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## ENVIRONMENTAL PROTECTION COST AND MILK PROCUREMENT COST DIFFERENTIAL FOR POLAND'S DAIRY COOPERATIVES

*The objective was a description of environmental protection cost differentials for Poland's dairy cooperatives taking into account costs of milk procurement. The authors have concluded that the average dairy cooperative in Poland is experiencing rising costs for environment protection inferring that the significance of these expenditures is also growing. The study includes the years 2004-2010 and material consists of information obtained from the questionnaire interview and secondary sources. Analyzing the relationship of these costs for the full period of the study, it was evident that environment protection expenditures in relation to milk procurement more than doubled for the cooperatives studied – from 0.67 to 1.51%. This suggests that expenditures pertaining to compliance with environmental regulations are important and undertaken projects serve to neutralize pollution or prevent its occurrence.*

**Key words:** *environmental protection cost, costs of milk procurement, dairy cooperatives.*

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## ДИФЕРЕНЦІАЦІЯ ВИТРАТ МОЛОЧНИХ КООПЕРАТИВІВ ПОЛЬЩІ НА ОХОРОНУ НАВКОЛИШНЬОГО СЕРЕДОВИЩА ТА ЗАКУПІВЛЮ МОЛОКА

*Мета статті полягає у дослідженні диференціації витрат молочних кооперативів Польщі на охорону навколишнього середовища у співвідношенні із витратами на закупівлю молока. Було встановлено, що у середньостатистичному молочному кооперативі в Польщі відбувається зростання витрат на охорону навколишнього середовища, що означає відповідне зростання їх значимості. Період дослідження охоплює 2004–2010 роки та включає інформацію, отриману з інтерв'ю і вторинних ресурсів. Проведений аналіз показав, що впродовж зазначеного періоду частка витрат на охорону навколишнього середовища у витратах на закупівлю молока досліджуваних кооперативів зростає більше, ніж удвічі, – від 0,67 до 1,51%. Це означає важливість витрат, пов'язаних із дотриманням екологічних норм і доводить те, що прийняті проекти забезпечують нейтралізацію забруднення чи запобігають його здійсненню.*

**Ключові слова:** *витрати на охорону навколишнього середовища, витрати на закупівлю молока, молочні кооперативи.*

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## ДИФФЕРЕНЦИАЦИЯ ЗАТРАТ МОЛОЧНЫХ КООПЕРАТИВОВ ПОЛЬШИ НА ОХРАНУ ОКРУЖАЮЩЕЙ СРЕДЫ И ЗАКУПКУ МОЛОКА

*Цель статьи состоит в исследовании дифференциации расходов молочных кооперативов Польши на охрану окружающей среды в соотношении с затратами на закупку молока. Было установлено, что в среднестатистическом молочном кооперативе в Польше отмечается рост расходов на охрану окружающей среды, что означает*

соответствующий рост их значимости. Период исследования охватывает 2004–2010 годы и содержит информацию, полученную из интервью и вторичных ресурсов. Проведенный анализ показал, что в течение указанного периода доля расходов на охрану окружающей среды в расходах на закупку молока исследуемых кооперативов выросла более чем вдвое, – от 0,67 до 1,51%. Это означает важность расходов, связанных с соблюдением экологических норм, и доказывает то, что принятые проекты обеспечивают нейтрализацию загрязнения или предотвращают его осуществление.

**Ключевые слова:** расходы на охрану окружающей среды, расходы на закупку молока, молочные кооперативы.

### Introduction

Generally, food processing is a melding of multiple technologies which requires utilizing environmental resources and discharging various substances into the air, water and soil as a result of various, individual and complicated mechanical functions. Therefore, whenever its further development is considered, negative environmental impact minimization is a prime concern. Using raw materials of plant or animal origin, food processors – dairies included – become important participants regarding environmental changes» [10, 25]. It is worthwhile to remember that a specific characteristic of dairy production is its dependence on environmental quality for its commodity (milk) and its products i.e. environmental protection is not only a responsibility of the dairy industry, it is its lifeblood [16]. Poland's dairy industry has been adjusting for several years – conforming to hygienic and veterinarian standards, processes pertaining to animal welfare, environmental protection – to regulations of the European Union [7, pp. 77-87]. There are a multitude of possibilities for dairy plants to improve the environment; however those choices are dependent on financial resources, chosen environmental policy, production capability, and also type of production. Even though environmental protection is seen as an essential goal in modern industry, pro-environment activity is still seen as a liability; the main obstacle being high financial investiture [9, p.78].

