

**PRO-ECOLOGICAL ACTIVITIES OF DAIRY FIRMS
IN WIELKOPOLSKA AS A FACTOR OF THEIR
COMPETITIVE POSITION**

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Abstract. Dairy firms generate a considerable amount of pollution in course of production, negatively influencing the state of natural environment. According to the EU ecological policy, all economic sectors must comply with the principle of sustainable development, which makes environmental targets equal to the economic ones. Pro-ecological activities of dairy firms are to ensure, first of all, implementing the assumptions of ecological policy, however, they can also become a factor favourably influencing their competitive position.

Key words: the competitiveness of the firms, the protection of environment, dairy companies, the environmental management

INTRODUCTION

The dairy industry is a significant section of the food processing industry in Poland, which results from both: the share of sold products and the quantity of employees. This is vital for the natural environment, which is subject to the pressure of pollution produced in course of dairy production. The activities of dairy firms must comply with the assumptions of the EU agricultural policy, which imply the equality of economic and environmental targets. Dairy firms willing to adapt the sustainable development principle set up their own development strategies, in which pro-ecological activities remain of vital importance. Apart from a primary target, consisting in meeting the EU directives, additional benefits may arise in the form of improving the firms' competitive positions.

Basing on research conducted in dairy firms of Wielkopolska, the author is willing to show to what degree the pro-ecological activities are implemented and verify the connection between pro-ecological activities and the firms' competitiveness.

FEASIBLE PRO-ECOLOGICAL ACTIVITIES IN DAIRY FIRMS

Pro-ecological activities include all the activities of a firm aiming at an improvement in its functioning, considering the ecological aspect and resulting in its ecologisation, i.e. a broadly understood change towards a firm consciously putting into practice the aims of ecological policy. Such change should result in a constant and ecologically sustainable development of the firm, including, in particular:

- a decrease in the use of resources and energy in processes of production, transport, storage etc.,
- environmentally-friendly changes in production technologies,
- reduction in directly generated pollution and waste,
- reduction in environmental nuisance concerning the products and services offered by the firm,
- taking into account the requirements of environmental protection and economising on resources at all stages, including the process of gaining materials and components for production and the post-production phase of how the products function [Jabłoński 2001].

The presentation of pro-ecological changes in this article will be limited to the activities of firms directly connected with the production process, which is directly connected with the specifics of empirical research conducted by the author.

There are a vast number of possibilities of improving the environmental parameters in dairy firms and the choice depends on the financial resources of a given unit, the adopted environmental policy, the size of the plant and the kind of processing. A detailed presentation of these undertakings is presented below in Table 1.

Due to the specific character of the processed product and the processing technique and technology, the dairy industry mainly influence the quality of open waters in Poland, while its influence on the quality of air and soil is not as significant. The main source of air pollution, as regards dairy firms, are boilers which emit pollutions such as soot, ash and gasiform compounds.

Dairy firms generate considerable amounts of sewers, which can be technological sewers, refrigeration sewers, domestic sewage and wastewaters.

Technological sewers are produced while washing appliances and rooms. They include remnants of milk and dairy products, but also detergents. Cooling sewers are generally clean and they can be reused, e.g. in cleaning rooms. Domestic and industrial sewages are produced in toilets and sinks used by employees and their share in the total balance is not significant.

Rain wastewaters are created as a consequence of rainfalls or snowfalls and they can be contaminated with mud or remnants of milk, lost due to insufficient milking. A typical characteristic of dairy sewers is the heterogeneity of their flow and different concentration values changing in time. These are usually determined by the kind of production in a given firm, which is usually dynamic and changeable [Ziajka 1997].

Table 1. Pro-ecological activities in dairy firms
Tabela 1. Działania prośrodowiskowe w przedsiębiorstwach mleczarskich

