

## SCENARIOS FOR INCREASING THE ECONOMIC EFFICIENCY OF DAIRY ENTERPRISES IN THE FOOD MARKET OF UKRAINE

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### Abstract

Substantiation of the strategy of increase of economic efficiency and development of effective evolution directions for dairy enterprises is crucial for fundamental improvement of their functioning, an increase of production volumes of high-quality dairy products, and strengthening of export potential of the dairy industry in general. In the current conditions of economic instability and macroeconomic challenges, new ways of successful transformation of existing business processes need to be sought. The article is devoted to researching modern realities and opportunities and forecasting scenarios for improving the efficiency of milk processing enterprises in Ukraine.

In the course of the research were used the information base of the State Statistics Service, information and analytical materials of the National Research Center Institute of Agrarian Economics on indicators of milk production. The study of modern trends in the functioning of enterprises in the dairy industry of Ukraine to substantiate prospective scenarios to increase their efficiency and profitability was carried out using the monographic method. A comparison of the actual and forecasted indicators of milk production volumes in agricultural enterprises and households and the purchase of milk by dairies, taking into account its quality, was carried out based on collected statistical and forecasted data by the method of comparative

analysis. The determination of the forecast indicators of raw material production to ensure the improvement of efficiency of dairies was carried out using the calculation-constructive method. To determine the forecast indicators of the development of the dairy industry raw materials base and substantiation of perspective parameters of purchase of dairy raw materials by processing enterprises of Ukraine till 2025, the method of extrapolation of the trend was used.

The priority direction of the development of agricultural producers and households specializing in milk production is the need to improve its quality. It is estimated that with 100% sale of high-quality milk by agricultural enterprises to dairies, their net annual income will increase by EUR 175 million. The achievement by households of the population of selling milk to milk processing plants in the ratio of the highest and the first grade of 50 : 50, or 1836.8 and 1836.8 thousand tons, respectively, will contribute to the growth of their net income to EUR 988 million per year. Under the conditions of increasing the share of milk sales by households to 30% of the total milk production, milk processing enterprises will additionally receive almost 1.1 million tons of raw materials, a 50% increase will result in 2.2 million tons, and a 70% increase will result in 3.2 million tons. A gradual increase in volume of raw milk purchases by processing enterprises during

2023 - 2025 will ensure an increase in utilization level of the production capacities of dairies by 41.1, 75.6, and 107.5%, respectively.

The justification of predictive parameters of development of the dairy industry of Ukraine differentiated in terms of producers of raw material base and production potential of milk processing enterprises makes it possible to determine reserves for maximizing its overall economic efficiency, which reflects the differences between the actual productions volumes and potential (forecasted) indicators. Regarding the practical implementation of directions for increasing efficiency of agricultural enterprises and households, aimed at improving the quality and increasing the volume of production, the strategic directions of development of milk processing enterprises will focus on ensuring full import substitution of dairy raw materials and increasing the utilization of their production capacities.

**Key words:** *Milk, quality, Implementation structure, Efficiency, Net income, Development.*

## 1. Introduction

The main task of the food market development is to solve the food problem, which is considered an important condition of social and political stability and economic independence of the state. The guarantee of food security implies an increase of the country's food resources which are of high quality, nutritious and accessible to every citizen, and an important place in the structure of which are taken by dairy products.

Substantiation of the strategy of increase of economic efficiency and development of effective evolution directions for dairy enterprises is crucial for fundamental improvement of their functioning, an increase of production volumes of high-quality dairy products, and strengthening of export potential of the dairy industry in general. In the current conditions of economic instability and macroeconomic challenges, new ways of successful transformation of existing business processes need to be sought.

The low level of purchasing power of the population of Ukraine during the period under investigation causes a gradual decrease in the level of consumption of dairy products by the domestic market. Thus, in 2021 consumption of dairy products (in recalculation to milk) per person made 201.9 kg, which is 20.9 kg less than in 2014. This encourages dairy enterprises to search for new markets for their products.

Accordingly, the export of milk and cream from 2012 to 2021 increased by 2.5 times (from 5.9 to 14.9 thousand tons), sour milk products - 1.8 times (from 3.1 to 5.5

thousand tons), and butter, which became the main export product, - 22 times (from 0.5 to 10.9 thousand tons). The export of cheeses has fallen by almost 10 times and amounted to only 6.9 thousand tons in 2021, compared to 67.7 thousand tons exported in 2012.