Conversely, the dairy farmer views milk production from the perspective of relatively stable prices, potential income and regular payment throughout the year [20]. The profitability of milk production is dependent of several variables such as herd size, production capability and type (extensive/intensive), dairy cattle yield, or wholesale milk prices [13]. The price of milk is tied to its quality, and quality is a determining factor regarding the profitability of milk production. Looking at the comprehensive costs scheme for dairy products, the commodity (milk) incurs between 40 and 75% of costs for dairy production [12].

### Materials and Research Methodology

This study is a partial effect of research funded by Poland's Ministry of Science and Higher Education under Project No. NN112204539. The objective was a description of environmental protection cost differentials for Poland's dairy cooperatives taking into account costs of milk procurement. For establishing general costs of environmental protection, the following categories were accepted:

- cooperative payments for air pollution emissions,
- cooperative payments for exceeding norms for air pollution emissions,
- cooperative payments for exceeding norms for noise emissions,
- expenditures for environmental protection investments,
- costs of solid waste management,
- costs of liquid waste discharge,
- costs for schooling employees in environmental protection,
- costs for schooling dairy farmers and shippers in environmental protection.

The study includes the years 2004-2010, and pertains to Poland's operating dairy cooperatives as of January 1, 2004 i.e. 214 cooperatives; however, 50 of those cooperatives were undergoing fusions with other cooperatives or other significant organizational changes, thus were excluded from the study. The remaining 164 dairies (76.64%) were listed according to their rising total assets value and every fourth cooperative (beginning with position 2) were chosen for study. Forty cooperatives were included in the study list; however, only 32 cooperative were able to provide complete and reliable data. Thus the study focused on 32 cooperative dairies which functioned uninterruptedly throughout the study period, constituting 19.51% of total cooperative dairies in Poland as of the end of 2005.

In the individual years of the study period, the total number of functioning cooperative dairies in Poland fluctuated and the study group constituted approximately 20% of functioning dairies of this type. As a result of the study's construct, the cooperative dairies in the study group were grouped in quartiles based on the volume of raw milk procurement. Three quartiles were generated: I – cooperative dairies of lowest procurement (25%); II – cooperative dairies of average (medium) procurement (50%); and III – cooperative dairies of highest procurement (25%).

Table 1  
*Limit values for each quartile separated due to the purchase of milk [million liters]  
in the surveyed cooperatives in years 2004-2010*

| Quartiles | Year |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|           | 2004 |      | 2005 |      | 2006 |      | 2007 |      | 2008 |      | 2009 |      | 2010 |      |
|           | from | to   | from | to   | from | To   | From | to   | from | to   | from | to   | from | to   |
| I         |      | 22.2 |      | 11.4 |      | 24.7 |      | 19.2 |      | 25.1 |      | 18.8 |      | 16.9 |
| II        | 22.3 | 64.9 | 11.5 | 52.0 | 24.8 | 64.7 | 19.3 | 64.0 | 25.2 | 64.8 | 18.9 | 54.4 | 17.0 | 53.1 |
| III       | 65.0 |      | 52.1 |      | 64.8 |      | 64.1 |      | 64.9 |      | 54.5 |      | 53.2 |      |

Source: own research.

One of the more important line items for dairy cooperatives is milk procurement understood as the product of the purchased volume and average wholesale price increased by transportation costs to a dairy. Table 2 presents this data for this expressed as percentages, reflecting the classes of cooperative dairies based on procurement volume.

The relationship of incurred environmental protection costs and milk procurement for small and medium dairies was lowest in 2005 – 0.42% and 0.43%, respectively. For dairies of highest consumption, the indicator value was lowest in 2008 (0.41%).

Furthermore, relationship studies comparing environment protection costs and milk procurement for first and last years of the study indicate that cooperatives of Quartiles I and III saw falling indicators. The opposite was found for cooperatives of medium milk volume procurement; in 2004 the relation indicator was 0.62% but in 2010, it rose to 5.67%. It appears that even after EU accession, these cooperatives were not overly concerned with environment protection; some in fact simply ignored it.