<p>Minimizing waste and preventing from waste formation Minimalizacja i zapobieganie powstawania odpadów</p>	<p>Reduction of waste formed in production, allowing for dividing them into seven groups: organic side products, other organic waste or decaying waste, sewage sludge, inorganic side waste, coal ash, packaging, dangerous substances Redukcja odpadów powstających w procesie produkcji z uwzględnieniem ich podziału na siedem grup: organiczne podprocesowe, inne organiczne lub gnijące, osady ściekowe, nieorganiczne poprocesowe, popiół węglowy, opakowania, substancje niebezpieczne</p> <p>Resourcing waste Stosowanie recyklingu surowców odpadowych</p> <p>Using reusable packaging Stosowanie opakowań wielokrotnego użytku</p> <p>Facilitating in-company waste disposal Usprawnienia gospodarki wewnątrzzakładowej</p> <p>Re-use of waste, e.g. as fodder, fertilisers or resources for building roads Ponowne wykorzystanie odpadów np. przeznaczanie na pasze, jako nawozy, do budowy dróg</p>
<p>Water and sewage economy Gospodarka wodna i ściekowa</p>	<p>Limiting the use of water by, e.g.: Ograniczanie zużycia wody poprzez m.in.:</p> <ul style="list-style-type: none"> optimal configuration and a joint project of pasteurizer, centrifuge and a homogenising unit optymalną konfigurację i łączny projekt pasteryzatora, wirówki i jednostki homogenizacyjnej reuse of water connected with washing the equipment and utilities ponowne użycie wody związane z myciem sprzętu i urządzeń limiting the number of rinses in the CIP system ograniczenie liczby płukań w systemie CIP reuse of condensate from evaporators for various purposes, for fire protection purposes, for car wash or rinsing ponowne użycie kondensatu z wyparek do różnych celów np. do celów przeciwpożarowych, mycia pojazdów, płukania using closed circuits for cooling stosowanie obiegów zamkniętych wody do chłodzenia using stages in dry-cleaning stosowanie etapów czyszczenia na sucho <p>Reducing production of waste, including, e.g.: Ograniczenie wytwarzanych ścieków poprzez m.in.:</p> <ul style="list-style-type: none"> strict control over milk spills ściśłą kontrolę wycieków mleka collecting all spills zbieranie wszystkich wycieków preventing milk and whey from pile-up zapobieganie spienianiu się mleka i serwatki reuse, whenever possible, of washing dilutions kilkakrotne stosowanie tam, gdzie jest to możliwe roztworów myjących using refined sewage for washing wykorzystanie do mycia oczyszczonych ścieków using pressure washing systems stosowanie systemów mycia pod ciśnieniem

	<p>Installation of a separate sewage farm Instalacja własnej oczyszczalni ścieków</p> <p>Reducing the pollution load of sewers Zmniejszanie ładunku zanieczyszczeń ścieków</p>
<p>Air protection and energy management Ochrona powietrza z uwzględnieniem gospodarki energetycznej</p>	<p>Reduction in emissions of compounds such as CO, CO₂, SO₂, NO_x, dioxins, other carbohydrates and dust Redukcja emisji takich związków, jak: CO, CO₂, SO₂, NO_x, dioksyny, innych węglowodorów, pyłu</p> <p>Installation of gas stoves Instalacja pieca gazowego</p> <p>Constant maintenance of potential sources of occasional emissions (e.g. of seals, superchargers and valves) Stała konserwacja potencjalnych źródeł emisji niezorganizowanych (np. z uszczelek, sprężarek, zaworów)</p> <p>Changing fuels to those with low content of sulphur Przechodzenie na opalanie innym paliwem o niskiej zawartości siarki</p> <p>De-sulphurating fuels Stosowanie odsiarczania paliw</p> <p>Using modern technologies of combustion, e.g. fluid layers Zastosowanie nowoczesnych technologii spalania np. złoża fluidalnego</p> <p>Reduction in the excess of air Redukcja nadmiaru powietrza</p> <p>Reduction in the use of electrical and thermal and energy Zmniejszenie zużycia energii elektrycznej i ciepłej</p> <p>Distribution of heat and steam outside a plant Rozprowadzanie ciepła i pary poza teren zakładu</p> <p>Installation of energy-saving boilers Instalacja energooszczędnych kotłów</p> <p>Reconstructing and changes in exploiting cooling systems Zmiana konstrukcji i eksploatacji systemów chłodniczych</p>

Source: author's own compilation based on Cavey [1998].
Źródło: opracowanie własne na podstawie Cavey [1998].

Water economy and also other pro-ecological activities carried by dairy firms should correspond with the best available techniques (BAT), mentioned in BREF reference documents (BAT Reference Note). These documents are compiled by the European Office of Integrated Permissions governed by EU Directive 96/61/EC, called IPPC Directive (i.e. 'Integrated Pollution Prevention and Control'). Integrated permission is an administrative decision issued as a licence, allowing to implement a technological installation under strictly defined circumstances concerning all components of the environment and meeting the criteria of "best available techniques". The best available techniques are technical, technological and organisational measures preventing the appearance or minimising pollutions which are technically feasible and economically justified. According to the integrated permissions and basing on observations of water

economy conducted in Polish dairy firms, water use can be best limited by means of [Budny and Turowski 2005 a]:

- by introducing surveying of water use and its monitoring (up to 20%),
- as previously and by using evaporating waters and building cheap plants of collecting precipitated water (by 20-40%),
- as previously and by managing water from membrane processes (by 40-60%).

