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**REGIONAL CHANGES IN MILK PRODUCTION IN POLAND  
– STATE AND REASONS OF OCCURRENCE**

*REGIONALNE ZMIANY W PRODUKCJI MLEKA W POLSCE  
– STAN I PRZYCZYNY ICH WYSTĘPOWANIA*

**Key words: milk production, dairy farms, regions**

*Słowa kluczowe: produkcja mleka, gospodarstwa mleczne, regiony*

**Abstract.** The paper discusses changes taking place in the area of milk production and at dairy farms in the years 2004-2011 in particular regions of Poland. Moreover, an attempt is undertaken to answer to the following question: What factors and to what degree determine development of cattle breeding and milk production in particular regions of Poland? Conducted surveys and analyses evidence that regional polarisation in terms of milk production in Poland is growing. Significant increase in the production of milk occurred in Podlaskie province, where purchases of milk grew from 1 787 384 166 kg in quota year 2004/2005 to 2 558 160 176 kg in quota year 2010/2011. Milk production is successively falling in Podkarpackie province. Main barriers hindering development of dairy farms include significant capital requirements (connected with construction or modernisation of livestock buildings) as well as considerable difficulties related to usage of structural funds designated to livestock buildings.

### **Introduction**

Poland has relatively good natural conditions for breeding of cattle and production of milk. As the country is dominated by lowlands, cultivation of fodder plants used in cattle breeding does not encounter significant limitations [Falkowski 2001]. The country lies in an area of moderate climate, considered to be most favourable for dairy cattle breeding. A certain natural limitation to dairy cattle breeding are insignificant resources of water and relatively low precipitation, which influences yielding of fodder plants (mainly of grasslands and corn). Among other things, it is thanks to favourable natural conditions for milk production in Poland that it occupies (in particular years) 11<sup>th</sup>-13<sup>th</sup> place in the world in terms of milk production. In years 2003-2009, overall production of milk in our country successively demonstrated a growing trend, despite the operating production quota system. Production growth, unfortunately accompanied by still low consumption of milk and dairy products, resulted in increased exports. The volume of dairy products turnovers in 2003 amounted to euro 278.4 mln, whereas in 2009 it was already as high as euro 836.2 mln [Seremak-Bulge 2011]. It ought to be emphasised that changes in milk production and processing in Poland were mainly influenced by a wide range of economic factors. An important factor causing growth in global production of milk in Poland (in years 2004-2008) was better production profitability because of increasing prices in milk purchases. At the beginning of 2004, the average price in milk purchases was nearly 100% lower than the EU average (15 states). After 1 May 2004, prices of milk in Poland began growing rapidly and at the beginning of 2005 they became much closer to prices offered in the countries of Western Europe [Seremak-Bulge 2005]. The first full year of Poland's membership in the EU (year 2005) was the best period for milk producers in terms of price relations. The situation changed in 2010. According to a survey conducted by IFCN, growing prices of labour and means of production made the costs of milk production at a typical Polish farm comparable with West European farms [Hemme 2011]. Moreover, the supported sustainable (balanced) development of European farming is (to a certain degree) in opposition to economic reality. Much deeper specialisation of agricultural farms is observed in Poland as well as concentration of specific kinds of agricultural production in particular regions, which is not really in line with the principles of sustainable development. This process is particularly evident in the dairy sector.

The objective of this article is to discuss changes taking place in the area of milk production and at dairy farms in years 2004-2011 in particular regions of Poland. Moreover, an attempt is undertaken to reply to the following question: What factors and to what degree determine development of cattle breeding and milk production in particular regions of Poland? The above questions are replied based on

figures from the Polish milk production quota system and surveys conducted at selected Polish gminas (principal units of administrative division) within the project of the Ministry of Science and Higher Education entitled: Social- economic conditionings of the regional changes in the production and processing of milk, No. 0890/B/H03/2010/39.

### Theories of agricultural activity location

Development of any kind of economy, irrespective of its spatial organisation (national, regional or local), is determined by establishment and activity of business entities in a specific area. According to Kazimierz Kuciński: “The fundamental forms of existence are the time and space” [2004]. Entrepreneurs (including farmers), under the influence of economic, social and cultural factors, make decisions to conduct (or develop) a given business activity at a certain place and time. To analyse, explain and forecast movements of various kinds of business activity (at a given time<sup>1</sup>), so-called location theories<sup>2</sup> have been formulated and developed so far. Beginnings of the location theory date back to the 18<sup>th</sup> century and its elements may be found as early as in the works of classical political economics (Ricardo and Smith) or in the school of physiocracy (de Montesquieu and Quesnay). However, the location theory as a separate subject developed as late as in the 19<sup>th</sup> century. The first period during which the issue of production location can be discussed as a systematised theory was the first half of the 19<sup>th</sup> century and the activity of Johan Heinrich von Thünen who formulated the theory of agricultural production location in 1826. Thünen’s theory was developed as a generalisation of the results of years-long empirical research on usage of land nearby the town of Thelkow in the Maklemburg Lake District. Thünen’s model presents hypothetical distribution of various kinds of agricultural production around one central sale market, namely the city. Thünen’s model implies that agriculture creates concentric circles (rings) around the central unit of the city, varying in terms of land utilisation methods (segments of agricultural production). Heaviest and most perishable products will be produced nearest the sale market. Because of many simplifications assumed in Thünen’s model and changing external conditions such as falling costs of transport, growth in market reach of agricultural raw materials and food products thanks to reduced time of transport (better roads and faster transport), expansion of cities caused by gradual absorption of adjacent rural areas, greater possibilities related to the movement of people and capital as well as state interventionism (also in the area of agriculture), conclusions from this model do not find practical application at all places. Currently, apart from the discussed Thünen’s model, other methods are applied in theoretical discussion of the principles underlying agricultural production, including utilisation of land. Models of spatial utilisation of land are used which assume that agricultural production in a given area depends not only on external conditions (distance from the sale market, costs of transport, prices of agricultural products, state intervention), but also on internal conditions related to a given farm. The most important ones include kind of production conducted so far and its volume, labour resources at the farm, its equipment with machines, devices and buildings, arable land resources and their quality, layout of fields at the farm.

