

# IMPLEMENTING THE IDEA OF SUSTAINABLE DEVELOPMENT IN THE DAIRY ENTERPRISES IN POLAND

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## Abstract

*The conception of sustainable development is a relevant element of the country policy and in order to realize it, the whole society must be involved, including the processing industry which interferes in the natural environment through using its' resources and emission of pollution. One of the branches of the agro-food sector in Poland realizing the demand of that conception is the dairy industry. The aim of the elaboration is presentation of the activities realized in the dairy industries in the range of sustainable development. The first part describes the assumptions of that conception and implementing those assumptions in reference to the production firms. In the second part, based on the analysis of the results of the empirical studies, implementing the basic activities in the dairy industries were described, taking into consideration such elements like water and sewage management, waste management and protection of the atmospheric air. The basic tool for empirical research was a questionnaire. The surveys were carried out in 76 Polish dairy enterprises in Poland, including 20 small, 40 medium and 16 large ones, from over 200 ones performing in the time. The majority of the Polish dairy enterprises implements the pro-environmental activities, which are consistent with the conception of sustainable development. Beside the environmental aspect which concerns protection of the basic environmental components, those activities also realize the economic aspect, because their effect is saving the raw materials, the energy and the material used in the production process, which in turn translates to financial savings.*

**Keywords:** *dairy enterprises, pro-environmental activities, sustainable development*

**JEL classification:** *D24, L23, L53, L66*

# 1 Introduction

The beginning of the conception of sustainable development was the year 1987, when UN Commission on Environment and Development, called after the name of the chairwoman the Brundtland Commission, published a report 'Our common future'. It was a turning point in the approach to the natural resources management and to the protection of the natural environment. The Commission analyzed the main tendencies resulting from contraction of natural resources and economic development and presented the rules of the new approach to the development policy.

Implementing rules of sustainable development is influenced by behavior of all business entities, however, taking into consideration large exploitation of natural resources by enterprises and generating dangerous pollution, it is the approach of those organizations which is essential for efficiency of implementing the conception. It should be expected that the sustainable development of an enterprise should undergo merger of the environmental and economic and social aims and should competently coordinate the firm's activities in those three areas (Witek-Crabb, 2001).

The production enterprises base their activities on the access to the natural resources, without which it would be not possible to conduct the entire production cycle. Therefore, they use the natural resources like water, air, fossil fuels. Simultaneously, during the production process, pollution of natural components is generated. The proper management of natural resources ensures their less consumption, which amongst the overriding ecological effect, translates to lower financial costs.

The aim of the elaboration is presenting main assumptions of the conception of durable and sustainable development and on that basis showing the activities carried out in the dairy enterprises whose role is to implement the environmental aspect of that conception. In the research the examples of natural resources management in the dairy industry which result from the empirical studies carried out by the author are presented. Selection of the dairy industry is caused by great importance amongst all the industries of the agro-food sector and by large influence of the production process on the environment's condition. The dairy industries, which often use the natural resources inefficiently, simultaneously produce pollution of all environmental components. It is particularly connected with using the raw materials in order to receive energy. It is significantly adverse, taking into consideration their exhaustion and emission of harmful gases which are generated during burning of those materials.

The dairy industry is one of the basic sectors of the Polish agri-food sector, which, among other things, is due to the fact that milk is one of the main, ranked among the most universal and complete taking into consideration the nutritional values of the food products [Kapusta, 2012]. In addition, in the sales structure of the Polish food sector in 2012 the dairy products constituted 14,8% [Polska Agencja Informacji I Inwestycji Zagranicznych, 2013].

Polish dairy industry undeniably benefited from joining the European Union. In less than 10 years this branch multiplied the foreign trade balance three times. The modernization of the processing tools of the dairy enterprises thanks to Common Agricultural Policy, influx of the foreign investors and arriving of large distribution deeply changed the range of Polish dairy products [Wieczorkiewicz, 2013].

In the last years Polish dairy enterprises, especially in the technological part, went through profound modernization. Particularly rapid development took place before and soon after joining Poland to the European Union. Thanks to those investments, Polish dairy industry is one of the most modern branches of economy in Poland. 10 years after joining Poland into EU structures the investments in the dairy industry were based mainly on introducing new products and new solutions. Technologies for the dairy industry have been developing in three directions: increasing the effectiveness, lowering the production costs and environmental compatibility of the products [Rymanowski, 2012].

