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Trends in the development of dairy farming and its state financial support in Ukraine

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► **Abstract.** The importance of dairy farming for food security and the formation of added value in agriculture necessitates a rational combination of market self-regulation mechanisms and instruments of state intervention in economic processes in the sector. The purpose of this study was to assess the development of dairy farming in Ukraine and identify ways to improve its state support. The following methods of scientific cognition were employed in the study: analysis and synthesis, induction and deduction, abstract-logical, historical, comparative analysis, monographic, computational-constructive, graphical, tabular, statistical analysis, generalisation, causal and retrospective analysis, analytical alignment of time series, economic modelling, and forecasting. Based on the results of using these methods, the study summarised the current trends in the development of dairy farming in Ukraine and its state financial support using tax and budgetary regulation instruments. The study covered the specifics of the existing structure of dairy farming in Ukraine, which, unlike the countries of the European Union, is represented by three categories of economic entities. It was found that since the early 2010s, Ukraine has been experiencing processes of concentration in the field of dairy farming. The study found a direct correlation between the size of the number of cows kept and the profitability of dairy farming. It was determined that enterprises with up to 100 cows gradually reduce the volume of activities in the dairy farming sector due to its unprofitability. The study assessed changes in the structure of dairy farms in European countries from the mid-1990s to the early 2020s and found that they are also characterised by trends in the concentration of dairy farming. The efficiency of the state financial support for the development of dairy cattle breeding in Ukraine through the instruments of tax and budgetary regulation in the pre-war period and in the martial law regime was assessed. The paper described the advantages and disadvantages of the applied instruments of budgetary support for dairy farming, substantiated proposals for the use of instruments of tax and budgetary stimulation of dairy farming development in the period of post-war economic recovery of Ukraine, considering the existing trends in the development of dairy farming in Ukraine. The practical significance of this study lies in the possibility of using the obtained results in the drafting of policy documents on the post-war development of the agro-industrial complex of Ukraine in general and specifically its dairy subcomplex

► **Keywords:** dairy sector; state regulation; structure of dairy farms; fiscal policy; budget support programmes; categories of milk producers

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▸ Introduction

The development of dairy farming at the global, regional, and national levels is traditionally on the agenda of government agencies, international professional and non-governmental organisations. The dairy industry generates significant employment and provides financial livelihoods for many economic entities, which requires constant monitoring of existing trends and outlining further prospects for its development. The Global Dairy Platform facilitates sectoral discussions on best practices in milk production and processing, as well as the exchange of information on trends and potential trajectories for the development of the dairy industry globally, in specific regions and in countries/groups of countries (2018 Annual review, 2019).

The relevant issues are also constantly in the focus of attention of the academic community – a many scientists investigate the issues of generalising the existing trends in the development of the dairy farming sector, systematically monitoring changes in the structure of the dairy sector in individual countries, groups of countries or regions, as well as changes in the efficiency of milk production. J.H. Britt *et al.* (2018) try to predict the trajectory of the global dairy industry in the long term. According to their forecasts, the size of dairy farms will increase substantially, and milk production will be considerably modernised through the active introduction of the latest technologies and innovative practices. R. Bhat *et al.* (2022) also address the need to control the structural features of dairy farms. W. Poczta *et al.* (2020) note that the economic situation on dairy farms in the European Union (EU) varies substantially between countries and emphasise that medium and large highly specialised intensive farms play an increasingly important role in milk production, as they are characterised by high productivity levels. T. Zinchuk *et al.* (2022) analyse the factors that have led to structural changes in Swiss dairy farming. J.M. MacDonald *et al.* (2020) describe the structural transformation of dairy farming in the United States, noting the factors that led to it and assessing the prospects for further consolidation in the sector.

Dairy farming has been the leading livestock sector in Ukraine, despite the complexity of the business due to its high capital intensity, long payback period, and elevated level of risks – from cow husbandry to the need to process perishable raw milk quickly. Therewith, the dairy sector in Ukraine has been undergoing substantial structural changes since the early 2010s, which need to be considered when developing the instruments of state financial support.

The importance of dairy farming for Ukraine's food security necessitates the formation and continuous review of the state support policy for this sector of the agri-food complex, primarily through tax and budgetary regulation. Before the full-scale Russian invasion, Ukraine had developed a certain toolkit of state financial support for dairy farming. However, considering the substantial decline in the performance of Ukraine's dairy sector, it proved insufficient – especially in terms of stimulating the activities of small milk producers. Furthermore, the conditions of post-war economic recovery and Ukraine's European integration require modernisation of the existing tools to stimulate the development of the dairy sector in Ukraine.

At the same time, a rather limited number of scholars are concerned with the issues of comprehensive assessment of the effectiveness of state financial support for the development of dairy farming in Ukraine. A. Semsal & S. Shupyk (2021) note that state financial support plays a vital role in shaping the motivation of agricultural producers to increase milk production.

S. Shupyk (2021) tried to substantiate a set of financial regulation measures at the state and regional levels, which can provide incentives for the revival of the dairy farming sector in Ukraine. A similar goal is pursued by a team of authors (Svynous *et al.*, 2022), who, based on an assessment of the existing instruments of state financial support for dairy farming in Ukraine, are trying to substantiate the most effective forms of state financial support for it.

Ukraine lacks comprehensive research on the effectiveness of state financial support for dairy farming. This is particularly relevant considering the challenges faced by the sector due to Russian aggression. It is necessary to define the role of the dairy sector in ensuring the country's food security and develop a system of state incentives for its development. Existing approaches to financial incentives for the development of the dairy industry need to be clarified and modernised. The purpose of this study was to summarise the trends in the development of the dairy sector of the Ukrainian agro-industrial complex (AIC) and to analyse the effectiveness of state support to develop proposals for further improvement of this sector.

▸ Materials and Methods

This study was conducted using a set of general scientific and economic and statistical methods. Specifically, by applying the methods of causal and retrospective analysis, the author summarises the trends in the development of the dairy farming sector of Ukraine before the beginning of the Russian armed aggression and the impact of the state financial support measures on them, and also identifies certain stages within which the trends changed. Using a systematic approach, the interrelationships between the processes that took place in the field of dairy farming during the study period (2004-2023) were identified.