Regarding the import of dairy products, a steady trend of increasing the flow of raw materials for milk processing enterprises has been established. The import of milk and cream in natural volume increased by 3.8 times, and milk whey increased by 9.8 times.

The catastrophic reduction of the herd of dairy cows by 36.5% (from 2.63 to 1.67 million heads) for the period from 2010 to 2021 made natural milk a scarce commodity on the Ukrainian market. The share of milk purchased by milk processing plants from agricultural enterprises is 89.5% of the total volume of their production, however, for the households, this indicator has reached the lowest level in the past 10 years and is only 9.3%.

The low quality of milk produced in farms is due to violations of sanitary and hygienic standards, technologies for keeping, feeding, and milking cows, and requirements for milk storage. Expressed milk can be stored without cooling for no more than 30 minutes, then it must be sent for processing or cooled to prevent the reproduction of bacteria. Milk with added water, starch, flour, soda, and chalk is often delivered from households. It is difficult to check such milk from each supplier at the receiving point. It is possible to detect a counterfeit through the indicator of the freezing point of milk, but this effective method remains outside the control of the state.

Therefore, milk processing enterprises, especially those of small capacity, often receive falsified milk, which is one of the reasons for the non-compliance of the products produced from it with quality and safety requirements.

In order to improve milk quality and establish uniform requirements for safety, quality, and hygiene adapted to EU standards in the production and distribution of milk, colostrum's, and dairy products, the Ministry of Agrarian Policy and Food of Ukraine adopted the order "On Approval of Requirements for the Safety and Quality of Milk and Dairy Products" No. 118 of March 12, 2019 [24]. These requirements introduce proper production practices for producing, processing, and distributing milk and dairy products.

The order provides for establishing requirements for milk and dairy products, their production, milking equipment, and hygiene in farms that produce milk and colostrum, for milking and collection of milk, colostrum, and milk raw materials, and personnel hygiene. In addition, market operators must guarantee

the compliance of milk with the requirements of Ukrainian legislation and certain criteria for the content of microorganisms and the number of somatic cells in raw milk from cows, which will be sent for industrial processing by the food production manufacture.

The problems of milk processing enterprises regarding their comprehensive evaluation and formation of main ways of increasing efficiency of milk production were studied in the works by Velychko *et al.*, [1], V. Karpenko [2], Usykova [3], Hladiy and Prosovykh [4], and others. Current issues of the development of milk production and processing industry, as well as the reasons for ineffectiveness of state economic policy and direct state financial support of milk producers were investigated by Poperechnyi and Salamin [5].

The place of Ukraine in the world market of dairy products and problems of ensuring quality of Ukrainian dairy products were studied by Dovhal [6], Tsaruk [7], Shevchenko [8], and Kosar *et al.*, [9], who were involved in the modeling of factors affecting the dairy market in Ukraine.

Varchenko *et al.*, [10], studied the main types of risks inherent in agricultural dairy production, assessed the consequences of their increase, and substantiated the methods of their minimization and neutralization.

Separate issues of development of economic relations between the participants of the milk and milk products market of Ukraine were studied by Kryukova [11], Ishchuk and Lyakhovska [12], and V. Kolosha [13].

Among foreign scientists, Daburon *et al.*, [14], made a significant contribution to the study of the problems of increasing economic efficiency of milk processing enterprises. They conducted a comprehensive study of the problems and prospects of building an inclusive business with the participation of small milk producers in the agro-food sector of Egypt.

The study of consumer demand for organic dairy products and the construction of models of the ideal system of demand was carried out by Li *et al.*, [15]. The assessment of the ecological efficiency of dairy enterprises in the north-eastern part of the USA with the function of directed output distance, which measures the joint production of milk and emissions, devoted their research to Njuki *et al.*, [16].

Zia and Akram [17], were engaged in studies of measuring the economic efficiency of milk production and studying profitability of dairy farming in different regions of Pakistan. Atsbeha *et al.*, [18], developed a multi-component pricing scheme and milk price formation for Icelandic dairy farms, and Basagaoglu [19] devoted his

research to forecasting price parameters of milk producers in Turkey, while Paura and Arhipova [20], were engaged in researching the problems of milk pricing and forecasting the parameters of modern milk market in Latvia.

The priority direction of increasing economic efficiency of milk processing enterprises and the dairy industry of Ukraine, in general, is solving the problem of improving the quality of milk produced in agricultural enterprises, primarily in households.

The purpose of the article is to study modern realities and opportunities and forecast scenarios for improvement of efficiency of dairy enterprises in the Ukrainian food market.

