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## **Policy Analysis Matrix: An analysis of the effectiveness of state agricultural policy for the dairy sector in Ukraine**

**Abstract.** Dairy production in Ukraine, as well as worldwide, is an important sector of the economy which ensures the food security of the country. The Ukrainian dairy sector has many unsolved systematic problems, foremost of which is the decrease in cow productivity and the number of cows. This directly influences the decrease of total milk production, and, as a result, a deficit on the food market. Today, the Ukrainian government has to focus on improving dairy sector support in order to ensure its effectiveness in the future.

PAM-analysis was used to evaluate the effectiveness of state agricultural policy in the dairy sector. Research results show that the production system of Ukraine can ensure profitable milk production in private and social prices. But, while dairy producers benefit from cheap internal resources, state policy in the dairy sector impacts profitability of milk production by production trade factors.

**Key words:** dairy sector, agricultural policy, protection, effectiveness, state regulation, PAM, Ukraine.

### **Introduction**

According to the example of developed countries, effectiveness of milk and dairy production as well as development of the dairy market under modern conditions of the agricultural sector depends on the effectiveness of state agricultural policy. State policy influences many areas: farm profitability; production volume and structure; inter-branch and inter-farm relationships aiming to create stable economic, legal, social and ecological conditions for the development of the dairy sub-sector; meeting population needs in food products; increase of dairy sector's export potential and expansion of the export geography through different parts of the world.

Ukrainian agriculture and the dairy sector in particular, is one of the most regulated sectors of the Ukrainian economy. But often, the state policy has a conflicting character and doesn't bring expected results. Today, the main task of state agricultural policy is to improve financial indicators of milk production. The aim of the research presented here is to evaluate the impact of state agricultural policy on the development of dairy production in Ukraine.

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## Dairy sector in Ukraine

During the last ten years, the dairy sector of Ukraine has faced a constant decrease of milk production primarily due to a decrease in the number of cows. Domestic agricultural enterprises often change their milk production orientation to milk-and-meat specialization, thus decreasing the number of milking cows. At the same time, milk production concentrates in private households with no sanitary and hygienic control and the raw material produced is often of doubtful quality. During many years private households remain the main milk producers with 79,7 % of general production in 2011, while in 1990, agricultural enterprises produced 76% of milk.

Another aspect of the problem is low cow productivity in Ukraine which is twice lower than in developed countries. Average milk production per cow in Ukraine is 3,5-4,5 thousand kilos/year while worldwide it is 6-9 thousand kilos/year. It is important to mention that positive dynamics are present in average yearly milk production, which can be explained by a decrease in the number of low-production animals.

Table 1. General indicators of milk production in Ukraine

Indicators	Years						Deviation 2011 to 2010, %
	1990	1995	2000	2005	2010	2011	
Milk production total, thousand tons:	24508	17274	12657	13714	11248	11085	98,5
including agricultural enterprises	18634	9443	3669	2582	2216	2246	101,3
including private households	5874	7831	8988	11132	9032	8839	97,8
Number of cows, thousands heads:	8378	7531	4958	3635	2631	2582	98,1
including agricultural enterprises	6195	4595	1851	866	589	584	99,1
including private households	2186	2963	3107	2769	2042	1998	97,8
Average milk production per cow, kg:	2863	2204	2359	3487	4082	4147	101,6
including agricultural enterprises	2941	1908	1588	2952	3975	4109	103,4
including private households	2637	2722	2960	3643	4110	4191	101,9

Source: own calculations by the State Statistics Service of Ukraine.

Constant yearly decreases of milk production have caused a deficit of dairy raw material (including available export markets). As a result, high competitiveness on the market influences purchasing prices. Between 2000 and 2005, milk purchasing price increased by 70%, and between 2006 and 2011 prices tripled, thus sometimes being higher than European prices.

Production cost is another important element in the production efficiency of agricultural enterprises. According to official statistics, forage costs and labor costs dominate the general structure of milk production costs – 45,5-47,5% and 18-21% respectively. Thus, between 2006 and 2011 the above-mentioned costs grew 2,3 and 3,1 times respectively, which resulted in an increase of the milk production cost by 2,5 times.

But, despite decrease of milk production volumes, its profitability in agricultural enterprises increased by 3,4 % in 2011 when compared to 2010, and by 119 % when compared to the crisis in 2006. Such results are explained by increase of purchasing prices

and state agricultural policy. During a few years the governmental program for dairy sector support was very unstable and changed several times, which restrained sector development.

The government program includes: financial and credit mechanism of regulation (preferential loans, leasing support, credit interest rates subsidizing), tax mechanism of regulation (fixed agricultural tax and special VAT mechanism), price mechanism of regulation (intervention purchases, setting the minimum purchase price), support of insurance, governmental support for the dairy industry through appropriate programs ("Revival of cattle", State Program for Rural Development for the period by 2015) etc.

The main reasons of such instability are: imperfect state management in the dairy sector, ineffective financial and credit policy for the agricultural sector, absence or complicated access to cheap financing, use of old technologies and production means due to absence of financial resources.