Methods of generalisation and graphical presentation of information were used to find trends and patterns of development of the dairy farming sector in Ukraine. To formalise the existing trends and determine the trend equation, the study analytically aligned the indicators of the number of cows, their productivity, and milk production volumes based on economic and statistical assessment of the dynamics of their change. Given the multidirectionality of the trends during the period under study, to ensure greater accuracy in formalising the trends, it was divided into two sub-periods for which the relevant trend equations were determined. To determine the trend equation, a power function was chosen because it is best suited to formalise trends with varying degrees of

proportionality of changes over time, which was the case in the Ukrainian dairy sector during the study period:

$$Y=a\times t^{b}, \quad (1)$$

where Y is the calculated (theoretical) value of the resultant attribute; a and b are the parameters of the equation, t is the period number (t=1, ..., n), n is the number of years.

The parameters of the trend equations were estimated using the least squares method, the main condition of which is to minimise the sum of squares of deviations of the factual values of the factor attribute (Y) from its theoretical (average) value determined by the trend equation.

The assessment of structural changes in the dairy farming sector of Ukraine was carried out using the methods of grouping and tabular presentation of information. The study identified the performance indicators of enterprises that kept up to 100 and more than 500/1000 cows, and, accordingly, determined their shares in the total number of cows, the total volume of milk produced, and conducted a comparative analysis of cow productivity in agricultural enterprises depending on the number of cows they keep. The same methods were used to estimate the relationship between dairy farm size (number of cows), productivity, profit per cow, and profitability of milk production activities.

When assessing the changes in the structure of dairy farms in the EU countries with developed dairy farming and the USA, the methods of grouping and comparative analysis were used. For this purpose, the study used the cow population scales applied by the International Farm Comparison Network (IFCN Dairy Report 2021, 2022). The use of the method of analytical data processing helped to characterise the trends of structural changes in dairy farming in these countries, and the use of the method of comparative analysis made it possible to compare them with the relevant trends in the dairy farming sector of Ukraine.

To characterise the instruments of tax and budgetary regulation of the development of the dairy farming sector in Ukraine, the study used the methods of retrospective analysis and generalisation of provisions of regulations on the state financial support for the development of the agro-industrial complex. The effectiveness of the existing budget programmes to support the development of dairy farming in Ukraine was assessed based on analytical and expert study of the indicators of their implementation passports. Trends in the state financial support for the development of livestock in general, and dairy farming specifically, during martial law are summarised based on analysis and expert assessment of the provisions of the regulations governing the relevant relations in Ukraine. The methods of economic modelling and scientific generalisation were used to comprehensively assess the effectiveness of the existing instruments of tax and budgetary regulation of dairy farming in Ukraine. The method of economic forecasting was used to outline further prospects for the development of dairy farming in Ukraine and to improve approaches to its fiscal incentives. The areas of modernisation of the instruments of state financial support for the development of dairy farming in Ukraine are formed by using the abstract-logical method.

The information and analytical framework for this study included the following: regarding Ukraine – statistical materials of the State Statistics Service of Ukraine, which characterise the state of development of dairy farming in Ukraine (specifically, Livestock in Ukraine 2021, 2022); for the EU and the USA – analytical materials of international professional organisations in the dairy farming sector and research groups under governmental structures (specifically, IFCN Dairy Report 2021, 2022; Dairy Market Review..., 2022; Augère-Granier, 2018).

The study was also based on the assessment of Ukrainian legislation on state financial support for dairy farming, namely, the Law of Ukraine No. 1877-IV "On State Support of Agriculture in Ukraine" (2004) and sub-legislative acts (namely, Resolution of the Cabinet of Ministers of Ukraine No. 107..., 2018) developed to implement its provisions, as well as data from the passports of budget programmes aimed at supporting the development of agricultural producers in Ukraine (Information on the implementation..., n.d.).

▸ RESULTS

A retrospective analysis of the development of the dairy farming sector. Since the early 2000s, the volume of activities of agricultural enterprises in the dairy farming sector has been declining substantially, despite the state financial support measures applied by the government during this period: both through budget subsidies and tax incentives (specifically, the application of a special regime for the collection of value added tax (VAT) – the so-called VAT subsidies, zero VAT rate for taxation of transactions involving the supply of milk by households for industrial processing).

The reason for the decline and stagnation of Ukraine's dairy sector in 2000-2010 in the segment of agricultural enterprises was the substantially lower profitability of milk production compared to the production of high-margin export-oriented crops (primarily grain/oilseeds and maize). As a result, the dairy sector was less attractive for agricultural businesses, which led most agricultural enterprises to either curtail their activities or not prioritise it when planning their development and approving their investment projects.

In the first half of the 2010s, the decline in the development of dairy farming in Ukraine in the segment of agricultural enterprises stopped: the number of cows still continued to decline, but due to the dynamic growth of cow productivity – as a result of improved cow husbandry technology – milk production in this category of producers was more or less stable, fluctuating within 2.6-2.8 million tonnes (Fig. 1). The volume of households' activities in the dairy farming sector has been steadily declining since the early 2000s. Therewith, while the rate of decline in the number of cows in the household segment averaged 4.8% per year until the mid-2010s, it increased to 7.2% in 2016-2021. The rate of reduction in milk production volumes in the household sector did not exceed 3% annually on average until the mid-20XX, but after 2016, it increased to over 5%.

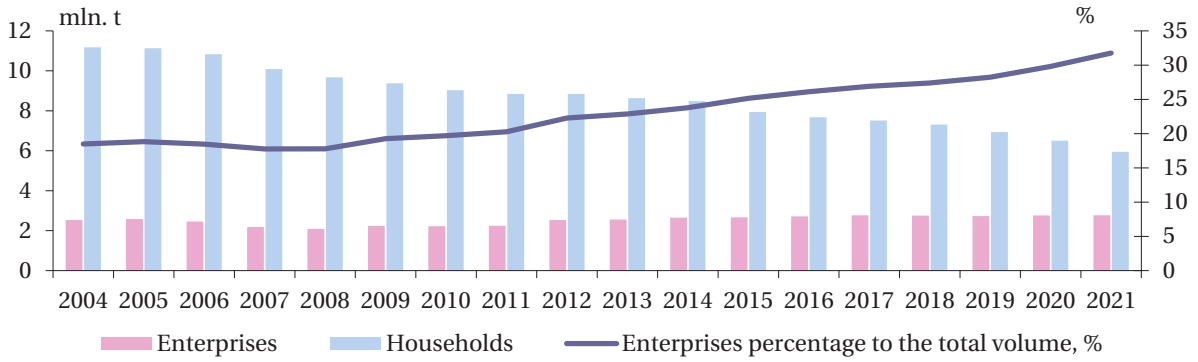

Figure 1. Dynamics of milk production in Ukraine by individual categories of producers before the start of full-scale Russian military aggression, million tonnes
Source: completed by the authors of this study based on Livestock in Ukraine 2021 (2022)

To formalise the existing trends in the development of the dairy sector in Ukraine, an analytical alignment of the indicators of the available number of cows, their productivity, and milk production in the entire Ukraine and by individual categories of producers in 2004-2021 was carried out (Table 1). Based on the economic and statistical assessment of changes in the existing trends in the development of the dairy farming sector, the relevant trend equations were formed.