## 2. Materials and Methods

The study of modern trends in the functioning of enterprises in the dairy industry of Ukraine to substantiate prospective scenarios to increase their efficiency and profitability was carried out using the monographic method. A comparison of the actual and forecasted indicators of milk production volumes in agricultural enterprises and households and the purchase of milk by dairies, taking into account its quality, was carried out based on collected statistical and forecasted data by the method of comparative analysis. The determination of the forecast indicators of raw material production to ensure the improvement of efficiency of dairies was carried out using the calculation-constructive method.

To determine the forecast indicators of the development of the dairy industry raw materials base and substantiation of perspective parameters of purchase of dairy raw materials by processing enterprises of Ukraine till 2025, the method of extrapolation of the trend was used. The research methodology can be structured as the following algorithm.

1. The forecast of theoretical milk production by agricultural enterprises was built according to the logarithmic trend by the formula:

$$y = a \ln(x) + b \quad (1)$$

Where:  $y$  is the predicted value of milk production in agricultural enterprises;  $a$  and  $b$  are constants.

2. The forecast of theoretical milk production in households was built according to the exponential trend using the formula:

$$y = ae^{bx} \quad (2)$$

Where:  $y$  - forecasted values of milk production in households;  $a$  and  $b$  are constants, and  $e$  is the base of the natural logarithm.

### 3. Justification of scenarios to improve efficiency of milk processing enterprises:

- The following formula was used to justify the forecast scenarios of the growth of the net income of agricultural enterprises from improvement of the quality of milk sold to dairies:

$$TPR = PR_{ex} + PR_{hq} + PR_{fg} \quad (3)$$

Where: TPR is the total net income of agricultural enterprises from sales, UAH million;  $PR_{ex}$  - net income from the sale of extra grade milk, UAH million;  $PR_{hq}$  - net income from the sale of high-quality milk, UAH million;  $PR_{fg}$  - net income from the sale of first-grade milk, UAH million.

- Scenario for 2023:

$$TPR_{2023} = PR_{ex2023} + PR_{hq2023} + PR_{fg2023} \quad (4)$$

$$PR_{ex2023} = MPr_{2023} * 0,45 * P_{ex2023} \quad (5)$$

$$PR_{hq2023} = MPr_{2023} * 0,40 * P_{hq2023} \quad (6)$$

$$PR_{fg2023} = MPr_{2023} * 0,15 * P_{fg2023} \quad (7)$$

- Scenario for 2024:

$$TPR_{2024} = PR_{ex2024} + PR_{hq2024} + PR_{fg2024} \quad (8)$$

$$PR_{ex2024} = MPr_{2024} * 0,5 * P_{ex2024} \quad (9)$$

$$PR_{hq2024} = MPr_{2024} * 0,45 * P_{hq2024} \quad (10)$$

$$PR_{fg2024} = MPr_{2024} * 0,05 * P_{fg2024} \quad (11)$$

- Scenario for 2025:

$$TPR_{2025} = PR_{ex2025} + PR_{hq2025} \quad (12)$$

$$PR_{ex2025} = MPr_{2025} * 0,6 * P_{ex2025} \quad (13)$$

$$PR_{hq2025} = MPr_{2025} * 0,5 * P_{hq2025} \quad (14)$$

Where:  $MPr$  is the forecast of milk production by agricultural enterprises for the period 2023 - 2025, thousand tons;  $P_{ex}$  - the price of extra grade milk, UAH/ton;  $P_{hq}$  - the price of premium milk, UAH/ton;  $P_{fg}$  - the price of first-grade milk, UAH/ton.

- The following formula was used to substantiate the forecast scenarios of growth of the net income of households from improvement of milk quality sold to dairies:

$$TPR_f = MPr_f * k (PR_{hq} + PR_{fg} + PR_{sg}) \quad (15)$$

Where: TPR<sub>f</sub> is the total net income of households from the sale of milk, UAH million;  $MPr_f$  - forecast of milk production by households for the period 2023 - 2025, thousand tons;  $k$  - the share of milk sold to milk processing enterprises from the total volume of production;  $PR_{sg}$  - net income from the sale of second-grade milk, UAH million.