Integrated permissions concern also the possibilities of limiting the use of electrical energy in dairy firms by means of direct and indirect methods. Direct methods comprise activities directly concerning the electrical receivers, such as: checking the selection of engine power, their load and working time; using modern appliances of high efficiency and energy-saving lightning. Indirect methods of reducing the use of electrical energy comprise all technical and organisational activities which function under the common name of “rules of good production practice”. Among them, the following ones can be mentioned: ensuring good isolation of rooms with low temperature, using automatic lightning switches, ensuring leakproof technological and technical installations, using monitoring and assigning target indices of use of electrical energy and an analysing of reaching the anticipated values, training employees and rewarding them for saving energy [Budny and Turowski 2005 b].

A dairy firm subject to an integrated permission should be able to prove that it uses all the available methods of the best available technique as regards thermal economy, e.g. it ensures an optimal use of energy by using very efficient appliances and an appropriate organisation of work; regular conservation of appliances; co-production of warmth and electricity, using heat exchangers and pumps to regain heat from technical appliances; ensuring maximal use of steam and condensate ensuring effective isolation of pipes, appliances and buildings; possessing an efficient system of preventing failures and their consequences [Budny and Turowski 2005 c].

RESEARCH METHODOLOGY

The research aimed at describing the sort of pro-ecological activities conducted in dairy firms and how they influenced the competitiveness of the firms. The research was done in the first quarter of 2008. Dairy firms situated in Wielkopolska, employing more than 9 people (small, medium-sized and big firms) were the subjects of the research.

According to the data obtained in the last quarter of 2007 from the Chief Statistical Office, there were 21 small (10-49 employees), 27 medium (50-249 employees) and 9 big firms (more than 249 employees) i.e. 57 firms altogether.

As a result of preparatory activities, it was established that only 39 firms from the list remained in the dairy business. Primary data was obtained from interviewing members of the board and middle management, e.g. marketing managers, sales managers or chief engineers, managers of environmental departments or employees in charge of quality. A survey was used which consisted of four parts. Part one included questions connected with the determiners of competitiveness, such as the evaluation of the firm's financial potential, production potential, sales potential, competing instruments and also characterising the branch with regard to the changes in competition. Part two of the survey was connected with the necessity of defining the kind of pro-ecological activi-

ties, concerning the production process, conducted in dairy firms. Answering the questions resulted in defining the sort of water and sewage management system employed by a given firm and describing the measures of atmosphere protection and waste management in the examined units. Part three of the survey was designed to study management systems in the firms, and particularly – the Environmental Management System according to ISO 14001, according to EMAS, the Quality Management System according to ISO 9001 and the HACCP System. The last part of the survey was aimed at characterising the examined firms with regard to the employment numbers, organisational forms, the kind of processing, the most important markets, annual sales figures and changes in financial results and sales profitability net in the last five years.

The analysed group consisted of 39 firms, in 31 of which were directly interviewed and the remaining firms refused to answer any questions due to trade secrets and the necessity to defend the firm against its competitors. Therefore, the research was conducted on 79.5% of the whole population, i.e. the research was based on a representative sample.

Achieving competitiveness takes place by means of competitiveness strategy which aims at reaching the competitive position and achieving competitive advantage. A company's market share and its financial situation can serve as measures of its competitive position. The competitive position of a company outperforms those of its rivals if its financial situation is better and market share is greater. In order to achieve the desired competitive position, measured by the expected market share and the required condition of finance, the company has to achieve competitive advantage over its rivals in a chosen market segment or segments. The company will achieve competitive advantage on the market if its offers are more frequently chosen than the offers of its competitors and its products are more often purchased by consumers [Adamkiewicz 1999].

Detailed characteristics of the studied firms can be found in Table 2.

Table 2. The profile of examined companies
Tabela 2. Charakterystyka badanych przedsiębiorstw

The characteristic indicators of companies Wskaźniki charakteryzujące przedsiębiorstwa	Number of firms Liczebność	(%)
1	2	3
The year of establishment: Rok powstania:		
< 1989	29	74.2
1990-1995	6	16.1
1996-2000	4	9.7
The law and organization form: Forma organizacyjno-prawna:		
the physical person leading economical activity osoba fizyczna prowadząca działalność gospodarczą	4	9.7
cooperative – spółdzielnia	24	61.3
civil partnership – spółka cywilna	1	3.2
limited company – spółka z o.o.	10	25.8

Table 2 – cont. / Tabela 2 – cd.