Table 1. Results of the analytical alignment of trends in indicators number of cows, their productivity and milk production in Ukraine

Period	Indicator	Trend equation	Reliability coefficient (R^2)	Forecast value for 2023
All categories of farms				
2004-2011	Number of cows	$Y_1 = 4091.7t^{-0.2172}$	0.9682	x
	Cow productivity	$Y_2 = 3167.3t^{0.1269}$	0.9636	
	Milk production volumes	$Y_3 = 14\ 348t^{-0.1166}$	0.8765	
2012-2021	Number of cows	$Y_1 = 2762t^{-0.2058}$	0.8678	1635
	Cow productivity	$Y_2 = 4244.6t^{0.0763}$	0.914	5131
	Milk production volumes	$Y_3 = 11\ 984t^{-0.1045}$	0.7852	9245
Agricultural enterprises				
2004-2011	Number of cows	$Y_1 = 985.12t^{-0.2616}$	0.9698	x
	Cow productivity	$Y_2 = 2425.5t^{0.2389}$	0.931	
	Milk production volumes	$Y_3 = 2592.6t^{-0.0868}$	0.6262	
2012-2021	Number of cows	$Y_1 = 603.13t^{-0.1444}$	0.9344	421
	Cow productivity	$Y_2 = 4384.7t^{0.1725}$	0.9089	6731
	Milk production volumes	$Y_3 = 2521.7t^{0.0425}$	0.9266	2804
Households				
2004-2011	Number of cows	$Y_1 = 3106.5t^{-0.2038}$	0.9598	x
	Cow productivity	$Y_2 = 3399.4t^{0.0964}$	0.9675	
	Milk production volumes	$Y_3 = 11\ 759t^{-0.1238}$	0.8672	
2012-2021	Number of cows	$Y_1 = 2162.6t^{-0.2256}$	0.842	1225
	Cow productivity	$Y_2 = 4234.3t^{0.0377}$	0.9014	4665
	Milk production volumes	$Y_3 = 9529.8t^{-0.1564}$	0.8053	6441

Note: Y is the outcome variable (Y_1 is the number of cows (in the corresponding period for the corresponding category of producers); Y_2 is the cow productivity (in the corresponding period for the corresponding category of producers); Y_3 is the milk production (in the corresponding period for the corresponding category of producers); t is the factor attribute (period number), t = 1; n is the number of years
Source: completed by the authors of this study based on Livestock in Ukraine 2021 (2022)

Therewith, the relevant period was divided into two – in the first, performance indicators in dairy farming declined in all categories of farms (2004-early 2010). In the second case, only households saw a decline in milk production. Proceeding from the data in Table 1, the power coefficient in the trend equation for the 1st period to formalise the indicators characterising the change in milk production was (-0.1166), and for the 2nd period – (-0.1045). Thus, the rate of decline in milk production did not differ significantly between the two sub-periods.

Considering the equation for changes in milk production by individual categories of milk producers, the situation is substantially different: for agricultural enterprises, the power coefficients are (-0.0868) and 0.0425, respectively; for households, (-0.1238) and (-0.1564). Thus, in 2004-2011, milk production in agricultural enterprises was declining, with a negative power law value almost 1.5 times higher than that of households. Since 2012, milk production in the agricultural segment has generally not declined, with a rather low degree of trend equation. On the other hand, the negative power law value of the trend equation for households decreased by more than a quarter for 2012-2021. As a result, the share of agricultural enterprises in total milk production increased from 18.3% in 2004 to almost 32% in 2021.

Predicting total milk production in Ukraine, even in the short term, is virtually impossible, both given the trends that began in the sector in the late 2010s and the Russian military aggression (Lupenko *et al.*, 2022). Thus, the calculated indicators of the development of the dairy sector of Ukraine in 2022, using the obtained trend equations in terms of certain categories of milk producers and periods, turned out to be relevant only for agricultural enterprises – subject to adjustment for the factor of the Russian military invasion, which led to a decrease in milk production in the segment of agricultural enterprises by 5.3% (Agriculture of Ukraine for 2022, 2023).

The factor of Russian military aggression had the greatest impact on the performance of households. Furthermore, the dynamics of these indicators in the second half of the 2010s and early 2020s was shaped by the new state dairy policy, which substantially tightened the requirements for milk supplied for industrial processing. Households using imperfect dairy technologies will be unable to supply milk for industrial processing, and thus will lose the relevant income channel, and with it the motivation to keep cows for additional income.

Currently, it is expected that starting from about 2025, Ukrainian dairy processing enterprises will completely abandon the use of milk produced by households, if it does not meet the approved safety and quality requirements (Order of the Ministry of..., 2019). Given this, in the short term, agricultural enterprises will need to promptly increase the volume of milk supplied by households for industrial processing to prevent a decline in milk processing.

To assess structural changes in the Ukrainian dairy farming sector in the segment of agricultural enterprises, the relevant groupings and structuring of dairy farms were carried out depending on the number of cows available, their productivity and share in total milk production over the pre-war twelve years (2010-2021), during which milk production in the segment of agricultural enterprises stabilised (Table 2).