- Scenario for 2023:

$$TPR_{f2023} = MPr_{f2023} * 0,3 (PR_{hq2023} + PR_{fg2023} + PR_{sg2023}) \quad (16)$$

$$PR_{hq2023} = MPr_{f2023} * 0,15 * P_{fq2023} \quad (17)$$

$$PR_{fg2023} = MPr_{f2023} * 0,8 * P_{ff2023} \quad (18)$$

$$PR_{sg2023} = MPr_{f2023} * 0,05 * P_{fs2023} \quad (19)$$

- Scenario for 2024:

$$TPR_{f2024} = MPr_{f2024} * 0,5 (PR_{hq2024} + PR_{fg2024} + PR_{sg2024}) \quad (20)$$

$$PR_{hq2024} = MPr_{f2024} * 0,25 * P_{fq2024} \quad (21)$$

$$PR_{fg2024} = MPr_{f2024} * 0,75 * P_{ff2024} \quad (22)$$

- Scenario for 2025:

$$TPR_{f2025} = MPr_{f2025} * 0,7 (PR_{hq2025} + PR_{fg2025} + PR_{sg2025}) \quad (23)$$

$$PR_{hq2025} = MPr_{f2025} * 0,5 * P_{fq2025} \quad (24)$$

$$PR_{fg2025} = MPr_{f2025} * 0,5 * P_{ff2025} \quad (25)$$

Where:  $P_{fq}$ ,  $P_{ff}$ ,  $P_{fs}$  are, respectively, the price of milk processing enterprises' purchase from the population of milk of the highest, first and second grades, UAH/ton.

## 3. Results and Discussion

Thus, in 2021, of the total volume of milk purchased by dairies from agricultural enterprises, extra milk accounted for 39.3%, and premium milk for 35.3%. That is, a third of the milk raw materials do not meet the State Standard 3662:2018 "Cow raw milk. Technical conditions" [25], which establishes requirements for milk of extra, higher, and first grades.

The milk of extra grade is not produced by households at all, and the share of the premium milk is only 0.7%. The share of first-grade milk consistently prevails (78.7%), the second-grade milk share is 19.6%, and the non-grade milk is less than 1%.

The developed scenario approach to increase efficiency of dairy enterprises is based on established forecast indicators of development of the raw material sector (according to current trends of operation and optimistic forecast) and structurally covers strategic decisions on improvement of quality and quality structure of raw milk, supplied to dairy plants by agricultural enterprises and households.

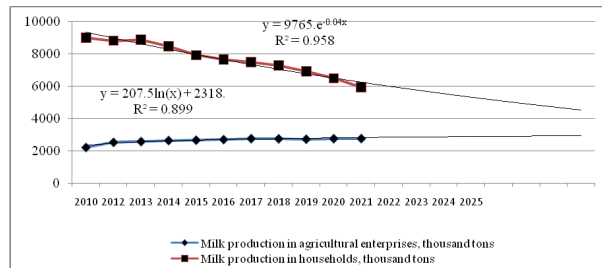
According to the trend equations with the highest approximation coefficients, the forecast indicators of the raw material base of the dairy industry of Ukraine, milk production in agricultural enterprises and households for the period up to 2025 (Table 1) were determined.

**Table 1. The result of alignment by analytical functions**

Indicator (factor)	Type of approximation	Predictive model	R <sup>2</sup>
<b>Milk production</b>			
<b>agricultural enterprises</b>	Logarithmic	$y = 246.54 \ln(x) + 2204.5$	0.9205
<b>households of the population</b>	Exponential	$y = 9843.5e^{-0.037x}$	0.9355

Source: The result of the authors' research.

Figure 1 contains visual results of alignment by analytical functions, namely, actual, theoretical and forecast indicators of milk production by agricultural enterprises and households in Ukraine.



**Figure 1. Dynamics of actual and forecast theoretical volumes of milk production in agricultural enterprises and households**

The selected forecasting models are adequate and statistically significant, so they can be used to substantiate the direction of stabilization of the dairy industry and the prospects for development of dairy processing enterprises in our country.

The first version of the efficiency improvement strategy (for 2023) provides for an increase in the sales structure the share of extra milk to 45%, premium milk to 40%, a decrease in the share of first-grade milk to 15%, and the cessation of production of second-grade milk. The implementation of this option will allow agricultural enterprises to receive an additional UAH 0.078 million (0.078 million euros) of net income per year.

The second option (for 2024) envisages an increase in the share of production and, accordingly, sale of extra grade milk to 50%, premium milk to 45%, and a decrease of the first-grade milk to 5%. The increase in the net income of agricultural enterprises is estimated at UAH 4.773 million (0.12 million euros) (from UAH 27.476 million (0.70 million euros) in 2021 to UAH 32.250 million (0.82 million euros) in the forecast period) (Table 2).

