (through the mechanism of providing preferential loans, insurance system, and the procedure for providing high-yield cows for temporary use, whose calves will stay in the agricultural enterprise or household farm, and whose cows will be transferred to other farms.

Furthermore, it is proposed to introduce a procedure for granting benefits or tax holidays for enterprises/businesses that: raise new types of highly productive livestock or produce organic products; introduce modern technologies; provide the processing industry with quality raw materials. Therewith, it is necessary to stimulate the use of modern technologies, promote production efficiency, specifically feeding, etc. Moreover, it is worth promoting the introduction of innovative technologies, research results of Ukrainian scientific institutions, which may be cheaper and more suitable for local conditions. In addition, when increasing production, it is necessary to consider the specific features of the regions, namely, the zones and regions where production has historically been the most developed, where the most favourable natural and climatic conditions and feed resources are, as well as where production is noticeably declining, etc.

Consideration of the findings of this study and the recommendations provided will help to increase production volumes both in individual enterprises by eliminating the identified problems and in the industry as a whole by reducing existing threats and exploiting opportunities. The analysis suggests a rather negative trend of declining beef production in Ukraine, particularly in contrast to the global dynamics. To improve the efficiency of the development and functioning of the beef market in Ukraine, especially in the context of its convergence with the EU markets, V. Lyakhovets (2018) suggests the introduction of international experience. However, the authors of the present study believe that direct borrowing of the classical European model of the economic mechanism for regulating the beef market without factoring in the local organisational and economic conditions of the market environment is impossible, which is caused not only by the prohibitive cost of implementing its main principles against the background of the current crisis in the Ukrainian economy, but also by the need to find Ukraine's own and more efficient way of developing the beef market. The authors of this study believe that the amount of state support for the beef market depends on the real capabilities of the budget; tax, credit, price, investment, export-import, customs, monetary and credit policies, which affect the solvency of enterprises to provide production, material and technical resources.

A. Sakhno and I. Salkova (2021) agree with this, noting that in the production of meat sold on the internal market at prices higher than world prices, in the future, it is necessary to increase its own competitiveness not by increasing state support, but by reducing costs and improving the quality of meat products. The authors of the present study also came to the same conclusion. As noted above, and considering the findings of this study on the state, trends, features, and reasons for the decline in beef production, the issues of product competitiveness, increased profitability, consumer preferences, identification of regional reserves for production development, and improvement of product quality are still open. Yu. Sinyavina and T. Butenko (2021) note that quality improvement is an additional reserve for the economic efficiency of the industry. In Ukraine, this is one of the main prerequisites for both efficiency and growth in demand for products in the internal and external markets. Furthermore, the authors of the present study believe it is necessary to focus on quality as well, since it primarily affects public health and long-term demand.

The study proved the need for capital investment in the development of agricultural enterprises as a basis for the development of effective meat production activities. The authors of this study fully share the opinion of N.G. Kopitets and V.M. Voloshyn (2020) that meat production is provided by a range of agricultural and industrial sectors of the country, which requires a clear definition of priorities for the development of the meat market and mechanisms for state support for the livestock sector.

Therefore, considering the above, when developing the main aspects of the strategy for sustainable development of the country's agricultural sector in the future, the Ukrainian meat market should be given priority in the system of state regulation. M.O. Karpyak (2018) shares the same opinion, emphasising that today livestock production underlies sustainable development of crop production. In other words, the implementation of the state policy to support the development of livestock is a prerequisite for the sustainable development of the agricultural sector and has a considerable impact on improving food security and preserving the Ukrainian countryside. As noted above, consideration of the findings of this study on the state, trends, features, and reasons for the decline in beef production may help to increase it, but the issues of product competitiveness, increased profitability, consumer preferences, identification of regional reserves for production development, etc. are still open. These are promising areas for further research.

CONCLUSIONS

Thus, the study showed that global beef production is growing steadily, with its share not falling below 20.3% of total meat production in 1961-2022. Its main producers are primarily the countries of North and South

America, Asia, and Australia, and among European countries – Germany and France. Beef production in the EU declined, although there was an increase in exports and a decrease in imports, primarily from Brazil and the UK. Ukraine exports beef mainly to the East. Its largest consumers include Argentina, the US, and Brazil. Ukraine's share of global production is declining. The world's largest beef producers do not always produce the most beef per capita, as observed in China and India.