Table 2. Structure of dairy cattle breeding in agricultural and farm enterprises

Indicators	2010	2015	2021	2021 to, p.p.		2022 *for reference*
				2010	2015	
Number of enterprises that kept cows, units	3741	2614	1686	45.1	64.5	1440
Number of cows in agricultural enterprises, thous. heads	589.1	505.1	424.6	72.1	84.1	394.2
Share of enterprises that held (%):						
– up to 100 cows	55.4	50.2	43.8	-11.6	-6.4	42.5
– over 500 cows	7.2	9.6	13.7	6.5	4.1	14.9
– incl. over 1000 cows	1.2	2.4	4.8	3.6	2.4	5.1
Share of cows owned by enterprises (%):						
– up to 100 cows	10.0	7.9	5.6	-4.3	-2.2	5.9
– over 500 cows	36.3	43.5	52.5	16.9	9.0	54.0
– incl. over 1000 cows	11.3	18.9	28.9	17.7	10.0	30.3
Share of milk produced by cows owned by agricultural enterprises (%):						
– up to 100 cows	5.8	5.2	4.1	-1.7	-1.1	…
– over 500 cows	45.4	49.7	61.4	16.0	11.7	…
– incl. over 1000 cows	14.2	21.5	34.1	19.9	12.6	…
Productivity of cows in agricultural enterprises (kg):						
– up to 100 cows	2190	3496	4804	219	137	…
– over 500 cows	4712	6035	7618	162	126	…
– incl. over 1000 cows	4736	6005	7687	162	128	…
For reference: number of cows per 1 enterprise that kept them, heads	157	193	252	160	130	274

Source: compiled by the authors of this study based on Livestock in Ukraine 2021 (2022); Agriculture of Ukraine for 2022 (2023)

As the data presented in Table 2 shows, the situation in the Ukrainian dairy farming sector has changed substantially in recent years before the full-scale Russian invasion, with concentration processes taking place in the sector, which will only intensify in the context of the post-war economic recovery. Thus, there is a trend towards concentration of dairy farms in Ukraine, as it is more cost-effective to keep more cows due to economies of

scale. The results of the grouping and structuring of dairy farms in terms of the number of cows kept, their average productivity and profitability in the dairy farming sector are presented in Table 3.

Table 3. Grouping and structuring of agricultural enterprises engaged in dairy farming according to the number of cows held

Groups according to number of cows, heads	Number of farms in the group	The share of the number of enterprises, %	Share in total cow livestock, %	Share of milk, %	Milk yield per 1 cow, kg	Profit per cow, UAH	Profitability, %	Share of milk in revenues, %
2010								
up to 100	1006	41.8	8.9	6.2	2765	13.4	0.3	5.3
101-300	915	38.0	31.8	26.5	3323	925.7	14.6	16.6
301-500	268	11.1	19.6	20.2	4118	1 591.7	19.4	25.2
501-1000	173	7.2	22.2	26.2	4693	2 457.2	24.6	28.0
over 1000	44	1.8	17.6	20.9	4736	1 710.8	16.4	26.5
Total	**2406**	**100.0**	**100.0**	**100.0**	**3981**	**1 452.5**	**17.9**	**20.0**
2016								
up to 100	501	32.9	5.5	3.6	3688	326.7	2.3	3.5
101-300	581	38.2	23.7	19.3	4562	2 490.1	13.1	10.3
301-500	225	14.8	18.9	19.0	5642	4 494.9	18.5	17.2
501-1000	144	9.5	21.0	25.1	6678	6 176.9	20.8	21.0
over 1000	70	4.6	30.9	33.1	5995	5 706.5	20.5	16.7
Total	**1521**	**100.0**	**100.0**	**100.0**	**5606**	**4 520.6**	**18.3**	**14.5**

Note: 2016 is the last year for which such calculations can be made (due to a substantial reform of statistical reporting of agricultural enterprises)
Source: completed by the authors of this study based on Livestock in Ukraine 2021 (2022)

As Table 3 shows, there is a relationship between dairy farm size and profitability of milk production, with higher profitability for those farms that keep more cows. Therewith, dairy farming activities of enterprises with up to 100 cows were factually unprofitable. As a result, dairy farms with a small number of cows are gradually ceasing to operate, resulting in a rapid decline in the number of enterprises with less than 100 cows in Ukraine.

This trend should be considered when forming state financial support for the development of dairy farming. In the context of the post-war economic recovery in Ukraine, it is necessary to ensure that state financial support resources are concentrated on economically powerful dairy farms. The concentration of dairy farming is an objective trend inherent in the dairy farming industry of most countries with developed dairy farming, including European countries and the United States (Table 4). To better illustrate the structural changes in the dairy sector of these countries, a period of a quarter of a century was chosen – from the mid-1990s to 2020 inclusive.

Table 4. Changes in the structure of dairy farms in selected European countries with developed dairy farming and the USA (2020 vs 1996), %

EU as a whole			Lithuania			Denmark			Germany		
Headcount	**1996**	**2020**	**Headcount**	**1996**	**2020**	**Headcount**	**1996**	**2020**	**Headcount**	**1996**	**2020**
1-2	16	4	1-2	55	10	up to 50	37	1	up to 9	5	1
3-10	13	4	3-9	31	15	51-100	48	7	10-19	14	2
11-30	18	10	10-19	2	10	101-250	13	33	20-29	17	5
31-100	34	32	20-29	1	7	250-500	2	30	30-49	23	10
101-300	10	33	30-99	2	25	501-1000	0	19	50-99	21	26
over 300	9	17	over 100	11	33	over 1000	0	10	over 100	20	56
France			**Netherlands**			**Poland**			**USA**		
Headcount	**1996**	**2020**	**Headcount**	**1996**	**2020**	**Headcount**	**1996**	**2020**	**Headcount**	**1996**	**2020**
up to 9	5	1	up to 9	0	0	up to 9	90	15	1-49	18	4
10-19	10	3	10-29	11	2	10-19	8	17	50-199	45	16
20-29	17	3	30-49	27	5	20-99	2	52	200-499	15	10
30-49	38	12	50-99	50	33	100-199	0	10	500-999	8	10

Table 4, Continued

France			Netherlands			Poland			USA		
Headcount	1996	2020	Headcount	1996	2020	Headcount	1996	2020	Headcount	1996	2020
50-99	28	47	over 100	12	60	over 200	0	6	1000-2500	9	19
over 100	2	34							over 2500	5	41

Source: calculated according to the data from IFCN Dairy Report 2021 (2022)

As the data in Table 4 shows, between the mid-1990s and 2020, there were substantial changes in the structure of dairy farms in European countries, namely, the concentration of dairy farming. While in the EU in total in the mid-1990s, almost half of the cow livestock was owned by entities with no more than 30 cows, in 2020 the share of the corresponding livestock fell to 18%. On the other hand, the share of livestock owned by entities with more than 100 cows increased from 19% to 50%. As a result, as of the early 2020s, more than half of the cow livestock in the EU on average was owned by entities with more than 100 cows. Moreover, the share of livestock owned by entities with more than 100 cows increased over the study period: in Lithuania – up to 33%; in Denmark – 92%; in Germany – 56%; in France – 34%; in the Netherlands – 60%.