Table 2  
*The Relationship of Environment Protection Costs (%) in Relation to Milk Procurement (100%)  
in Considered Cooperatives per Quartile for the Years 2004-2010*

| Year | Quartile |      |      | Total |
|------|----------|------|------|-------|
|      | I        | II   | III  |       |
| 2004 | 1.14     | 0.62 | 0.67 | 0.67  |
| 2005 | 0.42     | 0.43 | 0.83 | 0.74  |
| 2006 | 0.89     | 4.94 | 0.57 | 1.35  |
| 2007 | 1.22     | 2.45 | 0.57 | 0.99  |
| 2008 | 0.77     | 3.25 | 0.41 | 0.87  |
| 2009 | 1.01     | 4.33 | 0.62 | 1.35  |
| 2010 | 0.92     | 5.67 | 0.55 | 1.51  |

Source: own research.

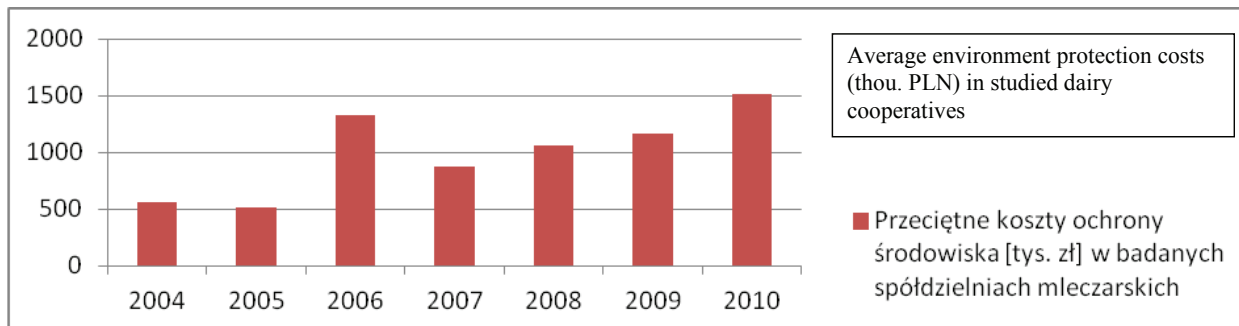
Yet accession to the European Union carried with it adapting to new legal requirements and financial restrictions forcing compliance which, in turn generated rising expenditures for environment protection in the years 2006-2010. The significant rise in expenditure indirectly confirms that it is best to expeditiously initiate changes to earlier known requirements rather than ignore them, since those requirements may prove to be costlier later on. Furthermore, market share may suffer because of competition from better prepared and more efficient entities. Analyzing the relationship of these costs for the full period of the study (see Table 3), it was evident that environment protection expenditures in relation to milk procurement more than doubled for the cooperatives studied –from 0.67 to 1.51%.

Table 3  
*The Relationship of Environment Protection Expenditures (%) in Relation to Milk Procurement (100%)  
in Studied Cooperatives, 2004-2010*

|   | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|------|------|------|------|------|------|------|
| Relationship of environment protection expenditures % in relation to milk procurement | 0.67 | 0.74 | 1.35 | 0.99 | 0.87 | 1.35 | 1.51 |

Source: own research.

Diligence in regard to the natural environment condition requires consideration of economic concerns. Maintaining environmental values generates costs for their protection -- avoiding potentially much higher future economic and social losses caused by environment pollution [1, 4, 5, 6]. Worth remembering that the costs of compliance with environmental requirements continues their relevance with regard to production costs, as well as milk procurement. This is confirmed by another publication where average expenditures for environment protection were analyzed for Poland's dairy cooperatives for the years 2004-2010 (see Illus. 1) which demonstrated that average dairy cooperatives in Poland incurred increasingly higher expenditures for environment protection, proving that environment protection costs for this commercial sector are high and are rising at a significant rate [11].



**Illustration 1 – Average Environment Protection Costs (thousands PLN) in Studied Dairy Cooperatives for the Years 2004-2010**

Source: see footnote 15.

