

COMPETITIVENESS OF DAIRY INDUSTRY COMPANIES OPERATING IN SUSTAINABLE DEVELOPMENT CONDITIONS

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Abstract. The aim of this study is to present issues connected with introduction of the sustainable development concept in range of the environmental aspect in companies operating in the dairy industry, and to show how such activities affect competitiveness of those subjects. A description of environmental measures was collected from companies in the dairy industry situated in the entire country. These activities have been related to reducing water consumption and sewage production, reducing the amount of waste produced, and reducing the amount of dust and gaseous pollutants. This study attempts to find relations describing those measures including change in the competitive position of investigated companies. Conclusively, those relations are not equal with reference to all environmental changes introduced in the manufacturing companies. Some part of pro-environmental measures have beneficial effects on the financial result or in company's market share. And some of those measures do not show any relation or they even sometimes show a negative relation.

Keywords: environmental protection, dairy companies, sustainable development

INTRODUCTION

The sustainable development concept was created in opposition to the traditional, economic growth-based development program (Pawłowski, 2006). As stated by the Brundtland Commission: sustainable development

is a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (Rogall, 2010). The Brundtland report led to spreading the idea of sustainable development, and made people believe that a healthy economy depends on proper environmental conditions. Therefore, the environmental policy needs to be integrated into the overall economic policy (Pessoa and Rui Silva, 2009; Söderbaum, 2011).

The three main characteristics of sustainability, stability and self-sustainability originate from the definition of sustainable development (Ionescu, 2011). Sustainable development is an attempt to formulate a program integrating the various levels of human activity (Pawłowski, 2006).

The concept of balanced and sustainable development integrates environmental and economic objectives so that the current generation's economic growth and civilization progress does not take place at the expense of exhausting non-renewable resources and degrading the environment, for the sake of future generations which will have the same right of self-development (Kośmicki, 2010).

The sustainable development concept has been successfully adopted as a supreme principle for various political institutions at all levels of state administration and in businesses. However, putting this principle into action proves to be much more difficult (Volkery et al., 2006).

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Because each company establishes its own socio-economic system, its development goals should always address the following three areas: economic benefits; people related with the company; and the company's environmental footprint. The environmental measures taken by companies involve a broadly understood, well-balanced development that respects nature and the resources of the earth. Sustainable development of the company is supposed to be based on a skillful coordination of the company's activities in the three areas referred to above, and on the creation of the company's vision in which every measure undertaken is internally consistent and underpinned by the triple foundation (Witek-Crabb, 2001).

In manufacturing companies, environmental protection results primarily from the need to comply with the regulations provided for in the environmental policy at national and company level. The environmentally-oriented measures taken by industrial enterprises allow them to demonstrate improvement of their environmental performance while having a positive impact on the economic indicators, e.g. enabling a competitive edge (Hadryjańska, 2015).

For dairy companies operating under market economy conditions, the priority is to achieve the lowest production costs or a cost level that provides the highest profits. Therefore, the measure consisting in a continuous change of their approach towards the environment must be profitable for the companies. Otherwise, they will not go further than complying with the regulations.

Dairy companies use natural resources in their production processes, and thus they contribute to environmental pollution. The consequence are costs of discharges into the environment and the resource exploitation costs. In this context, lower consumption of resources means lower environmental costs.

However, the main problem is that most of the entrepreneurs still believe that environmental measures only involve financial contributions. For them, it is very hard to see any opportunity to improve their financial performance or increase their market share through the implementation of environmentally-friendly measures.

The objective of this paper is to identify specific solutions in the manufacturing of dairy products in sustainable development conditions which can strengthen the company's competitive position measured with financial performance or market shares. Attention was focused on the environmental aspect of this concept.

The starting point to attain this objective is a thesis that environmental protection activities taken by dairy companies have an impact on their competitive position.

ACHIEVING ENVIRONMENTAL PROTECTION CONDITIONS IN DAIRY COMPANIES

Just like any manufacturing companies in other industries, dairy companies rely on natural resources in their manufacturing processes, and therefore they exploit water, soil, and air. Meanwhile, they contribute to the accumulation of contaminants which are by-products of dairy manufacturing. Water is mostly used in the milk processing facilities as it is required at many production stages of nearly all product types. The dairy industry uses approx. 27.6% of water (according to 2010 data) consumed by the entire food sector (Kasztelan, 2012). Moreover, it creates a lot of highly polluted wastewaters with various pH rates, containing large quantities of general suspended solids, nitrogen, phosphorus, protein and grease (Kasztelan, 2012).