Poland's experience is quite specific: in the mid-1990s, the number of cows owned by entities with up to 10 cows exceeded 90% of the total number of cows, and there were no farms with more than 100 cows at all. In contrast, in 2020, the share of livestock owned by entities with up to 10 cows decreased to 15%, while the share of livestock on farms with 20 to 100 cows increased from 2% to 53%. Furthermore, more than 15% of the cow livestock was owned by entities with more than 100 cows.

The United States has developed its own model of the dairy sector, which relies on large dairy farms. While in the mid-1990s the share of cows owned by entities with more than 1,000 heads was less than 15%, in 2020 it rose to 61%. The share of cows owned by entities with less than 100 cows decreased from 63% in the mid-1990s to less than 20% in 2020.

The impact of state financial support measures on the development of dairy farming. The analysis of the information sources used shows that dairy farming is conventionally subject to state financial regulation. Accordingly, most countries or supranational entities allocate significant amounts of financial resources to stimulate its development. Before the start of the full-scale Russian military aggression, Ukraine was no exception in this regard, with considerable attention being paid to the issues of state financial support for the development of the dairy industry in Ukraine.

Until 2017, state support for the development of dairy farming in Ukraine was for a long time mainly provided through the application of a special VAT regime for the taxation of transactions involving the supply of raw milk (as well as other types of agricultural products) – the so-called VAT accumulation regime (Tulush, 2017). Under the terms of this special regime, the VAT liabilities due to the state budget stayed at the disposal of milk producers and were used by them to finance expenses related to the development of dairy farming. The use of this specific instrument of state financial support substantially increased the amount of own financial resources at the disposal of milk producers – on average by 8.5-9.0% of their income.

Since 2017, the special VAT regime for taxation of transactions on the supply of certain types of agricultural products has been completely cancelled, but a slightly modified instrument of state financial support – the so-called quasi-accumulation (refund) regime – has been proposed following Article 16-2 of the Law of Ukraine No. 1877-IV "On State Support of Agriculture in Ukraine" dated 24.06.2004 (2004). This instrument made provision for the refund of a part of the VAT liabilities paid to the budget by business entities within the scope of the budget subsidy for financial support of agricultural producers to stimulate the production of certain types of agricultural products (including milk), prescribed in the relevant budget programme of state support (Tulush, 2017). The respective area of budget support was an "umbrella" one, i.e., it concerned many types of agricultural products aimed at filling the domestic market (livestock products, fruits, vegetables, berries). However, after 2017, the relevant direction of state financial support for agricultural producers was not applied, although as of 2023 it is prescribed in Law No. 1877-IV (Law of Ukraine..., 2004).

The dynamics of budget financing for the development of dairy farming in Ukraine in terms of individual instruments of state financial support used in 2018-2021 is presented in Table 5.

Table 5. Budget financing of dairy farming development needs in Ukraine in terms of individual instruments of state financial support in 2018-2021, UAH million

Budget support instruments	2018	2019	2020	2021
Instruments of the direction "State support for livestock development and processing of agricultural products"				
Partial reimbursement of the cost of purchased breeding animals, sperm, embryos ***("umbrella" area)***	214.6	150.2	300.0	527.5
Partial reimbursement of the cost of construction/reconstruction of livestock facilities and agricultural processing facilities ***("umbrella" area)***	1 278.7	526.0	430.6	941.1
Special budgetary subsidy for cows	512.1	531.2	x	x
Special budget subsidy for keeping young cattle in households	321.2	615.4	x	x
Special budget subsidy for the increase in the number of cows of own reproduction	x	x	x	100.0

Table 5, Continued

Budget support instruments	2018	2019	2020	2021
Partial compensation of the cost of construction/reconstruction of livestock farms and agricultural processing enterprises in terms of costs financed by bank loans ***("umbrella" area)***	63.1	75.2	1.8	17.4
Tools of the area "State support for the development of farms"				
Special budgetary subsidy for cows	x	x	35.2	57.6

Source: compiled according to data from Information on the implementation of budget program passports (n.d.)

As Table 5 shows, Ukraine used a variety of instruments to promote dairy farming in the years before the Russian invasion. Some of them were used on a regular basis, while the state almost immediately abandoned the use of certain instruments and replaced them with new ones. Some of the instruments were developed for the dairy sector only, but most of them were "umbrella", i.e., available to business entities engaged in any type of livestock production (poultry farming, pig husbandry, beekeeping, etc.).

It is worth noting the small amounts of budget allocations to support the development of the dairy sector in these years: about UAH 0.5 billion in 2020 and less than UAH 0.7 billion in 2021 (in 2018-2019, the amounts of budget support were slightly higher – UAH 1.7 and 1.5 billion, respectively). Given that the cost of raw milk in 2020-2021 exceeded UAH 100 billion, the budget allocations to support the development of dairy farming can be considered insufficient, as they did not exceed 0.5% of the cost of raw milk, and therefore could not have a substantial impact on the development trajectory of the dairy farming sector in Ukraine. In the years before the Russian invasion, partial reimbursement of the cost of purchased breeding animals, semen, and embryos, as well as partial reimbursement of the cost of construction/reconstruction of livestock facilities and agricultural processing facilities, were conditionally permanent instruments of budget support for the development of dairy farming in Ukraine.

According to clause 8 The procedure for the use of funds provided in the state budget for budgetary support for the development of animal husbandry and processing of agricultural products, approved by Resolution of the Cabinet of Ministers of Ukraine No. 107 dated February 7, 2018 (Resolution of the Cabinet of Ministers of Ukraine No. 107..., 2018) partial reimbursement of the cost of breeding animals, sperm, and embryos was provided to economic entities for purchased heifers, cows, and other types of farm animals, sperm, and embryos of cattle in the amount of up to 80% of the cost (excluding VAT). Thus, the relevant area was "umbrella", i.e., it applied not only to cattle breeding but also to other types of livestock. The use of such a broad approach to forming a circle of recipients within one area of budget support made this instrument unpredictable. Quotas for certain areas of livestock activities were not prescribed, and no priority was given to certain types of activities in the distribution of budget support. As a result, if the amount of applications exceeded the amount of budget allocations, the amount of budget support was distributed proportionally, i.e., as a certain share of the application, within the factual amount of budget allocations. Furthermore, the maximum amount of support per animal was determined, specifically, for breeding heifers, cows purchased in Ukraine – 50.4 thousand per head.