In order to improve the actual situation, the Ukrainian government must: determine all advantages and disadvantages of its regulation policy; analyze level and mechanisms of state support for milk production which will afterwards allow evaluation of perspectives for the domestic dairy sector on the international market.

Improvement of the state support policy in milk production remains one of the most important and strategic priorities for the Ukrainian government.

## **Material and methods**

The agricultural sector is very often a target of state regulations. Government usually pursues different objectives: increase in production, securing of farm income, supplying of the population with cheap foodstuff, etc. Besides, in our opinion, present state agricultural policy should be aimed at supporting milk producers, the formation of regulatory policy to provide a stable income for dairy producers, fair and rational allocation of available resources and supporting enterprises that really need help.

Most European countries have a wide system of agricultural policies which affect agricultural production. The impact of a single policy on the profitability of production could be either positive or negative.

We suggested use of the The Policy Analysis Matrix (PAM, developed by Monke and Pearson in 1989) used as an instrument of analysis for the entire production system. This matrix will help analyze effectiveness of agriculture sector regulation and the role of the state in this regulation. State policy effects are evaluated while observing profit change of agricultural producers [Monke and Pearson 1989].

The main idea of the PAM is the comparison of private and social prices for inputs used in production and also for the produced goods. Private prices are prices observed in a current situation, while social prices conform to the situation without any intervention of the government or market distortions [Yao 1997].

In practice, PAM, presented in Table 2, contains costs and revenues in private and social prices. Total production costs are separated to tradable inputs and domestic factors to produce one unit of output. Tradable inputs are goods traded internationally. Domestic factors refer to land, labour and capital. The prices of domestic inputs are mainly determined by local markets. In contrary, prices of tradable inputs are determined by international markets.

Table 2. Structure of the Policy Analysis Matrix (PAM)

	Revenues	Costs		Profits
		Tradable inputs	Domestic factors	
Private price	A	B	C	D=A-B-C
Social price	E	F	G	H=E-F-G
Effects of divergences and efficient policy	I=A-E	J=B-F	K=C-G	L=G-H=I-J-K
Profitability coefficient (PC)	PC = D/H			
Domestic cost ratio (DRC)	DRC = G/(E-F)			
Private cost ratio (PCR)	PCR = C/(A-B)			
Social cost benefit ratio (SCBR)	SCBR = (F+G)/E			
Nominal protection coefficient (NPC)	NPR = A/E			
Effective protection coefficient (EPC)	EPR = (A-B)/(E-F)			

where is: (A) revenue based on private price, (E) revenue based on social price, (I) output transfers, (B) tradable input cost based on private price, (F) tradable input cost based on social price, (J) input transfers, (C) domestic input cost based on market price, (G) domestic input cost based on social price, (K) factor transfers, (D) private profits, (H) social profits, (L) net transfers.

Source: [Monke and Pearson 1989].

The structure of the PAM allows a double calculation in the table.

On the first line of the PAM is the calculation of private profitability (D), defined revenue (A) minus total costs (B+C). Where, B and C are tradable and domestic inputs, respectively. In other words, the first line of the PAM contains the value for the accounting identity measured at private prices, which is the price actually used by different agents to purchase their inputs and sell their outputs.

The second line of the PAM calculates the social profit which reflects social opportunity costs. Social profits measure efficiency and comparative advantage. Social profitability (H) measures revenue valued at social prices less value of tradable and domestic input both valued at social price.

The third line of the matrix represents transfers that come into changes in government policy.

The differences between revenues, costs and profits in private and social prices can be both negative and positive. A negative output transfers (I<0) or positive input (J>0) and factor transfers (K>0) means worsening of the situation in a sector through state policies. Transfers by costs and revenues can equilibrate each other. Net transfers (L) show an impact of government influence on a farm income [Ramanovich 2005].

A few additional indices can be calculated from the PAM. The most used are:

- The *Profitability coefficient* (PC) shows the impact of all transfers on profitability. The index is calculated as a ratio of private profit to social profit.

- The *Domestic cost ratio* (DRC) measures the efficiency of utilisation of domestic factors in the analyses of production systems. The DRC is widely used as an indicator of competitiveness. The index calculated is a ratio of social costs for domestic factors to their value added. If the DRC<1, the production in a country is competitive. If the DRC>1 it signifies that the country has a disadvantage in production of the analysed goods.

- The *Private cost ratio* (PCR) is almost identical to the DRC. The difference is that for the PCR the values in private prices are used.

- An alternative for DRC in measuring comparative advantage is *Social cost benefit ratio* (SCBR). The SCBR is defined by the ratio of total resources cost to the revenue. The SCBR provides more accurate rankings of the comparative advantage of alternative activities. In this study only one activity is investigated. So, the result of DRC is similar to using SCBR.

- The *Nominal protection coefficient* (NPC), which is defined by the ratio of domestic price to the social price can be calculated for both output and input. NPC greater than 1 indicates implicit nominal protection or subsidy by producers, and implicit nominal tax, when NPC is less than 1.

- The *Effective protection coefficient* (EPC) another coefficient of incentives, is the ratio of value added in private prices to value added in social prices. This coefficient measures the degree of policy transfer from product market-output and tradable-input-policies. EPC value greater than 1 indicates positive protection of value added by producers, while effective taxation of value added by producers is indicated when EPC is less than 1.