### Wholesale Milk Prices

In the first year after Poland's accession to the European Union, wholesale milk prices rose over 20% and remained at relatively stable levels during the next 3 years (2004-2006). During 2007-2009, Poland's wholesale milk prices experienced major fluctuation caused by abrupt changes in world market milk and milk product prices. In December of 2007, the wholesale price of milk was 1.32 PLN/liter; 37% higher than at the beginning of that year and the average price of milk was 15% higher than a year earlier. In 2008, the increased milk price of a year earlier was corrected to just short of 0.90 PLN/liter in December. Restraining falling wholesale milk prices and their slow reversal started to occur in the 4<sup>th</sup> quarter of 2009 [15]. The milk prices continued rising throughout 2010 and maintained through 2011. In December of 2011, for milk delivered for wholesale purchase, producers were earning an average of 129.29 PLN/hectoliter, i.e. over 9% more than for the previous year, according to the Central Statistical Office of Poland. This level of price had not been noted since December 2007 [2].

Even though there were significantly higher prices in 2014, as compared to the previous year, a steady decline in wholesale milk prices has been observed from the first months of the year. The average price in March floated around 150.31 PLN/hl, 1% lower than in February but 20% higher for the same period in 2013. April delivered another drop in price -- wholesale price was 145.47 PLN/hl, 3% lower than in March but 15% higher than in April of 2013. May showed another 4% monthly price drop coming in at 139.89 PLN/hl but 11% higher than a year earlier. In June, milk producers were getting 135.75 PLN/100 liters; 3% less than in May but 6.5% higher than the year previous [23]. According to the Central Statistical Office, wholesale milk prices for August 2014, were in the area of 1.28 PLN/liter; 4.3% less than for July and 3.6% less than August 2013.

### Summation

The average dairy cooperative in Poland is experiencing rising costs for environment protection inferring that the significance of these expenditures is also growing. Taking into account the relationship between environment protection expenditures and milk procurement, it is apparent that this relation was, for small and medium dairies, lowest – 0.42 and 0.43%, respectively, and for large cooperative dairies this relation was lowest in 2008 – 0.41%. Medium dairy cooperatives noted the highest rise indication for environment protection expenditure as they related to milk procurement i.e. 0.62% in 2004, to 5.67% in 2010. Analyzing the relationship of these costs for the full period of the study, it was evident that environment protection expenditures in relation to milk procurement more than doubled for the cooperatives studied – from 0.67 to 1.51%. This suggests that expenditures pertaining to compliance with environmental regulations are important and undertaken projects serve to neutralize pollution or prevent its occurrence [1]. For that matter, this agricultural food industry has its own specificity which sets it apart from other industries – first of all, the short period for storing raw milk and its propensity to spoil.

This factor justifies efficient processing and avoiding long distance transport of raw milk [14]. The procurement of raw milk, and its transport is an essential element in the functioning of a dairy plant: most important factors are milk's vulnerability understood as its low tolerance to conditions and effects of transport, the scattered nature of its producers and their distance from processing plants. With the creeping tendency of centralizing processing, these above factors take on more significance. Careful planning of transport logistics insures the delivery of milk with full value for processing at lowest possible cost. It is not only an issue of competitiveness with other dairies, but above all, the condition allowing for technological processing [18, 8].

The nature of milk should be noted as goods undergoing physical transport – it is a perishable product in which active natural processes take place which can only be retarded by cooling. Inappropriate logistics of raw milk can induce biochemical processes which cannot be eliminated in down-the-line production and distribution leading to not only consumption quality degradation, but also a threat to public health [22].

### **Zróżnicowanie kosztów ochrony środowiska w polskich spółdzielniach mleczarskich i kosztówskupu mleka**

**Streszczenie:** Celem artykułu było omówienie zróżnicowania kosztów ochrony środowiska w spółdzielniach mleczarskich w latach 2004 – 2010 z uwzględnieniem zróżnicowania kosztów skupu mleka. Materiał do badań stanowiły informacje uzyskane z kwestionariusza wywiadu oraz źródła wtórne. Stwierdzono, że koszty ochrony środowiska w badanych spółdzielniach względem kosztów skupu mleka wzrosły z 0,67% do 1,51% co oznacza, że w dalszym ciągu koszty dotyczące spełniania wymogów środowiskowych są ważne.

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