According to the passport of the budget programme "Financial Support to Agricultural Producers" for 2021, the sub-area "Partial reimbursement of the cost of purchased breeding animals, semen, embryos" (planned annual funding of UAH 350 million) of the area "State support for the development of livestock and processing of agricultural products" (planned annual funding of UAH 1150 million), it was planned to stimulate the purchase of 4.5 thousand heads of cows (heifers, calves), 130 thousand doses of bull semen, and 50 cattle embryos (Passports of budget programmes for 2021, 2022). As a result of the relevant measures, it was planned to increase the average milk yield per cow by 1% compared to the previous year and increase the number of cows in agricultural enterprises by 0.5% compared to the previous year. The planned increase in the number of cows was not achieved, and productivity growth occurred regardless of the government's incentives, due to the improvement of milk production technologies by dairy businesses.

Another conditionally permanent instrument of budget support was a partial reimbursement of the cost of construction/reconstruction of livestock facilities and agricultural processing facilities. According to paragraph 9 (Resolution of the Cabinet of Ministers of Ukraine No. 107..., 2018), partial reimbursement of the cost of facilities was provided in the amount of up to 50% of their cost (excluding VAT), including the cost of equipment, built/reconstructed and commissioned completed facilities for keeping animals, milking parlours, and agricultural processing enterprises.

Under the sub-area "Partial reimbursement of the cost of construction/reconstruction of livestock facilities and agricultural processing facilities" (planned annual funding of UAH 350 million) of the "State Support for the Development of Livestock and Agricultural Processing", it was planned to reimburse the cost of 30 newly built/reconstructed livestock farms and complexes (about one third of which were for keeping cattle). An increase in the number of cows in agricultural enterprises compared to the previous year's level (by 0.5%, also not achieved) was also declared as an indicator of the quality of this sub-direction of budget support (Passports of budget programmes for 2021, 2022).

Until 2020, entities that kept cattle received a special budget subsidy:

- for keeping cows – twice a year to agricultural enterprises for each identified and duly registered cow as of 1 January and 1 July of the respective year in the amount of UAH 900 per head; the respective number of cows was verified by the administrator of the Unified State Register of Animals; a refund was provided in case of a decrease in the number of cows (after receiving a budget subsidy); in case of a decrease in the number of cows, no subsidy for keeping cows was provided for the current period;
- for keeping young cattle – to households for keeping identified and registered young cattle up to 13 months of

age, which were born in households or purchased by them from other owners; the subsidy was provided for every 4 months of keeping, cumulatively, considering the age of the young cattle, in the amount of the following scheme: 1-5 months – 300 UAH/head; 5-9 months – 700 UAH/head; from 9 to 13 months – 1500 UAH/head. The total amount of the subsidy for young cattle could not exceed UAH 2500 per head; to receive the subsidy, it was necessary to submit a cattle passport, and in case of keeping 10 or more heads, an extract from the Unified State Register of Animals.

The planned amount of the special budget subsidy for cows was quite significant – UAH 700 million, but in 2018-2019, business entities were able to use only 74% and 76% of the planned budget allocations, respectively (Information on the implementation ..., n.d.). The level of support reached 2.8% of the value of raw milk received from the cow and was quite effective. However, as a result of the reform of the Agrarian Ministry in 2019 – through its merger with the Ministry of Economy – the relevant budget support instrument was lost.

The level of utilisation of the planned volumes of special budget subsidies for cattle keeping by households in 2018-2019 was 64% and 88%, respectively (in the first year, the area did not work as intended) (Information on the implementation of ..., n.d.). The support covered both dairy and beef cattle breeding and was more aimed at supporting the incomes of households engaged in these activities. The abandonment of this support instrument seemed quite logical, as it did not have much impact on the state of the dairy industry.

In 2019, a sub-area "Special budgetary subsidy for cow keeping by farms" was introduced under the "State Support for the Development of Farms" budget programme of the "Financial Support for Agricultural Producers". In this way, an attempt was made to support the development of livestock breeding on farms. The subsidy was granted to farms that owned five or more cows, for each cow available as of 1 July of the relevant year, in the amount of UAH 5000, but not more than UAH 250 000 (i.e., the development of farms with up to 50 cows was stimulated). The level of disbursement of funds in this area left much to be desired: 35% in 2020, 58% in 2021 (Information on the implementation of..., n.d.).

Some questions arose about this area of support, since:

- the share of farms in the total number of cows kept by agricultural enterprises is insignificant and does not substantially affect the milk processing market;
- farms with up to 50 cows are not very efficient, as evidenced by the decline in the share of their livestock in the total number of cows held by this category of milk producers;
- dairy farming is not attractive for farmers – most of them are engaged in crop production and are not going to invest in dairy farming.

Considering this, the introduction of the corresponding support measure – through subsidies to farms with up to 50 cows – looked more populist and inappropriate in terms of the efficiency of spending state budget resources. Clearly, neither tactical nor strategic tasks in the dairy sector can be solved with this type of support.

In 2021, another instrument of budgetary support for the development of cattle breeding was introduced – a subsidy for the increase in the number of cows of own reproduction (Resolution of the Cabinet of Ministers of Ukraine No. 107..., 2018). It was granted to agricultural enterprises for each available bred cow of their own reproduction, by which the main herd increased as of 1 July of the relevant year compared to the existing number of cows as of 1 January (in the amount of up to UAH 30 thousand per head). Due to the low amount of planned budget allocations in this area (UAH 100 million), the results of its implementation required the application of the proportional principle of financing, and business entities that ensured an increase in the number of cows actually received amounts 3.2 times less than those declared in the relevant procedure. This area of support is the most effective, as it encourages not just keeping cows, but increasing their number. A substantial problem with its application in 2021 was the meagre amount of budget allocations, which resulted in the factual subsidy amounts paid by the state being significantly lower than the declared amounts.

Since the beginning of Russian military aggression in February 2022, the available tools for budget support for dairy farming development have become unavailable due to the concentration of budget resources on supporting national defence. The budget programme "Financial Support for Agricultural Producers" – like other economic programmes – was "frozen" for the period of martial law and did not function in 2022-2023 (Law of Ukraine..., 2021). The imposition of martial law makes it impossible to finance economic development programmes, including the provision of state financial support to dairy farmers.

At the same time, as a result of the Russian military aggression, agricultural businesses operating in the occupied territories or near the war zone suffered significant losses. Given that representatives of micro and small agricultural businesses make a substantial contribution to the country's food security and employment in their respective areas, as well as being the main producers of agricultural products for domestic consumption, external donors decided to allocate EUR 50 million in emergency financial support to them in 2022 within the framework of the EU's budget support to Ukraine (Financial support..., 2023).