### **1.1 The assumptions of conception of sustainable development with detailed reference to the enterprises**

The increasing amount of people on the Earth is connected with the need for bigger production, larger natural resources' usage, larger pollution's emission. Therefore, it is an unfavorable aspect for the natural environment which translates to the social problems. In order to counteract those problems, the economic growth paradigm has been replaced by the durable and sustainable development paradigm.

The 'Environmental protection law' from 2001 provides that 'Sustainable development – is such a development in which in order to balance the development opportunities of particular societies or its' citizens – both the current and the future generations – the political, economic and social activities are integrated, with maintaining the environmental balance and the durability of the basic environmental processes'. From this definition it follows that the economic and civilization growth of the current generation should not take place at the expense of natural resources exhaustion and damaging the natural environment, for the sake of future generations which also will have rights to their own development.

(Urbaniec, 2001). It would mean a combination of the economic growth with special care for intactness of natural resources, which for some authors seem not to be possible to implement in reality (Mitlin, 1992).

Straight from the definition of sustainable development result three main features, which are sustainability, durability and self-holding. The conception of sustainable development, assuming a dialogue for decades between the citizens of the same country and between different countries, emphasizes the necessity to satisfy people's needs without belittlement of future generations' chances (Ionescu, 2011).

In order to implement the paradigm of durable and sustainable development efficiently, the 'invisible hand of the market' is not enough. There is a necessity to use the state intervention, e. g. in the form of institutional conditions or legal solutions. The argument for using the state interventionism in case of sustainable development is, among others, occurrence of negative external effects connected with economic and municipal activity of a human being with lack of cost internalization of those effects. It results in increased, from environmental protection point of view, production of particular goods, higher contamination of production, too low prices of the products polluting the environment, lack of economic factors to implement technical and technological changes aiming environmentally friendly production and lack of the incentives to promote recycling (Pieńkowski, 2011).

Ensuring implementation of rules of conception of sustainable development demands balancing simultaneously both the production and the consumption. The producers should use as little as possible the non-renewable resources and using the non-renewable resources should occur in a way enabling their recirculation, not allowing their dispersion in the form of waste. The enterprises should invest in new technologies which would allow to minimize the harmful influence of the production process on the natural environment. On the other hand, the sustainable consumption should be related with its' limiting and it should be based on more aware and deliberate action. The ecologically aware consumer is a subject who buys only the amount of goods which is absolutely necessary. Therefore, he plans his purchases trying to take into consideration amongst various other factors those connected with the necessity to protect the natural environment (Hadryjańska, 2015, p. 48).

The Brundtland Report allowed to spread the conception of sustainable development and make people realize that healthy economy depends on good environment, thus there is a necessity to implement the environmental policy into the general economic policy. It also strongly emphasized the fact that the eco-development means integration of the economics and ecology, taking into

consideration the strategy of a long-term development (Pessoa, Rui Silva 2009, Söderbaum, 2011).

The aims of sustainable development simultaneously constitute the aims of the ecological policy of the state whose assumptions appear in Article 5 of the Constitution of Republic of Poland, indicating that 'Republic of Poland is guided by the rule of sustainable development, meaning striving for: maintaining the possibility to renew the natural resources, rational using of the resources, limiting the onerousness for environment and not crossing the limits designated by its' resistance, maintaining its' biological diversity(...)'.

Creating the conception of sustainable development enabled a closer look at the discussion and difficult topics, such as distribution of wealth, equality, extreme poverty, helping the poorest countries, maximizing the profits at all costs, access to the basic goods constituting the existence of man, the quality of natural environment, environmental threats and internalization of the environmental costs. The assumptions of the conception seem to be basically good and the difficulties in their realization cannot deter and cause their rejection, because so far there is no better solution (Schrecker, 1996). However, it is also relevant that implementing the rules of sustainable development took place on all levels of social-economy system's functioning, starting from individual business entity, through particular industrial branches, ending with the macro-economic scale.

The enterprise is a relevant link in realization of the investment programs of the state's ecological policy and it is in the center of interest of the activities on behalf of environment's protection. Presently the implemented Ecological Policy of the State determines the essence of reconstruction of the production and consumption model towards reducing the pressure on the environment through suitable shaping of the pro-ecological patterns. For the enterprise entering into the mutual interdependencies with the natural environment it is beneficial to elaborate internal environmental policy consistent with ecological policy of the country, whose basics are connected with realization of the rule of sustainable development.