1	2	3
The scale of employment (person): Wielkość zatrudnienia (osób):		
0-49	7	19.3
50-249	23	58.1
> 249	9	22.6
The change of financial result during last 5 years: Zmiana wyniku finansowego w ciągu ostatnich 5 lat:		
it increased insensibly – zwiększył się nieznacznie	20	48.4
it increased rather meaningful – zwiększył się dosyć znacząco	10	25.8
it increase very distinctly – zwiększył się bardzo wyraźnie	3	6.4
it decrease insensibly – zmniejszył się nieznacznie	1	3.2
it decrease rather meaningful – zmniejszył się dosyć znacząco	1	3.2
it decrease very distinctly – zmniejszył się bardzo wyraźnie	1	3.2
it is at similar level – jest na podobnym poziomie	3	6.4
The kind of food processing industry: Rodzaj prowadzonego przetwórstwa:		
milk and the others milk drinks – mleko i inne napoje mleczne	29	74.2
hard cheeses – sery twarde	7	19.3
cottage cheeses – sery białe	26	67.7
powder milk – mleko w proszku	9	22.6
butter – masło	21	54.8
processed cheese – ser topiony	7	19.3
melow cheeses – sery miękkie	4	9.7
icecreams – lody	4	9.7
The most important markets: Najważniejszy rynek zbytu:		
local – lokalny	18	45.1
domestic – krajowy	31	80.6
international – międzynarodowy	7	19.3
The engagement of foreign capital (%): Zaangażowanie kapitału zagranicznego (%):		
< 10	1	3.2
10-50	0	0
> 50	4	9.7

Source: own research.
Źródło: badania własne.

RESULTS

All the firms had to evaluate their financial potential (including the options of financing their current activities, the quality of financial management and the scale of costs), production potential (including the degree of equipment wear, the degree of production ecologisation, automation of production processes), the potential of quality assurance, sales and the instruments of competing. In order to define their competitive positions, the firms described their estimated market shares and the changes in financial results. All the answers concerned the short-term situations of the firms, but also the situations five years earlier.

Taking into account the factor of time enabled drawing conclusions regarding the relations between the ecologisation of production processes and the firms' competitiveness. The questions in the survey included pro-ecological activities of the examined units with respect to atmosphere protection, waste disposal and water and sewage management systems.

The Table 3 shows a proportional specification of the most important results necessary to analyse the degree of ecologisation and competitiveness of the examined firms. The lines describing the change of degree of involvement in pro-ecological activities (marked *) match the columns presenting as follows: the number of companies not showing changes, showing considerable growths or showing insignificant growths.

As it results from the conducted research, the majority of firms claim to have experienced positive changes in competitiveness in the last five years. The most beneficial changes were observed with respect to production potential and the changes affecting the competing instruments. The firms claimed to have the worst potential with respect to sales. The competitive position measured by means of market shares and financial results improved in over 60% of examined units.

The greatest changes in pro-ecological activities took place in water economy and waste disposal, while the smallest changes took place with respect to atmosphere protection. The least degree of involvement in the ecologisation process was noticed in small firms. Introducing activities aimed at minimizing the quantity of production waste, e.g. by modifying the technologies and/or products, was a substantial change in the examined firms. Small firms, often managing very limited amounts of capital, can involve their financial means in water economy only to a limited degree (most often by using closed circuits) and in protecting atmosphere by installing gas-fired kettles.

Medium-sized firms, employing between 50 and 249 people, showed substantial changes in waste disposal, which mainly involved recycling, modifying technologies and products. These units showed substantial involvement in supporting production ecologisation with regard to sewage disposal. That was mainly about introducing measuring devices and steering devices for the level of liquid, reusing diluted cleaning detergents and using pressure wash. The degree of medium-sized firms' involvement in water economy and air protection was much lower. The most frequent way of reducing the use of water was limiting the number of rinse of appliances, using optimal configuration of pasteurizer, centrifuge and homogenising unit, as well as preventing an excessive use of cooled water between production stages. The lowest number of activities were implemented with respect to atmosphere protection – most of them were limited to installing a gas oven. Some of the firms declared limiting the emissions of pollution to atmosphere by conserving the potential sources of spectacular emissions and installing automatic venting systems, leading the vented ammonia to the compressor slot.