The relevant resources were allocated to the state budget for 2022 and used to support small agricultural producers under the new areas of support prescribed by Government Resolution No. 918 "On Approval of the Procedure for the Use of Funds Provided for in the State Budget for Supporting Farms and Other Agricultural Producers" of 16.08.2022 (2022), namely:

- a budget subsidy per unit of cultivated farmland (1 hectare) – in the amount of UAH 3.1 thousand per hectare, but not more than UAH 372 thousand per farm (i.e., the maximum area of farmland for which the subsidy was provided was 120 hectares);
- a special budget subsidy for the keeping of cattle (cows) – in the amount of UAH 5.3 thousand per head, but not more than UAH 530 thousand per farm (i.e., the maximum number of cattle for which the subsidy was provided was 100 heads, the minimum – 3 heads).

The new areas of support for farms and other agricultural producers were part of the new budget programme "Support for farms and other agricultural producers", which was administered by the Ukrainian State Fund for Support of Farms and its regional offices using the State

Agrarian Register (Special budget subsidy..., 2022). The recipients of budget support were farms and other agricultural producers (including households) that had ensured that information about their agricultural activities was entered into the State Agrarian Register and had cattle registered in the Unified State Register of Animals. In 2022, a special budget subsidy for cattle (cows) was paid in the amount of UAH 329 million, which was received by 10 247 agricultural businesses for keeping 62.1 thousand cows. It was assumed that the relevant area of support – at the expense of EU budgetary support to Ukraine – would be maintained in 2023, but only if the EU allocated appropriate donor funds (Financial support..., 2023).

Notably, the payment of a special budget subsidy for cattle (cows) under the budget programme "Support to farms and other agricultural producers" pursued social rather than economic goals. Its task was to support small agricultural producers in the difficult conditions of martial law, when agricultural logistics were severely disrupted, and households did not understand what to do with their existing cows. The purpose of the special budget subsidy for cattle (cows) was to "calm down" the market and provide targeted support to the most vulnerable category of agricultural producers who were deprived of the opportunity to attract financial resources from other sources to ensure the continuation of agricultural activities (Special budget subsidy..., 2022).

The introduction of this area of budget support was not directly related to the development of dairy farming, as the purpose was to provide prompt support to small agricultural producers. The latter's activities are crucial for achieving an adequate level of food security, particularly in terms of milk and dairy products. The value of such support lies in its promptness and targeting, but it should be considered as a one-off rather than a systemic measure. Most likely, this practice will not be applied to agricultural producers in Ukraine in the future.

▸ Discussion

Thus, in the evolutionary development, Ukraine has devised its own instruments of state financial support for the development of dairy farming, which had many differences from those used in the EU countries. Although this toolkit was quite extensive, due to the low level of budget allocations, it did not have a substantial impact on the development of the dairy sector in Ukraine. Due to limited budgetary resources, there is a tendency to use selective rather than continuous budget support programmes. As a result, most dairy businesses in Ukraine have found budget support resources unavailable. Furthermore, due to insufficient budgetary allocations for state financial support for dairy farming, the principle of proportionality was applied when distributing the amounts, which made it unpredictable.

Insufficient attention was paid to stimulating the development of small dairy producers when formulating the policy of state support for the development of dairy farming. In this context, the efficiency of small dairy farms depended more on the level of entrepreneurial skills of such business entities than on the prevailing conditions for running a dairy business. This feature is highlighted in the study by A. Jedik *et al.* (2014).

The importance of dairy farming in ensuring food security (both global and regional, as well as in individual countries) determines the need for a rational combination of market self-regulation and state regulation. These issues are constantly being discussed by European scholars. G. Koutouzidou *et al.* (2022) focus on the issue of the efficiency of the use of available resources by dairy farms. The authors present the main structural and financial characteristics of dairy farms with different efficiency, which resulted in the formation of the appropriate farm structure and the identification of the main cost factors. The authors state that dairy farms must constantly ensure their economic sustainability and be less risk-averse in an environment where opportunities to reduce production costs on high-intensity farms are significantly reduced.

D. Läpple & G. Sirr (2019) note that the abolition of the milk quota has led to substantial changes in the EU dairy sector. They note considerable differences in the changes in milk production in individual EU countries after the implementation of the relevant EU decision. Using the example of Irish and Dutch dairy farms, they conduct a comparative analysis of the efficiency of their operation in terms of intensification and increase in production volumes – considering the average size of dairy farms, the amount of direct budget payments and investments made. J. Marzec & A. Pisulewski (2017) analysed the impact of EU Common Agricultural Policy (CAP) subsidies on the technical efficiency of Polish dairy farms. They identified several types of subsidies and assessed which ones were most probable to lead to substantial differences in the technical efficiency of dairy farms. The authors conclude that the impact of subsidies on the technical efficiency of dairy farms is negative.

M.-L. Augère-Granier (2018) notes that the dairy sector is the second largest agricultural sector in the EU. In this context, dairy policy is an integral component of the CAP and consists of several instruments designed to support farmers' incomes and address market imbalances. It includes the organisation of a common market, state intervention measures (purchase, storage, etc.), direct budgetary payments, and rural development measures. Therewith, the EU dairy policy is being dynamically updated, and updated state support packages are being developed and implemented.

M. Gaworski *et al.* (2016) note that there are currently substantial differences in the levels of development of the dairy sector in individual EU countries. Specifically, they point out that further transformation of the Polish dairy sector requires overcoming the existing barriers that hinder its effective development, namely, the prominent level of dispersion in the production of raw milk and its low technological level. In view of this, they see further areas for the transformation of the Polish dairy sector in terms of technical and technological re-equipment and increasing the profitability of dairy farms, which requires the implementation of state support measures.

It is difficult to disagree with the conclusions of G. Koutouzidou *et al.* (2022) that dairy farms need to always ensure their economic sustainability – despite the state financial support, which is not stable in Ukraine. In this context, the conclusions of M. Klopčič *et al.* (2019) are quite accurate that instability in the choice of further

development strategy by dairy farms due to changes in state financial support policy makes future decision-making insufficiently effective. Accordingly, when approving development strategies, dairy business entities should consider the results of market forecasting rather than the possibility of using state financial support resources in their activities.