The production enterprises often perceive the activities connected with environment protection as a ballast which causes additional costs but is indispensable for legislative reasons. They are relatively rarely convinced by the arguments, even such that the proper approach to the natural resources economy may improve their competitiveness. Surely, the reason of that state is still inadequate ecological awareness of the managerial staff and other workers, but also limited financial resources of the organization. The knowledge about what may be done in order to increase the environmental parameters and to use natural resources more

efficiently in the production industries is also too little (Łuczka-Bakula, 2010), (Kudlak, 2010).

In 2000 the RP government adopted the 'Long-term strategy for durable and sustainable development – Poland 2025'. The document clarifies the aims of the policy in the range of all three basic pillars of sustainable development: social, economic and environmental. The overriding aim of this strategy is to provide Polish families increase in well-being, strengthening their material self-reliance and sense of security. The document determines inter alia the rules and methods of horizontal activities which refer to the enterprises. Amongst others, they are:

- consistent realization of the rule of liquidation of pollutions at source, m. changing the energy carriers, dissemination of cleaner technologies, minimizing of the energy and resources' usage, common normalization of emission in the industry, energetics and transport, introducing the product standards limiting the pollution emission to the environment in full cycle of product consumption;
- inclusion of the environmental costs to the economic calculation, especially in reference to the energy- and material-consuming production processes and wares and such transport forms which cause significant decrease of the environment's quality;
- development and implementing new economic instruments of environment management, including the common ecological insurances, the allowance markets and the ecological fees for the households and small family businesses;
- creating consistent and stable law-financial system compatible with the rule 'the polluter pays', providing effective financing the environment's protection;
- implementing solutions directed at providing ecological safety, including the biological and chemical ones, in the form of notification procedures or licensing of the production activities, trade, development of the rescue plans and notification of the people;
- diversifying of the energy sources towards ecologically demanded direction, including increase in the energy production from renewable resources;
- enlargement of the range of the environment impact assessment system and introducing strategic procedures for the assessment of impact on the environment;
- realization of the research programs aiming increasing the effectiveness of using the natural resources in the production processes, especially development of alternative fuels' technologies enabling replacing the petrochemical fuels based on carbohydrates;

- development of the mechanism of collecting data, controlling the environment condition and compliance with emission standards and implementing the monitoring and statistical systems to the processes and phenomenon not covered by the system data collection;
- common implementing the certification system of the enterprises.

## **2 Data and methods**

The aim of the research was to identify pro-environmental activities implemented in dairy enterprises that contribute to raising the level of sustainable development in the country. The basic research tool was a questionnaire composed of three parts. One of them concerned activities undertaken by dairy enterprises related to water and sewage management. The second part of the survey included questions about waste management, and the third part - questions related to the protection of atmospheric air.

A mail questionnaire was used for the research, and a personal interview was selected as a supporting and complementary method by means of telephone or direct conversation. The use of this form of information collection was necessary in cases where the respondents were unable to properly answer the questionnaire or when the questionnaire was partially completed by the respondents. In addition, telephone contact was also made at the stage of collecting the address data in order to supplement the data obtained from the Central Statistical Office.

The basic tool for the questionnaire survey was a questionnaire which, through a proper and thoroughly thought out structure, affected the achievement of the research objectives. The questionnaire allowed to obtain accurate information from respondents and to determine the structure of the survey as a form of research. It also enabled the unification of the storage system of collected data and improved the processing of data. The questionnaire was structured with the explicit purpose of the research. The questions contained in it were of closed nature and were presented to the respondents in exactly the same way as to the content and form.

After the questionnaire was completed, pilot studies were carried out in 10 enterprises to obtain information that would enable the basic research to be carried out correctly. The purpose of the pilot study was to obtain qualitative information. Pilot studies made it possible to check the developed research tool and revealed respondents' responses to individual questions in the questionnaire. The collected data allowed to describe the way of understanding the questions or revealing the feelings and emotions caused by individual questions. It was also necessary to test the prepared questionnaire in terms of completeness of the anticipated responses.

The questions have been checked in terms of their suitability for achieving the objectives of the study.

Some questions should have been answered yes-no, and some of the answers were assigned an order scale, in order to assess the significance of a given factor.

The survey data received has been processed in Excel. The number of enterprises has been assigned the appropriate response rate.