To achieve the research objectives, it was decided to use primary sources, i.e. information from dairy companies. This study mainly relied on an indirect survey method: a questionnaire supported by personal interviews which, in turn, are an example of direct surveys. The basic tool for this survey was a questionnaire whose adequate and well-conceived layout contributed to the achievement of the aims of this survey. The questions pertained to the period immediately preceding Poland's accession to the EU (2003) and the current period (2015), enabling a later study on the relationship between the environmentally-oriented activities of dairy companies and their competitiveness.

The research population was composed of dairy enterprises with more than 9 employees, i.e. small, medium and large enterprises. The smallest companies (up to 9 employees) were deliberately excluded. They were considered to have such a small production volume that dealing with environmental and competitive edge issues was not a part of their core business. Empirical research was conducted throughout the country, and a questionnaire survey was sent to all operators. From a group of more than 200 then-active dairy companies, 76 questionnaires were obtained, which means the survey response rate was about 40%. The vast majority (about 70%) of companies who completed the questionnaire were dairy cooperatives.

Table 1. Methods for reducing water consumption and wastewater generation in dairy enterprises in 2015 and 2003
Tabela 1. Sposoby ograniczania zużycia wody i wytwarzania ścieków w przedsiębiorstwach mleczarskich w 2015 i 2003 roku

Ways to reduce water consumption Sposoby ograniczania zużycia wody	2015		2003	
	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw
Optimal configuration of equipment and total pasteurizer design, centrifuge and homogenization unit Optymalna konfiguracja i łączny projekt pasteryzatora, wirówki i jednostki homogenizacyjnej	44	57.9	12	15.8
Use of pistol handle hoses for washing Stosowanie do mycia węży z uchwytyami pistoletowymi	52	68.4	25	32.9
Use of closed cooling water circuits Stosowanie obiegów zamkniętych wody do chłodzenia	40	52.6	26	34.2
Preventing excessive consumption of cooled water during downtime Zapobieganie nadmiernemu zużyciu chłodzonej wody podczas przerw w procesach produkcji	44	57.9	16	21.0
Reduced number of rinsing cycles in CIP systems due to the deployment of computer-based control systems W systemach CIP (czyszczenia w miejscu) ograniczenie liczby płukań przez zastosowanie komputerowych systemów sterowania	43	56.6	13	17.1
Use of hose water to wash the plant and vehicles Wykorzystanie wody z węży do mycia i czyszczenia zakładu i pojazdów	37	48.7	28	36.8
Full control, adjustment and replacement of fittings, valves, taps and gaskets Pełna kontrola armatury, zaworów, kurków i uszczelek oraz ich regulacja (zawory) i wymienianie na nowe (uszczelki)	54	71.0	41	53.9
Appropriate washing and cleaning of equipment Właściwie przeprowadzone mycie i czyszczenie urządzeń	51	67.1	35	46.0
Use of welded pipe connectors Stosowanie spawanych złączy rur	53	69.7	44	57.9
Strict control of milk leakages Ścisła kontrola wycieków mleka	51	67.1	34	44.7
Use of equipment to measure and control the level of liquid Stosowanie przyrządów pomiarowych i sterowniczych poziomu cieczy	47	61.8	23	30.3
Use of high-pressure washing systems Stosowanie systemów mycia pod ciśnieniem	45	59.2	28	36.8
Repeated use of cleaning solutions, where possible Kilkakrotne stosowanie tam, gdzie to możliwe, roztworów myjących	43	56.6	5	32.9

Source: own elaboration based on information obtained from the companies.
 Źródło: opracowanie własne na podstawie danych pozyskanych od firm.