In terms of food self-sufficiency in Ukraine, consumption of beef and veal in 2016-2022 was consistently lower than production. It is found that the share of agricultural enterprises in the structure of beef production has noticeably decreased, but there is a direct correlation between changes in the number of enterprises and production volumes. Notably, enterprises have greater opportunities to apply modern technologies, attract highly qualified personnel, enter foreign markets, etc.

Regionally, most beef and veal are produced in the Forest-Steppe zone, with over 43% since 2019, and the other two zones alternating between them. The regions that stand out are Lviv, Ivano-Frankivsk, Kyiv, Vinnytsia, and Kharkiv. The decline in production was primarily caused by a significant reduction in the number of livestock (by 6.7 times compared to 1961) and a negative level of profitability of cattle meat production. The increase in average consumer prices is not helping to boost demand for beef. The primary reasons for the decrease in the number of cattle are proposed to be divided into general, individual enterprises and households, which should help to accelerate their solution, including through the influence of the state.

Therefore, considering the growth of beef production in the world, its consumption by the majority of the population, favourable natural and climatic conditions, and one of the world's largest grain production volumes in Ukraine, as well as the production of other products and raw materials for processing enterprises, it is advisable to promote cattle breeding and beef production, specifically through the adoption of the necessary regulations, improving product quality, introducing modern technologies, preferential insurance, lending, and a range of other measures by the state and individual enterprises.

The study found a decrease in the supply of live animals to processing enterprises in the post-war period, with a significant decrease in the purchase of animals from the population due to military operations. However, positive developments in production give grounds for the resumption of cattle breeding in the postwar period. Still, there is a decrease in meat stocks, particularly beef, in Ukraine. An analysis of beef production before and after the hostilities, including growth rates, suggests that its recovery may depend heavily on cooperation with foreign partners. In the future, it is advisable to expand the research on the development of beef production, considering the climate crisis and the increase in the share of Ukraine's exports in the world market.

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None.

CONFLICT OF INTEREST

The authors of this study declare no conflict of interest.

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Стан і перспективи розвитку виробництва яловичини та телятини в Україні в контексті міжнародної економічної інтеграції

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Анотація. Виробництво яловичини зумовлене необхідністю забезпечення продовольчої безпекикраїни, задоволення потреби переробної промисловості в сировині, необхідністю збільшення надходжень до державного бюджету від експорту. Мета статті полягає у висвітленні стану, тенденцій виробництва у світі та Україні, виявленні проблем та визначенні напрямків розвитку з врахуванням міжнародної економічної інтеграції. Використано методи аналізу, синтезу, узагальнення, конкретизації, математичні та графічний. В результаті досліджень визначено тенденцію до зростання виробництва яловичини та телятини у світі, основні країни продуценти та переважну сталість їх частки у світових обсягах протягом десятиліть. Виявлено, що більше виробництво яловичини не завжди дозволяє забезпечити вищі обсяги на душу населення (наприклад в Китаї та Індії). Спостерігається зменшення продукування Україною та її частки у світових обсягах, хоча виробництво перевищує фонд споживання. Визначено, що у структурі суб'єктів господарювання зменшується частка сільськогосподарських підприємств та існує пряма залежність їх кількості та обсягів виробництва, яке переважає у зоні Лісостепу. Виділено області найбільші продуценти (Київську, Вінницьку, Харківську, Львівську), де передбачається першочерговий розвиток у післявоєнний період. Визначено основні причини зменшення виробництва, зокрема зниження поголів'я худоби, від'ємний рівень рентабельності, зростання середніх споживчих цін. За результатами SWOT-аналізу визначено перспективи розвитку та розроблено відповідні пропозиції. Запропоновано причини зменшення поголів'я худоби, яловичини виокремлювати як загальні, підприємств, господарств населення; наголошено на їх взаємозалежності. Наголошено на необхідності державної підтримки виробників через надання продовольчої допомоги населенню безкоштовно та через купівлю продукції за нижчими цінами залежно від їх матеріального рівня. Виокремлено міжнародну економічну інтеграцію як один з вагомих чинників збільшення виробництва яловичини. Підкреслено необхідність врахування споживчих переваг населення країн з якими укладено регіональні торговельні угоди, зокрема щодо виробництва кошерної та халяльної продукції. Результати досліджень та розроблені пропозиції можуть використовуватись при розробці державних заходів стосовно нарощування виробництва яловичини та підвищення її частки у світовому експорті

Ключові слова: обсяги виробництва; яловичина; державна політика; регіональні торговельні угоди; рентабельність; продовольча допомога