The conclusions of D. Läpple & G. Sirr (2019), A. Groeneveld *et al.* (2016) that changes in the state policy on dairy farming have led to an increase in the level of intensification of dairy farming and, accordingly, its concentration. L. Čechura *et al.* (2021) analysed the impact of the abolition of milk quotas in the EU. There is heterogeneity in milk production across EU member states and increasing returns to scale. The abolition of quotas prompted farms to optimise their size. G. Trnkova *et al.* (2012) investigated the impact of subsidies on livestock enterprises in the Czech Republic. Subsidies reduced economic performance and increased costs for enterprises that received them compared to those that did not.

The conclusions of A. Pisulewski & J. Marzec (2022) that the possibility of obtaining budget financing for investment projects in the dairy farming sector is a factor that determines their implementation and that the investments made have led to an improvement in the economic situation of dairy farms due to a substantial increase in their income.

In Ukraine, since the early 2020s, dairy businesses have been effectively deprived of significant amounts of state financial support. After the abolition of a fairly effective support mechanism in the form of a special VAT regime, the state has been unable to offer an adequate replacement. On the other hand, the development of Ukraine's dairy sector was hindered by external factors – the effects of the spread of COVID-19 (in 2020) and Russian military aggression in 2022 – which led to lower prices for crop products and a decline in the profitability of traditionally high-margin export-oriented crop production.

In 2022, Russian armed aggression limited the state's ability to provide budgetary support for the development of agricultural production in general and dairy farming in particular. Therewith, Ukraine is currently undergoing substantial structural changes in the dairy farming sector, with a considerable reduction in the number of small milk producers and a process of dairy farm concentration. In this context, there is a need to revise the existing instruments of financial incentives for the development of dairy farming to ensure that they are in line with the processes currently taking place in the dairy farming sector.

▸ Conclusions

Ukraine's dairy sector is undergoing substantial structural changes: the role of private households, which was key in the mid-2010s, is rapidly declining; the number of small dairy farms is decreasing; and the concentration of cows is actively taking place. In 2023, the average number of cows in agricultural enterprises that keep them will approach 300 cows (in 2015, it was one and a half times lower). Due to the rapid decline in milk production by households (expected to be only about half of the figure for the first half of the 2010s in 2023), there is an urgent need to replace it – at least in terms of supply to industrial processing – with production on highly industrialised dairy farms. This requires the implementation of a suitable state incentive policy, primarily through tax and budgetary instruments.

Ukraine has developed certain tools for budgetary support for the development of dairy farming, which has several differences from the practice of providing budgetary subsidies in the EU. As the level of budget allocations under this instrument was too low (less than 0.5% of the value of the sector's gross output), it did not have a substantial impact on the development of the dairy sector in Ukraine. The Ukrainian model of dairy development envisages further consolidation of dairy farms. This vector of development is determined by the need to meet the existing raw material needs of dairy processing and ensure the competitiveness of Ukrainian dairy products in the internal and external markets. It is necessary to create conditions for investment and loans for agricultural businesses, expand the land bank for fodder crops and farms, and introduce financial measures to support the development of dairy farming, including tax and budgetary instruments.

The scientific originality of the findings of this study lies in a comprehensive summary of the state of development of dairy farming in Ukraine with the identification of key trends, assessment of the effectiveness of the instruments used to support it through the levers of tax and budget policy and proposals for its further improvement. Areas for future research in this area should include the following issues: formation of an effective instrument of state financial support for the development of the dairy farming sector in Ukraine in the context of limited budgetary resources; stimulation of international investors' involvement in the development of the sector in the post-war economic recovery of Ukraine; resumption of active use of tax incentives for activity in the sector; promotion of the formation of dairy clusters in the territories most affected by Russian military operations.

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▸ Conflict of Interest

The authors of this study declare no conflict of interest.

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Тенденції розвитку молочного скотарства та його державної фінансової підтримки в Україні

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► **Анотація.** Значимість молочного скотарства для забезпечення продовольчої безпеки та формування доданої вартості, створюваної у сільському господарстві, зумовлює необхідність раціонального поєднання механізмів ринкового саморегулювання із інструментами державного втручання в економічні процеси в галузі. Метою дослідження була оцінка розвитку молочного скотарства в Україні та визначення способів поліпшення його державної підтримки. В ході роботи використовувалися наступні методи науково пізнання: аналізу та синтезу, індукції та дедукції, абстрактно-логічний, історичний, порівняльного аналізу, монографічний, розрахунково-конструктивний, графічний, табличний, статистичного аналізу, узагальнення, причинно-наслідкового та ретроспективного аналізу, аналітичного вирівнювання рядів динаміки, економічного моделювання та прогнозування. За результатами використання зазначених методів узагальнено сучасні тенденції розвитку молочного скотарства в Україні та його державної фінансової підтримки шляхом застосування інструментів податково-бюджетного регулювання. Розкрито специфіку наявної структури молочного скотарства в Україні, яка, на відміну від країн Європейського Союзу, представлена трьома категоріями господарюючих суб'єктів. Встановлено, що з початку 2010-х рр. в Україні відбуваються процеси концентрації діяльності у сфері молочного скотарства. Виявлено пряму залежність між величиною утримуваного поголів'я корів та рентабельністю діяльності у сфері молочного скотарства. Визначено, що підприємства, які утримують до 100 корів, поступово зменшують обсяги діяльності у секторі молочного скотарства з огляду на її нерентабельність. Здійснено оцінку змін у структурі молочних ферм в європейських країнах із середини 1990-х рр. до початку 2020-х рр. та встановлено, що їм також притаманні тенденції щодо концентрації молочного скотарства. Здійснено оцінку ефективності державної фінансової підтримки розвитку молочного скотарства в Україні за рахунок інструментів податково-бюджетного регулювання у довоєнний період та в режимі воєнного стану. Охарактеризовано переваги та недоліки застосовуваних інструментів бюджетної підтримки молочного скотарства, обґрунтовано пропозиції щодо застосування інструментарію податково-бюджетного стимулювання розвитку молочного скотарства у період повоєнного відновлення економіки України з урахуванням наявних тенденцій розвитку молочного скотарства в Україні. Практична значимість дослідження полягає у можливості використання одержаних результатів при формуванні програмних документів щодо повоєнного розвитку агропромислового комплексу України в цілому та, зокрема, його молокопродуктового підкомплексу

► **Ключові слова:** молочний сектор; державне регулювання; структура молочних ферм; податково-бюджетна політика; програми бюджетної підтримки; категорії виробників молока