The third, most optimistic option for development of the dairy industry by 2025 assumes an achievement of 60% sale of milk by agricultural enterprises exclusively

**Table 2. Growth of the net income of agricultural enterprises from improving the quality of milk sold to dairies**

Indicators	2021	Forecast					
		2023	+/- until the fact of 2021	2024	+/- until the fact of 2021	2025	+/- until the fact of 2021
<b>Milk production, thousand tons</b>	<b>2767.7</b>	2872.1	104.4	2888.1	120.4	2903	135.3
<b>Milk sales to dairy plants</b>							
<b>Total, thousand tons, including:</b>	<b>2477.9</b>	<b>2570.5</b>	<b>92.6</b>	<b>2584.8</b>	<b>106.9</b>	<b>2599</b>	<b>121.1</b>
- extra grade milk	973.2	1156.7	183.5	1292.4	319.2	1559.4	586.2
- share, %	39.3	45	5.7	50	10.7	60	20.7
<b>Price, euros/ton</b>	<b>294.48</b>	<b>323.93</b>	<b>29.45</b>	<b>336.87</b>	<b>42.39</b>	<b>357.11</b>	<b>62.63</b>
<b>Net income from sales, million euros</b>	<b>286.58</b>	<b>374.70</b>	<b>88.12</b>	<b>435.40</b>	<b>148.81</b>	<b>556.85</b>	<b>270.26</b>
- premium milk	874.7	1028.2	154	1163.16	288	1039.6	165
- share, %	35.3	40	5	45	10	40	5
<b>Price, euros/ton</b>	<b>261.48</b>	<b>287.63</b>	<b>26.15</b>	<b>299.13</b>	<b>37.65</b>	<b>314.08</b>	<b>52.60</b>
<b>Net income from sales, million euros</b>	<b>228.70</b>	<b>295.75</b>	<b>67.02</b>	<b>347.94</b>	<b>119.21</b>	<b>326.52</b>	<b>97.81</b>
- first-grade milk	613.6	385.6	-228.0	129.2	-484.4	0	-613.6
- share, %	24.8	15	-10.4	5	-20.4	0	-24.8
<b>Price, euros/ton</b>	<b>248.91</b>	<b>273.66</b>	<b>24.85</b>	<b>273.66</b>	<b>24.85</b>		
<b>Net income from sales, million euros</b>	<b>152.73</b>	<b>105.52</b>	<b>-47.22</b>	<b>35.37</b>	<b>-117.36</b>		
- second -grade milk	15.9	0					
- share, %	0.6	0	-0.6				
<b>Price, euros/ton</b>	<b>185.42</b>	<b>185.95</b>	<b>0.53</b>				
<b>Net income from sales, million euros</b>	<b>29.48</b>	<b>0</b>	<b>-29.48</b>				
<b>Total net income from sales, million euros</b>	<b>697.51</b>	<b>775.95</b>	<b>78.44</b>	<b>818.70</b>	<b>121.17</b>	<b>883.39</b>	<b>185.88</b>

Source: Calculated according to the data of the State Statistics Service of Ukraine, 2022 [21 - 23].



of extra grade milk and 40% of higher grade milk. At the same time, their net annual income, according to the Table 2, will accordingly increase by UAH 7.322 million (0.19 million euros).

Strategic directions for improving the efficiency of household operations are based on the following assumptions. The first option is based on increasing the share of milk sold to milk processing enterprises from the total volume of production from the actual 9.3% (554 thousand tons) to 30% (1695.3 thousand tons). At the same time, the transformational shifts in the qualitative structure of milk will have the following form: the share of high-grade milk will increase from 0.2 to 15% and reach 254.3 thousand tons, and first-grade milk will remain almost unchanged at 80% but will increase in physical volume to 1356.2 thousand tons, and the second-grade milk will decrease from 19.9 to 5%, or from 108.4 to 84.8 thousand tons (Table 3).

The second option of the strategy to increase efficiency of development involves increasing the share of sold milk from the total volume of production to 50%, which exceeds 2.7 million tons. At the same time, the net income of Ukrainian households will reach UAH 25864.1 million (656.59 million euros) and will exceed the level of 2021 by 6.5 times. At the same time, under the most optimistic scenario, as a result of the increase

in product quality, households will sell 70% of the total volume of milk production to milk processing enterprises, and its quality structure will be 50% of the highest grade milk and 50% of the first grade one. Net operative income will exceed UAH 39 billion (0.99 billion euros).