### **3 Results and Discussions**

The empirical research was conducted using the questionnaire given in 2015 to the 76 Polish dairy enterprises, including 20 small, 40 medium and 16 large ones, from over 200 functioning at the time. The smallest firms, employing up to 9 workers were deliberately omitted. It was assumed that those firms run such a small production that taking care of environment protection's issues does not constitute fundamentally the frame of their activity. The object of the study were the pro-environmental activities in the dairy enterprises, taking into consideration water and sewage management, waste management and atmospheric air protection.

It was stated that over 80% of enterprises introduce the activities from the range of resources management, and only 5,5% of the dairy industries do not intend to introduce such activities, even in the distant future. The main reason for such situation are the financial considerations and low ecological awareness of the management staff. The beginning of especially intensified pro-environmental activities occurred after 2000.

Because the majority of the researched enterprises run active environment protection in their range, recognition of motivation of such activity is interesting (Tab. 1). In order to describe the reasons of taking pro-environmental activities the interviewers graduated them from the least important, through the moderately important, ending with the most significant. Over 70% of enterprises are involved in the environment's protection in order to adjust to the legal provisions. For over half of the enterprises the growth of the effectiveness and decreasing of the production costs as a result of pro-environmental policy were important, and for over 30% - the possibility to improve their image and maintaining their position on the market and meeting consumers' requirements. Simultaneously, over half of the respondents defined the firm's image improvement as insignificant reason for taking pro-environmental activities (such distribution is caused by the possibility to mark more than one answer by the respondents).

**Table 1 The reasons for taking actions from the range of natural resources management in the dairy enterprises**

Reason for undertaking proenvironmental activities	the most important		moderately important		minor important	
	Number of enterprises	Percentage of enterprises	Number of enterprises	Percentage of enterprises	Number of enterprises	Percentage of enterprises
<b>requirement to adapt to legal regulations</b>	57	75	9	11,8	10	13,2
<b>meeting requirements and expectations of consumers</b>	31	40,8	10	13,2	45	46
<b>maintaining the market share</b>	27	35,5	32	42,1	17	22,4
<b>improvement of company's image</b>	26	34,2	19	25	31	40,8
<b>increase in efficiency</b>	40	52,6	7	9,2	29	38,2
<b>reduction of production costs</b>	39	51,3	20	26,3	17	22,4
<b>improvement of company's competitive edge</b>	18	23,6	22	28,9	36	47,5
<b>general trend in the sector</b>	15	19,7	22	28,9	39	51,4

*Source:* Own study.

The studied enterprises determined the priorities concerning the resources management aiming protection of the main environment components (Tab. 2). Due to the character of the run production activity the most relevant in the dairy industry (for over 90% respondents) is to reduce the load of the wastewater pollution. For over 80% of the enterprises it is very significant to reduce the amount of waste and to limit the thermal and electric energy usage. Over 60% of the research enterprises determined that the prior activity in their enterprise is to increase the ecological awareness of the workers and to increase the production's automatization level.

**Table 2 The prior activities concerning resources management in the dairy enterprises**

Prior proenvironmental activities	Number of enterprises	Percentage of enterprises
Raising the environmental awareness of employees	49	64,5
Increased degree of automatization	52	68,4
Installation of filters reducing emissions to the atmosphere	27	35,5
Less use of raw materials for the production process	40	52,6
Reducing the amount of waste	66	86,8
Reduction of sewage pollutants load	70	92,1
Reduction of amount of heat and electricity	62	81,6

*Source:* Own study.

In the dairy industries the water resources are especially intensively used because they are demanded on various production stages of almost all products' sorts. The dairy branch uses about 27,6% of water (according to the data from 2010) compared to the whole food sector. Moreover, large amounts of wastewater of big pollution load, variable pH, with high content of general suspensions, nitrogen, phosphorus, proteins and fats are produced.

The dairy industries, in order to improve the water and sewage management, introduce technical-organization solutions which allow to save the water resources and to decrease the amount of wastewater created during the production circle. According to the research carried out in 2003 and 2015 in the dairy industries throughout the country it was possible to describe such activities and also to observe the changes which relatively took place in that period.

Over 70% of analyzed industries indicated that in 2015, in order to decrease the amount of water which leaked in an unchecked way, use full control of the armature, valves, taps and gaskets (Table 3). In 2003 slightly over half of the industries used such solution for improving the water and sewage management. Over 60% of the researched enterprises in 2015 used the washing hoses with pistol grips, efficient pipe connections and the measuring devices controlling the water usage. 12 years earlier there were much fewer of such firms. About 68% of the dairy enterprises in 2015 carried out a strict control of the milk leakage and also

properly organized the washing and cleaning of the devices, meaning immediately after finished process with water at the suitable temperature etc. In 2003 only 46% of the enterprises used such solutions.