In order to improve the water and sewage system, milk processing facilities implement technical and organizational solutions which save water and reduce the amounts of waste water generated during the production process. Over 70% of the companies covered by this analysis declared that in 2015, in order to reduce the uncontrollable leaks of water, a comprehensive test of armatures, valves, taps, and gaskets was performed (Table 1). In 2003, only slightly more than a half of the companies were seeking to improve their water and sewage management this way. In 2015, over 60% of companies covered were using hoses with plastic handles for washing, welded joints in the connecting pipes, measurement instruments and liquid level control equipment. That group was definitely smaller 12 years earlier. Almost 70% of the milk processing facilities carried out thorough inspections of milk leaks, and had a procedure in place to wash and clean the equipment with water at an appropriate temperature immediately upon completing the process. In 2003, only 46% of the companies were using such solutions. In 2015, to improve the water and sewage management, more than a half of the milk processing facilities optimized the control over the pasteurizer, used closed water cooling circuits, reduced the number of rinses in CIP (clean-in-place) systems and used high-pressure washing systems. Previously, the percentage of companies using such methods to reduce

the quantities of water and sewage used in the manufacturing of milk products was much lower.

Waste is an undesirable effect of dairy manufacturing processes, and needs to be managed properly. In milk processing facilities, the main groups of waste are postproduction organic waste, used packages and sludges which are wastewater residues. Less important waste includes: coal ash; non-organic post-production waste (e.g. grease residues); other organic, rotten and hazardous substances (containers for chemicals, e.g. HNO₃, left empty after the use of disinfectants). The amount of waste generated depends on the milk product manufactured. The lowest amounts of waste are involved in the manufacturing of drinking milk, cream, condensed milk, kefir, butter and ice cream. The largest amounts of waste are involved in the manufacturing of semi-cured cheese, cottage cheese and powdered milk. Curd scraps and offcuts are the effect of semi-cured cheese manufacturing processes. In turn, the manufacturing of cottage cheese results in the generation of solid waste when packaging, pressing and transporting cheese. Evaporator condensate is the result of powdered milk manufacturing processes (Cavey, 1998).

In 2015, the key waste management method used in the dairy industry was to recycle and minimize the amount of waste (approx. 80% of companies declared to use such methods) (Table 2). On average, in this period, one out of three companies was selling waste for road construction

Table 2. Methods for minimizing the amount of waste generated in dairy enterprises in 2015 and 2003

Tabela 2. Sposoby ostatecznego zagospodarowania odpadów w przedsiębiorstwach mleczarskich w 2015 i 2003 roku

Method or minimizing the amount of waste Sposoby ostatecznego zagospodarowania odpadów	2015		2003	
	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw
1	2	3	4	5
Landfilling Deponowanie na składowiskach	40	52.6	44	57.0
Minimizing the amounts of waste, e.g. through technological and product modifications Minimalizowanie ilości, np. poprzez modyfikacje technologiczne, produktowe	66	86.8	36	47.4
Animal feed component Przeznaczenie na pasze	46	60.5	50	65.8
Recycling Recykling	58	76.3	39	51.3

Table 2 cont. – Tabela 2 cd.

	1	2	3	4	5
Combustion Spalanie		9	11.8	18	23.7
Selling, e.g. for road building purposes Sprzedaż, np. do budowy dróg		23	30.3	40	52.6
Use in agriculture, e.g. as fertilizers Wykorzystanie w rolnictwie, np. jako nawozy		27	35.5	24	31.6
Burying Zakopywanie		17	22.4	18	23.7

Source: own elaboration based on information obtained from the companies.
Źródło: opracowanie własne na podstawie danych pozyskanych od firm.

or agricultural purposes, and one out of four companies was burying waste in the ground. Twelve years ago, waste was used in feed production or was landfilled (in the case of over 60% of entrepreneurs). In order to reduce the amount of waste, more than 80% of companies are implementing technological modifications. This means increasing the production automation degree with a positive effect on water and sewage management. More than a half of facilities modify their products and improve their in-house management schemes. Management efficiency can be increased e.g. through improvements in machinery and equipment maintenance, better control over all production stages or hiring a professional manager. In 2003, technology modifications were also the basic method of reducing waste generation (employed by approx. 50% of companies) while less than a half of the facilities focused on their in-house management processes.

The implementation of environmentally-oriented measures in milk processing facilities also includes ambient air protection. The boiler houses are the most important sources of air emissions in milk processing facilities, and therefore constitute a health hazard. In the dairy industry, hot water boilers fired with coal are still used in most of the facilities, although gas units and oil heaters are being gradually introduced. An important source of emissions in the dairy industry are ammonia-based coolers. Ammonia emissions are characterized by uncontrolled leakages and are connected with system ventilation.