Regarding the practical implementation of directions for increasing efficiency of agricultural enterprises and households, aimed at improving the quality and increasing the volume of production, the strategic directions of development of milk processing enterprises will focus on ensuring full import substitution of dairy raw materials and increasing the utilization of their production capacities.

Thus, the purchase of raw milk in 2023, according to the scenario of development of milk processing enterprises, will increase compared to 2021 by 1.2 million tons, or by 37%; in 2024 the increase is projected by 2.3 million tons, which is 76%, and in 2025 by 3.3 million tons or 2.1 times. Rejection of import purchases of milk and cream, which in 2021 amounted to 14.4 thousand tons, milk whey - 9.1 thousand tons, and during the last five years increased by 18 times, will enable milk processing enterprises to additionally receive almost UAH 700 million (17.77 million euros) annually (Table 4).

**Table 3. Growth in the net income of households from improving the quality of milk sold to dairies**

Indicators	2021	Forecast					
		2023	+/- until the fact of 2021	2024	+/- until the fact of 2021	2025	+/- until the fact of 2021
<b>Milk production, thousand tons</b>	5946.2	5650.9	-295.3	5445.6	-500.6	5247.8	-698.4
<b>Milk sales to dairy plants</b>							
<b>Total, thousand tons, including:</b>	554.0 (9.3%)	<b>1695.3</b> (30%)	<b>1141.3</b>	<b>2722.8</b> (50%)	<b>2168.8</b>	<b>3673.5</b> (70%)	<b>3119.5</b>
- premium milk	0.7	254.3	253.6	680.7	680.0	1836.8	1836.1
- share, %	0.1	15	14.8	25	24.8	50	49.8
<b>Price, euros/ton</b>	262.67	281.05	18.38	295.11	32.44	309.86	47.19
<b>Net income from sales, million euros</b>	0.18	71.47	71.29	200.88	200.70	569.14	568.96
- first-grade milk	435.8	1356.2	920.4	2042.1	1606.3	1836.8	1401.0
- share, %	78.7	80	1.3	75	-3.7	50	-28.7
<b>Price, euros/ton</b>	200.50	210.53	10.02	223.14	22.66	236.55	36.05
<b>Net income from sales, million euros</b>	87.38	285.52	198.14	455.71	368.33	434.48	66.15
- second -grade milk	108.4	84.8	-23.6				
- share, %	19.6	5	-14.6	0	-19.9		
<b>Price, euro/ton</b>	128.83	136.58	7.74				
<b>Net income from sales, million euros</b>	13.96	11.58	-2.39				
<b>Total net income from sales, million euros</b>	<b>101.52</b>	<b>368.58</b>	<b>267.04</b>	<b>656.59</b>	<b>555.07</b>	<b>1003.62</b>	<b>902.10</b>

Source: Calculated according to the data of the State Statistics Service of Ukraine, 2022 [21 - 23].

**Table 4. Scenarios for development of milk processing enterprises as a result of quality improvement, production expansion and import substitution**

Indicators	2021	Forecast					
		2023	+/- until the fact of 2021	2024	+/- until the fact of 2021	2025	+/- until the fact of 2021
<b>Import of milk and cream, thousand tons</b>	14.4	-	-14.4	-	-14.4	-	-14.4
<b>Price, USD/ton</b>	928.9						
<b>Price, UAH/ton (euros)</b>	25545 (648.49)						
<b>Total cost, UAH million (euros)</b>	367.8 (9.34)	-	-367.8 (-9.34)	-	-367.8 (-9.34)	-	-367.8 (-9.34)
<b>Import of whey, thousand tons</b>	9.1	-	-9.1	-	-9.1	-	-9.1
<b>Price, USD/ton</b>	1284,9						
<b>Price, UAH/ton (euros)</b>	35334 (896.99)						
<b>Total cost, UAH million (euros)</b>	339.2 (8.61)	-	-339.2 (-8.61)	-	-339.2 (-8.61)	-	-339.2 (-8.61)
<b>Purchase of milk, thousand tons</b>							
- extra grade milk	973.2	1156.7	183.5	1292.4	319.2	1559.4	586.2
- premium milk	875.4	1282.5	407.1	1843.86	968.46	2876.4	2001
- first-grade milk	1049.4	1741.78	692.38	2171.34	1121.94	1836.8	787.4
- second-grade milk	124.3	84.8	-39.5	0	-124.3	0	-124.3
<b>Total</b>	3022.3	4265.8	1243.5	5307.6	2285.3	6272.6	3250.3
<b>Increase in workload of milk processing enterprises, %</b>	100.0		+41.1		+75.6		107.5
<b>The cost of raw materials purchasing, UAH million (euros)</b>	32182 (816.98)	45792 (1162.48)	13610 (345.51)	58821 (1493.24)	26639 (676.26)	75039 (1904.95)	42857 (1087.97)
<b>The cost of purchasing raw materials under the conditions of import substitution, UAH million (euros)</b>	31475 (799.03)	45085 (1144.53)	13610 (345.51)	58114 (1475.29)	26639 (676.26)	74332 (1887)	42857 (1087.97)