**Table 3 The ways of limiting the water usage and producing the wastewater in the dairy enterprises in 2015 and 2003**

Ways to reduce water consumption	2015		2003	
	Number of enterprises	Percentage of enterprises	Number of enterprises	Percentage of enterprises
Using pistol handle hoses for washing				
The full control of fittings, valves, taps and gaskets and their regulation and exchanging on new	54	71	41	53,9
Propely conducted washing machines	51	67,1	35	46
Applying welded connectors of pipes	53	69.7	44	57,9
Strict control of milk leakage	51	67,1	34	44,7
Applying measuring instruments and steering of level of liquid	47	61,8	23	30,3

*Source:* Own study.

The undesirable effect in the process of dairy products' production are the wastes which must be suitably managed. In the dairy industries the main groups of waste are the organic post-process waste, used packaging and the sewage sludge, meaning the leavings after wastewater treatment.

The main way of waste management in the dairy industry in 2015 was minimizing its' amount and recycling (about 80% of the enterprises indicated that they use such method) (Table 4). Over half of the dairy enterprises in that time deposited the waste in a landfill and used it for fodder. In 2003 the modifications of the technologies were also basic way to limit the produced waste (about 50% of units used such method), however, over 70% of the respondents declared using the waste for the fodder.

Table 4 **The ways of waste management in the dairy enterprises in 2015 and 2003**

Method to minimize waste levels	2015		2003	
	Number of enterprises	Percentage of enterprises	Number of enterprises	Percentage of enterprises
Deposit on landfills	40	52,6	44	57
Minimizing quantities eg through technological and product modifications	66	86,8	36	47,4
Destination on animal feed	46	60,5	50	65,8
Recycling	58	76,3	39	51,3

*Source:* Own study.

Implementing the pro-environmental activities in the dairy enterprises also concerns protecting the atmospheric air. In the dairy enterprises the most significant point source of the pollution emission to the atmosphere constituting a threat for the environment are the boiler rooms. In the dairy industry still the most common are the coal-fired heating boilers, however, they start to be gradually replaced by the gas or oil furnaces. The relevant source of emission in the dairy industry are the coolers which are often based on ammonia. The ammonia emissions have the form of uncontrolled escapes and they are also connected with venting systems.

In the name of the atmosphere protection the dairy enterprises (over 70% of those organizations) used in 2015 mainly the low-calorie fuels and they limited the dust by using the cyclone filters. About half of the enterprises constantly maintained the potential fugitive emission sources (e.g. from compressor gasket, orifices, valves etc.), used modern combustion technologies and passed to the gas heating. In 2003 almost all of the enterprises passed to the gas heating and used the capture systems (hoods, shielding systems) in order to limit the point emissions. Over half of the enterprises in that time constantly maintained the potential sources of the fugitive emissions, limited the dust by using the cyclone filters, used modern combustion technologies.

## 4 Conclusion

The idea of sustainable development constitutes a basis of the country's and European Union's policy. In implementing its' assumptions, so that their influence can be observable in the real economic, environmental and social effects, all of the subjects must participate, especially the production enterprises. The dairy enterprises can be classified to such subjects.

The majority of the Polish enterprises implement the pro-environmental activities which are consistent with the conception of sustainable development. Beside the environmental aspect which also concerns protection of the basic environmental components, those activities also realize the economic aspect because their effect are saving the resources, energy and materials used in the production process which translates to the financial savings. It was confirmed by the respondents' answers to the question about the main reason for introducing such activities. It turned out that the dairy enterprises are guided mainly by the legislative provisions, but also by the growth of the effectiveness and lowering the production costs.

Due to the character of the production activity the most significant in the dairy industry is to reduce the wastewater pollution load. Furthermore, it is extremely relevant to suitably manage waste and to reduce the heat and electric energy used in the production process.

The author, comparing the period directly preceding joining Poland to the EU with the beginning of the second decade of the XXI century, was able to observe the changes taking place in the dairy industries' approach to the environment's protection. Before joining Poland to the European Union (in 2003) the dairy enterprises used fewer ways to improve the water-sewage management and the waste management. However, the technological solutions whose aim was to protect the air from gas and dust pollutions were already implemented in 2003.

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