In 2015, in order to protect the air, milk processing facilities (over 70% of them) were using low-caloric fuel and reducing dust emissions with cyclonic filters (Table 3). About a half of the companies implemented continuous maintenance procedures for potential sources of fugitive emissions (from compressors gaskets, orifices,

Table 3. Methods for reducing emissions in dairy processing facilities in 2015 and 2003

Tabela 3. Sposoby ograniczania emisji zanieczyszczeń do atmosfery w przedsiębiorstwach mleczarskich w 2015 i 2003 roku

Methods for reducing emissions Sposoby ograniczenia emisji zanieczyszczeń do atmosfery	2015		2003	
	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw	number of enterprises liczba przedsiębiorstw	percentage of enterprises odsetek przedsiębiorstw
1	2	3	4	5
Reducing dust emissions with cyclonic filters Ograniczenie pyłów dzięki filtrom cyklonowym	56	73.7	59	59.2
Switching to gas heating Przechodzenie na opalanie gazem	34	44.7	70	92.1

Table 3 cont. – Tabela 3 cd.

	1	2	3	4	5
Continuous maintenance procedures for potential sources of fugitive emissions Stala konserwacja potencjalnych źródeł emisji niezorganizowanych		43	56.6	51	67.1
Using low calorific fuel (SO ₂ reduction) Stosowanie paliw niskokalorycznych (ograniczenie SO ₂)		58	76.3	78	71.0
Use of capture systems (hoods, guard systems) to reduce point emissions Stosowanie systemów wychwytyjących (okapy, systemy osłon) w celu ograniczenia emisji punktowych		18	16.5	93	85.3
Use of state-of-the-art combustion technologies, e.g. fluidized bed (SO ₂ reduction) Zastosowanie nowoczesnych technologii spalania, np. złoża fluidalne (ograniczenie SO ₂)		36	47.4	44	57.9

Source: own elaboration based on information obtained from the companies.
Źródło: opracowanie własne na podstawie danych pozyskanych od firm.

valves, etc.), used modern combustion technologies, and switched to firing with gas. At the time this survey was conducted, only a few companies had solutions in place which enabled the reduction of the excess of air during combustion of fuels to limit NO₂ emissions, and solutions intended to reduce point source emissions. In 2003, almost all of the companies switched to firing with gas and used capture systems (hoods, shielding systems) in order to limit point source emissions. More than a half of the companies implemented continuous maintenance procedures for potential sources of fugitive emissions, reduced dust emissions with cyclonic filters, and used state-of-the-art combustion technologies.

As shown by the tabular data above, before Poland joined the EU, milk processors had less methods in place to improve water, sewage and waste management. However, technical solutions intended to protect ambient air against gaseous and dust emission were used already in 2003.

IMPACT OF ENVIRONMENTALLY-ORIENTED MEASURES IMPLEMENTED IN THE MILK PROCESSING FACILITIES ON THEIR COMPETITIVE POSITION

While environmental protection in industrial companies is crucial because of the need to comply with regulations,

it can also have a positive impact such as strengthening the competitive edge. Specific milk processing facilities have started to recognize additional financial benefits from the implementation of environmentally-oriented measures. Finding a correlation between such measures and improvements to financial performance or market share could prove the existence of such a dependence. This would mean that beside additional costs for the entrepreneurs, environmental protection provides them with tangible benefits.

The chi square method, intended for qualitative characteristics testing, was used in order to investigate the dependence between environmentally-oriented measures of manufacturing processes run by milk processing companies and their competitive position. This test is used to evaluate the deviations between empirical figures and theoretical numbers that would appear in the data table if the characteristics were dependent. The larger is the difference between empirical and theoretical figures, the higher is the value of chi-square statistics, and the stronger is the relationship between the features.