Source: The result of the authors' research.

The justification of predictive parameters of development of the dairy industry of Ukraine differentiated in terms of producers of raw material base and production potential of milk processing enterprises makes it possible to determine reserves for maximizing its overall economic efficiency, which reflects the differences between the actual productions volumes and potential (forecasted) indicators.

#### 4. Conclusions

- Established changes in the production structure of dairies and an increase in the share of import dependence on the dairy market require evolution of promising directions for development of dairy enterprises. For agricultural producers, the priority direction of development is to improve the quality of raw milk. Thus, with the sale of 45% of extra grade milk,

40% of higher grade milk, and 15% of first-grade milk, agricultural enterprises will additionally receive UAH 3.090 million (0.078 million euros) in net income per year. With a ratio of 50% of extra grade, 45% of higher grade, and 5% of first grade, the increase in net income will be UAH 4.773 million (0.12 million euros) per year. With 100% sale of high-quality milk, net annual income will increase by UAH 7 billion (0.18 billion euros).

- The sale of milk by households in the ratio of the highest and first grade of 15 : 80 is 254.3 and 1,356 thousand tons, respectively, or UAH 14519 million (368.58 million euros) million of net income. If the ratio of milk sales for processing is 25:75, or 680.7 and 2042.1 thousand tons, respectively, households will receive UAH 25.864 (0.66 euros) million in net income, and the ratio is 50 : 50, or 1836.8 and 1836.8 thousand tons accordingly, the net income from sales will increase to UAH 39.534 million (1 million euros) per year.

- If the share of milk sales by households increases to 30%, milk processing enterprises will receive almost 1.7 million tons of raw materials, in the case of increase to 50% they will receive 2.7 million tons, and at the mark of 70% they will get 3.7 million tons.

- A gradual increase in the volume of raw milk purchases by processing enterprises in 2025 compared to 2021 by 1.2 million tons, 2.3 and 3.3 million tons will ensure an increase in the utilization level of the production capacities of dairies by 41.1, 75.6 and 107.5% respectively. Rejection of the import supply of milk and cream will enable milk processing enterprises to receive almost UAH 700 million (17.77 million euros) annually.