Table 3. The assessment of the degrees of ecologisation and competitiveness in dairy firms
 Tabela 3. Ocena stopnia ekologizacji i konkurencyjności przedsiębiorstw mleczarskich

Determinants Wyznaczniki		Number of firms showing no changes Liczba przedsiębiorstw nie wykazująca zmian (%)	Number of firms showing growth/ significant growth* Liczba przedsiębiorstw wykazująca wzrost/znaczący wzrost* (%)	Number of firms showing decline/ insignificant growth * Liczba przedsiębiorstw wykazująca spadek/mało znaczący wzrost* (%)
Potential evaluation Ocena potencjału	finance finansowego	32.3	61.3	6.4
	production produkcyjnego	25.8	64.5	9.7
	quality assurance w sferze zapewnienia jakości	41.9	48.4	9.7
	sales w sferze sprzedaży	22.6	51.6	25.8
Evaluation of competing instruments Ocena instrumentów konkurowania		22.6	64.5	12.9
Market share Udział w rynku		19.4	64.5	16.1
Financial result Wynik finansowy		6.4	74.2	19.4
Change in the degree of involvement in pro- ecological activities* Zmiana stopnia zaan- gażowania w działania środowiskowe*	water economy gospodarka wodna	22.6	54.8	22.6
	sewage disposal gospodarka ściekami	35.5	41.9	22.6
	waste disposal gospodarka odpadami	38.7	51.6	9.7
	protection of atmosphere ochrona atmosfery	35.5	35.5	29.0

*Explained in the text.
 *Wyjaśniono w tekście.
 Source: own research.
 Źródło: badania własne.

Big firms were mostly involved in waste disposal and air protection (installation of gas ovens, using low-caloric fuels, choosing fuels with low content of sulphur), but showed only little activity in the area of water and sewage management. Analysing interviews resulted in finding a connection between ecologisation and the firm's competitive position (Table 4).

Table 4. The relationship of environmental activities with competitive position
 Tabela 4. Związek działań środowiskowych z pozycją konkurencyjną przedsiębiorstw

The engagement in ecologisation (quantity of companies) Zaangażowanie w ekologizację (liczba przedsiębiorstw)	The changes of competitive position (quantity of companies) Zmiana pozycji konkurencyjnej (liczba przedsiębiorstw)		
	decrease spadek	absence brak	increase wzrost
Absence Brak	4	1	1
Insignificant increase Mało znaczący wzrost	0	4	7
Meninghful increase Znaczący wzrost	0	3	11

Source: author's own compilation.
 Źródło: badania własne.

As it is shown in the above table, the decrease in competitive position was solely experienced by firms not involved in the process of ecologisation. 19 firms experienced increasing competitiveness, of which 7 firms were not significantly and 11 firms – significantly engaged in implementing ecological changes.

CONCLUSIONS

Basing on the research conducted in 31 firms of the Wielkopolskie Province, it can be assumed that in the last five years the firms have increased their production, financial and sales potential and also experienced favourable changes in competitive position. The only cases of decreasing competitive positions happened in firms which had not implemented any pro-ecological changes. 18 firms observed increases in their competitiveness and they were significantly (the case of 11 units) or slightly (7 units) engaged in the process of ecologisation. The examined firms showed the greatest involvement in environmental protection in the areas of water economy and reducing waste.

Small firms implemented a number of improvements in waste disposal, medium-sized firms – in waste disposal and limiting the amount and toxicity of production sewers and big firms – in atmosphere protection and waste disposal. All the examined units showed significant pro-ecological changes with regard to water management. Small and medium-sized firms did not introduce any changes with respect to atmosphere protection, while big firms showed considerable involvement in this area. The examined firms which put into practice pro-ecological activities in the last five years have all seen increasing competitive positions.

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**DZIAŁALNOŚĆ PROŚRODOWISKOWA PRZEDSIĘBIORSTW
MLECZARSKICH W WIELKOPOLSCE CZYNNIKIEM KSZTAŁTUJĄCYM
ICH KONKURENCYJNOŚĆ**

Streszczenie. Działalność przedsiębiorstw mleczarskich jest związana z dużą ingerencją w środowisko naturalne. Udział tych firm w gospodarce narodowej jest znaczący i dlatego wprowadzanie zmian prośrodowiskowych w ich przypadku jest bardzo ważne, aby realizować zasady zrównoważonego rozwoju i polityki ekologicznej kraju. Badane przedsiębiorstwa wdrażają działania proekologiczne, szczególnie w przypadku gospodarki wodnej i zagospodarowania odpadów. Jedynie duże przedsiębiorstwa są zaangażowane w ochronę atmosfery. Proces ekologizacji wpływa na konkurencyjność tych przedsiębiorstw. Firmy, które nie wdrażały działań środowiskowych deklarowały zmniejszenie pozycji konkurencyjnej.

Słowa kluczowe: konkurencyjność firm, ochrona środowiska, przedsiębiorstwa mleczarskie, zarządzanie środowiskiem

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