The *p*-value for all environmentally-oriented measures was calculated and compared to the significance level set at $\alpha = 0.05$. All the *p*-values beyond 0.05 were rejected because of the lack of dependence between the characteristics investigated. Environmentally-oriented

Table 4. The p -values in the relationship between environmentally-oriented measures and market shares and financial performance of dairy enterprises

Tabela 4. Wartości p dla związku pomiędzy działaniami prośrodowiskowymi a udziałem w rynku i wynikiem finansowym w przedsiębiorstwach mleczarskich

Environmentally-oriented measures Działania prośrodowiskowe	p -value for the market share Udział w rynku (p)	p -value for the financial performance Wynik finansowy (p)
Backup power generator Posiadanie rezerwowego generatora	0.005	0.005
More energy-efficient evaporators Zwiększona energooszczędność wywarek	0.014	0.014
Switching to gas heating Przechodzenie na opalanie gazem	0.014	0.014
Leak detection and repair (LDAR) program in ammonia refrigeration systems Zastosowanie w amoniakalnych systemach chłodniczych programu wykrywania i napraw przecieków (LDAR)	0.014	0.014
Reusable packaging Stosowanie opakowań wielokrotnego użytku	0.017	0.017
Reduced number of rinsing cycles in CIP systems due to the deployment of computer-based control systems W systemach CIP (czyszczenia w miejscu) ograniczenie liczby płukań przez zastosowanie komputerowych systemów sterowania	0.017	0.010
Product modifications Modyfikacja produktów	0.033	0.050
Designing a pasteurizer so as to eliminate the amount of milk evacuated to the sewage in the start-up phase Konstrukcja pasteryzatora pod kątem eliminacji ilości odprowadzania mleka do ścieków w fazie rozruchu	0.043	0.050

Source: own research.
Źródło: badania własne.

activities with a p -value lower than or equal to 0.05 were selected for the purposes of further analysis. The table below shows the environmental measures correlated with the milk processing companies' market share and financial performance (Table 4). Given the limited nature of this study, there were no pro-environmental activities that demonstrated a relationship with only one feature of the companies' competitive position.

To demonstrate the relationship between a specific environmentally-oriented measure that can be correlated with the competitive position, bar graphs were used (as described below) and allowed to conclude that a relationship exists between these parameters.

The use of a backup generator had an adverse effect on the market share and financial performance. All the milk processing facilities equipped with a backup generator noticed a decline in their competitive position. Conversely, more than 70% of the investigated operators which did not own a backup generator could observe an improvement of their market share and financial performance.

As a consequence of increasing the energy-efficiency of evaporators (consuming large amounts of energy), more than 70% of the operators covered by this study reported an improvement of their financial performance and market share. Meanwhile, it was noted that only

slightly more than 30% of companies who did not rely on such solutions experienced an improvement of their competitive position. Therefore, it is beneficial for dairy companies to improve the energy-efficiency of evaporators as it can favorably affect their financial performance and market share.

As regards protection against ambient air pollution, it is important to choose appropriate combustion fuels in boiling houses. In the milk processing facilities, switching to gas firing seems to be a frequently used environmentally-oriented measure, as it reduces ambient air pollution. However, according to various studies, the installation of gas boilers as the main goal in the process of implementation of sustainable development measures for milk processors means a decline in their market share. If such measures are not the basic environmentally-oriented measure, one can observe that the market share increases. Thus, it may be concluded that switching to gas firing strengthens the competitive edge only if more significant greening measures are being carried out simultaneously. The link between implementing such changes and financial performance is the same as in the case of market share evolution, e.g. in the companies where the introduction of a gas furnace was an important part of environmentally-oriented measures, a decrease of financial performance was experienced. In turn, in companies where the introduction of a gas furnace was a less significant element, an increase of profits was reported. Therefore, it may be concluded that switching from the boilers system to a more environmentally-friendly solution positively affects financial performance as long as it is not the only and not the most significant environmentally-oriented improvement. A similar conclusion can be made as regards influence of using leakage detection and repair programs in ammonia-based cooling systems on the financial performance. However, in this case, the companies did not indicate whether this activity was significant to them.

Milk processing facilities implement multiple measures related to water and sewage management because this is the area where the manufacture of milk products has the largest environmental footprint. With those measures in place, the evolution of the companies' competitive position could be effectively correlated to the greatest extent. Approx. 80% of companies which reduce the number of rinsing cycles in CIP systems by

using computer-based control systems experienced an increase in their market share. However, such an increase was also reported by 60% of the establishments who did not introduce such measures. The decline in the market share was much more significant in companies who had their CIP systems controlled by computers. Based on this fact, it can be assumed that milk processing companies could not significantly increase their market share by implementing such solutions. Reducing the number of rinsing cycles in the CIP system proves beneficial for the companies' profit, because more than 90% of the entities covered by this analysis who introduced such measures reported an increase of this parameter. Also, more than 50% of the companies who did not limit the number of rinsing cycles with computer control systems experienced a decrease of their financial performance.