## 5. References

- [1] Velychko A. Y., Kukharuk R. M., Maslova I. V., Rukhlyakova M. V. (2021). *Status and prospects of development of the market of milk and dairy products in Ukraine* (in Ukrainian). *Ahrosvit*, 16, pp. 62-68.
- [2] Karpenko V. L. (2020). *Analysis of the state of development of the dairy industry of Ukraine* (in Ukrainian). *Bulletin of the Khmelnytskyi National University*, 5, pp. 90-100.
- [3] Usykova O. M. (2019). *The concept of competitive strategic choice and analysis of the development of milk processing enterprises of Ukraine*. *Eastern Europe: Economics, Business and Management*, 2, (19), pp. 198-204.
- [4] Hladiy M. R., Prosovykh O. (2022). *The current state and prospects for the development of the dairy industry of Ukraine* (in Ukrainian). *Bulletin of the Lviv Polytechnic National University. Series "Problems of Economics and Management"*, 2, (10), pp. 20-31.
- [5] Poperechnyi S., Salamin O. (2022). *Current problems and perspectives of the development of the milk market* (in Ukrainian). *Economy and society*, (37). <URL:<a href="https://doi.org/10.32782/2524-0072/2022-37-32">https://doi.org/10.32782/2524-0072/2022-37-32. Accessed 18 June 2022.</a>
- [6] Dovhal O. V. (2020). *The place of Ukraine in the world market of dairy products* (in Ukrainian). *Bulletin of the Khmelnytskyi National University. Series: "Economic Sciences"*, 6, pp. 243-249.
- [7] Tsaruk D. S. (2020). *Analysis of the external environment of functioning of enterprises in the dairy processing industry of Ukraine* (in Ukrainian). *Economic space*, (156), pp. 98-103.
- [8] Shevchenko A. V., Tabachuk N. O. (2019). *The current state of the dairy market and ensuring its quality in the context of Ukraine's European integration* (in Ukrainian). *Scientific Bulletin of the Uzhhorod National University. Series: International Economic Relations and World Economy*, 27, (2), pp. 101-107.
- [9] Kosar N., Kuzo N., Binda J., Hayvanovych N., Pytulyak N. (2022). *Modeling of the factors influencing the dairy market in Ukraine* (in Ukrainian). *Agricultural and Resource Economics: International Scientific E-Journal*, 8, (3), pp. 42-59.
- [10] Varchenko O., Radko V., Rudykh O., Svyynous I., Tkachenko K. (2019). *Risks of dairy farming in Ukraine and ways of their minimization and neutralization*. *Agricultural Science and Practice*, 6, (1), pp. 41-59.
- [11] Kryukova I. O. (2020). *The system of economic relations between the participants of the milk and milk products market of Ukraine* (in Ukrainian). *Ukrainian Journal of Applied Economics*, 5, (3), pp. 8-16.
- [12] Ishchuk S. O., Lyakhovska O. V. (2020). *Development of milk processing industries in the regions of Ukraine: Raw material aspect* (in Ukrainian). *Regional Economy*, 1, pp. 42-51.
- [13] Kolosha V. P. (2019). *Some aspects of assessing the level of efficiency of intensification in milk production* (in Ukrainian). *Actual Problems of Innovative Economy*, 4, pp. 63-69.
- [14] Daburon A., Alary V., Ali A., Osman A. M., Abdelsabour H. T., Tourrand F. J. (2021). *Toward territorialized dairy inclusive businesses: Insights from an Egyptian case study: Making dairy businesses inclusive*. *Development in Practice*. DOI:10.1080/09614524.2021.1937535. Accessed 18 June 2022.
- [15] Li X., Peterson H. H., and Xia T. (2018). *Demand for Organic Fluid Milk across Marketing Channels*. *Agricultural and Resource Economics Review*, 47, (3), pp. 505-532.
- [16] Njuki E., Bravo-Ureta B. E., and Mukherjee, D. (2016). *The Good and the Bad: Environmental Efficiency in Northeastern U.S. Dairy Farming*. *Agricultural and Resource Economics Review*, 45, (1), pp. 22-43.
- [17] Zia K., Akram W. (2020). *Economic efficiency and profitability analysis of milk production in district Sargodha*. *Applied Economic Review*, 1, (2), pp. 90-125.
- [18] Atsbeha D., Kristofersson D., Rickertsen K. (2016). *Component supply responses in dairy production*. *European Review of Agricultural Economics*, 43, (2), pp. 193-215.
- [19] Basagaoglu F. (2020). *Milk price predicting with holt winters and ordinary least squares*. *Scientific Papers Series Management Economic Engineering in Agriculture and Rural Development*, 20, (4), pp. 105-110.
- [20] Paura L., Arhipova I. (2016). *Analysis of the milk production and milk price in Latvia*. *Procedia Economics and Finance*, 39, pp. 39-43.
- [21] State Statistics Service of Ukraine. (2022). *Animal husbandry of Ukraine. Statistical collection* (in Ukrainian). <URL:<a href="http://www.ukrstat.gov.ua">http://www.ukrstat.gov.ua. Accessed 18 June 2022.</a>
- [22] State Statistics Service of Ukraine. (2022). *Balance of milk and milk products* (in Ukrainian). <URL:<a href="http://www.ukrstat.gov.ua">http://www.ukrstat.gov.ua. Accessed 18 June 2022.</a>
- [23] State Statistics Service of Ukraine (2022). *Supply of milk to processing enterprises* (in Ukrainian). <URL:<a href="http://www.ukrstat.gov.ua">http://www.ukrstat.gov.ua. Accessed 18 June 2022.</a>
- [24] Ministry of Agrarian Policy and Food of Ukraine. (2019). *On Approval of Requirements for the Safety and Quality of Milk and Dairy Products* (in Ukrainian). Order 118.
- [25] State Standard of Ukraine. (2019). *DSTU 3662:2018 Cow's raw milk. Specifications* (in Ukrainian). Order 188.