## Results

To investigate the influence of policy on the Ukraine dairy sector, milk production at the level of agricultural enterprises was analyzed. For the calculation of social prices of inputs and outputs, world prices were used. The world prices are adjusted for transportation and other costs. For importing inputs, social prices are calculated by adding marketing costs by CIF prices. In addition, FOB export prices are used for exportable inputs. The major outcomes of the analysis are presented on Table 3.

Table 3. Results of the PAM-analysis for dairy production enterprises

	Revenues, UAN/t	Costs, UAN/t		Profits, UAN/t
		Tradable inputs	Domestic factors	
Private price	2735	656,65	1586,75	491
Social price	3309	786,17	1620,23	903
Effects of divergences and efficient policy	-574	-33,48	-129,55	-411
PC	0,54			
DRC	0,64			
PCR	0,76			
SCBR	0,73			
NPR	0,83			
EPR	0,82			

Source: own calculations by the State Statistics Service of Ukraine.

In the given PAM structure, calculation of the difference between revenues and expenses in private prices shows that, on average, dairy enterprises gained 491 UAH/t of profit in milk production. However, the difference between private and social prices means that domestic enterprises, functioning in the conditions of the existing market and state policy, receive on 411 UAH/t less of profit. In the other words, social revenue of 903 UAH/t of milk is an indicator of efficiency and competitiveness advantages, and the difference between private and social revenue reflects net transfers (incomings) resulting from the change of the state policy.

In general, results of the PAM-analysis show both positive and negative impact of the existing policy on the market situation. On the one hand, milk producers in Ukraine benefit from cheap internal resources. Currently, expenses on the internal production factors are 1586,75 UAH/t, which is lower than the level of social prices (1620,23 UAH/t). The same situation is observed with tradable production factors, but it is important to mention that the current imperfect economic system makes tradable resource costs more expensive. However, analysis results are also influenced by state policy which partially compensates costs related to herd renovation – compensation of 50 % of the cost of purchased cows and heifers. Currently, tradable resource costs paid by milk producers are of 656,65 UAH/t, in social prices – 786,17 UAH/t.

Also, the price policy in enterprises caused a decrease of the agricultural revenues from 3309 to 2735 UAH/t. In general, the production system in Ukraine allows profitable milk production in private and social prices. However, due to governmental policy regarding market production factors in then dairy sector, the profit from milk production decreased by 46 % (PC = 54).

DRC (0,64) and PCR (0,76) demonstrate active exploitation of internal resources in milk production. In both cases (in current situation as well as in case of social prices), milk production in Ukraine can be considered competitive. Nevertheless, approximation of the given indicators to 1 means a decrease of competitive advantages in the dairy sector.

The SCBR indicator is another competitiveness indicator, as it is more sensitive to errors and helps determine whether production is really competitive and creates net social revenue for the country. Thus, SCB for Ukrainian milk producers is 0,73, which means that domestic milk producers in Ukraine are competitive. In other words, their expenses on 1 ton of produced milk are 73% of revenue.

NPC (0,83) is another important indicator, which shows the effectiveness of state regulation and level of support of the Ukrainian milk market. Its value testifies to the invisible nominal tax for producers. The value of the EPR (0,82) indicator confirms the imperfectness of the support system for milk producers and the presence of invisible taxation of the added value, which creates additional barriers for domestic products when entering the world market.

## **Conclusions**

Analysis of the internal support of Ukrainian milk producers was performed on the basis of the conducted calculations. Obtained results affirm that the internal support mechanism of the Ukrainian dairy sector needs to be improved and partly changed. The current mechanism of dairy sector state support doesn't favor an increase in the sector's efficiency. Absence of support on entering international markets and immoderate taxation

weakens the competitive positions of domestic dairy products. In our opinion, in order to determine the qualitative level of state support of the dairy sector, it is necessary to review governmental policy regarding accessibility of production resources needed in milk production, making them less expensive and accessible for producers. Such measures will favor milk production cost decreases, and as a final result – improvement of efficiency.

## References

- Monke E., Pearson S. [1989]: Policy analysis matrix for agricultural development, Cornell University Press, Ithaca, NY.
- Morris M. [1990]: Determining Comparative Advantage through DRC Analysis: Guidelines Emerging from CIMMYT's Experience. CIMMYT Economics Paper No. 1. Mexico City, Mexico.
- Nelson G., Panggabean M. [1991]: The Costs of Indonesian Sugar Policy: A Policy Analysis Matrix Approach. *American Journal of Agricultural Economics* 73, p. 704-712.
- Ramanovich M. [2005]: Policy Analysis Matrix: an analysis of dairy sector in Belarus, IFCN Dairy research center, Kiel, Germany.
- State Statistics Service of Ukraine [2011]: Statistical yearbook of Ukraine, Kiev [Available at]: <http://www.ukrstat.gov.ua>
- Yao, S. [1997]: Comparative Advantage and Crop Diversification: A Policy Analysis Matrix for Thai Agriculture, *J. Agri. Econ.*, 48, p. 211-222.