Another measure taken to reduce the amount of sewage water is to redesign the evaporator so as to eliminate the disposal of milk to wastewaters in the start-up phase. As shown by the correlation analysis, such methods can have a positive impact on the evolution of market share. 70% of the milk processing facilities who believed this solution to be important for them experienced an increase in the market share, while a decrease was reported by 20% of entities covered by this analysis.

Although dairy companies are implementing changes in waste management in order to balance the manufacturing process, this proves to be much more expensive than improvements to water and sewage management. Examples of such measures include technology and product modifications. Approx. 70% of companies who modified a product and considered it to be an important measure compared to other environmentally-oriented measures experienced an increase in the market share, whereas less than 30% of companies did not experience any changes. In cases where this measure was considered not to be sufficiently significant, more than 30% of companies experienced a decrease in their market share. It seems advisable to encourage this approach in order to contribute to the implementation of balanced development concepts in milk processing facilities, and in order to increase the market share. All the companies who decided that reusable packages are a measure of greater importance recorded the same market share in 2013 and 2015. More than a half of companies who considered this measure to be less significant experienced

a decrease of their market shares, while more than a half of companies experienced an increase of this indicator. It can be therefore assumed that reusable packaging does not significantly contribute to the increase of market share.

CONCLUSION

Milk processing facilities are adopting many solutions that contribute to the implementation of sustainable development rules, especially as regards their environmental aspect. It is crucial to emphasize that often such measures do not involve any important technical and technological changes which usually generate significant financial costs. Frequently, it proves to be enough to slightly improve a manufacturing process which results in lower consumption of resources. Then the result is doubled, because in addition to environmental benefits, the company can also save its financial resources.

This study demonstrated the existence of a link between the environmentally-oriented measures and the competitive position of dairy industry companies. This relation may vary, and may be positive or negative. A negative relation was only observed in the case where a backup power generator was in place. While the reduction of the number of rinsing cycles in the CIP system results in improvements of financial performance, it does not have a comparable effect on the market share. In cases where the evaporator was redesigned and products were modified, a clear positive effect on market share was demonstrated, whereas no impact on the financial performance was observed.

The implementation of the sustainable development concept in milk processing facilities means more than just improvements to the environmental performance. Also, it may contribute to strengthening the competitive

edge, as reflected by market shares and financial performance of the company.

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KONKURENCYJNOŚĆ PRZEDSIĘBIORSTW BRANŻY MLECZARSKIEJ DZIAŁAJĄCYCH W WARUNKACH ZRÓWNOWAŻONEGO ROZWOJU

Streszczenie. Celem pracy jest zaprezentowanie zagadnień związanych z wdrażaniem aspektu środowiskowego koncepcji zrównoważonego rozwoju w przedsiębiorstwach branży mleczarskiej oraz pokazanie, jak takie działania wpływają na konkurencyjność podmiotów. Opisano działania środowiskowe podejmowane w przedsiębiorstwach mleczarskich usytuowanych na terenie całego kraju. Były one związane z ograniczaniem zużycia wody i produkcji ścieków, zmniejszaniem ilości produkowanych odpadów oraz zmniejszaniem ilości zanieczyszczeń pyłowych i gazowych. Podjęto próbę znalezienia relacji tych działań ze zmianą pozycji konkurencyjnej badanych zakładów. Okazało się, że relacja ta nie jest jednakowa w stosunku do wszystkich zmian środowiskowych wprowadzanych w przedsiębiorstwach produkcyjnych. Część działań prośrodowiskowych korzystnie wpływa na wynik finansowy lub na udział przedsiębiorstwa w rynku, niektóre z nich nie wykazują żadnej relacji, a niekiedy relacja ta jest ujemna.

Słowa kluczowe: ochrona środowiska, przedsiębiorstwa mleczarskie, zrównoważony rozwój

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