Decisions on locating business entities are determined by various factors. In agriculture, the area of free decisions (including those related to location) is relatively narrow. Agricultural farms (enterprises) usually already exist, and the rate of establishment of new ones is 2-3% per annum. As a consequence, farmers usually make decisions related to the segment of production than location of the entity in physical terms [Woś 1996]. An important position in the Polish agribusiness sector is occupied among agricultural farms (enterprises) by entities dealing with dairy cattle breeding and production of milk. The aforementioned production has certain specific features and related consequences. The most important characteristics of milk production at agricultural farms include:

High labour and capital intensity of this activity as compared with other kinds of activity which may be conducted at agricultural farms. In this kind of activity, human labour comes down to daily feeding, care and milking of dairy cows. As a result, in this case it is difficult for a farmer to take time off during the summer break or holiday periods. Moreover, investment outlays needed for dairy cattle breeding are very high. This results above all from the fact that animals need to be kept in livestock buildings. Investment expenditures related to a modern livestock building for 60-120 dairy cows are above one million PLN.

**Clear relation of milk production with plant production at agricultural farms.** Production of milk requires fodder which can only be consumed by animals (green fodder, silage, hay), which must usually be produced at the agricultural farm as it is not easily available on the market. This involves the need to possess (use) considerable land resources. On the other hand, sufficient resources of land allow proper utilisation of organic fertilisers.

<sup>1</sup> In economic geography, some authors propose that the notion of space-time ought to be used. This opinion is expressed, for example, by Hägerstrand, Kowalski [1977]

<sup>2</sup> An extensive discussion of the location issues is contained in: Domański [2004], Kuciński [2004].

**Production of high quality milk is only (economically) justified – which is quite difficult.** This is caused by the fact that during this kind of activity the farmer bases on animals whose health condition may change. It is difficult to guarantee perfect conditions for the animals and prevent diseases. In some cases, it is also difficult to diagnose (in particular during the first stage) an illness which influences condition of the mammary gland. In consequence, it is difficult to separate milk with an increased number of somatic cells from milk with correct parameters.

**Necessary cooperation of the farmer (producer) with a milk processing entity (dairy).** It is difficult to conduct direct sales or processing activity at a dairy farm. This is caused by natural characteristics of milk, and above all from the fact that milk may only be consumed during a short period of time.

### Regional changes in milk production in Poland in years 2004 -2011

Dairy farms in Poland are continuously developing and increasing the scale of activity. This is evidenced by statistical data and the business reality (Tab. 1). In quota year 2004/2005, the number of farmers producing milk for sale was 323 664, whereas in quota year 2010/2011 it was only 186 820 (decrease by 46%). Global production of milk (including commodity production) during the analysed period increased; therefore, the average annual milk quota per one supplier grew from 35 356 kg to 68 719 kg.

**Table 1. Changes in milk production in Poland in quota years 2004/2005 – 2010/2011**

*Tabela 1. Zmiany w produkcji mleka w Polsce w latach kwotowych 2004/2005 – 2010/2011*

Specification/ <i>Wyszczególnienie</i>	Quota year/ <i>Rok kwotowy</i>		Change/ <i>Zmiany</i> [%]
	2004/2005	2010/2011	
Volume of milk deliveries [thous. kg]/ <i>Wielkość dostaw mleka [tys. kg]</i>	8 346 603	9 106 935	9.1
Degree of quota utilisation by wholesale suppliers/ <i>Stopień wykorzystania kwoty przez dostawców hurtowych [%]</i>	99	95	-4.0
Number of wholesale suppliers [thous.]/ <i>Liczba dostawców hurtowych [tys.]</i>	311	168	-46.0
Number of direct suppliers [thous.]/ <i>Liczba dostawców bezpośrednich [tys.]</i>	76	15	-80.3
Average quota per wholesale supplier [thous. kg]/ <i>Średnia kwota w przeliczeniu na dostawcę hurtowego [tys. kg]</i>	27	57	111.1
Average quota per direct supplier [thous. kg]/ <i>Średnia kwota w przeliczeniu na dostawcę bezpośred. [tys. kg]</i>	5,9	6,5	10.2

Source: own study based on Agricultural Market Agency data

*Źródło: opracowanie własne na podstawie Agencji Rynku Rolnego*

The changes are occurring with different dynamics in particular Polish provinces. Generally, one may state that the production and processing of milk in Poland is focused in the central and north-eastern parts of the country. In five provinces (Podlaskie, Wielkopolskie, Mazowieckie, Łódzkie, Lubelskie), in quota year 2010/2011 dairies purchased and processed over 74% of commodity milk. It is noticeable that the process of milk production concentration in these provinces (except for Mazowieckie province) is growing successively (table 2). Particularly significant growth occurred in Podlaskie province, where purchases of milk increased from 1 787 384 166 kg in quota year 2004/2005 to 2 558 160 176 kg in quota year 2010/2011 (by 30%). During the analysed years, 11-10 entities dealing with milk purchases operated in Podlaskie province. On average, from 162 489 thousand kg of milk (quota year 2004/2005) to 255 816 thousand kg of milk (quota year 2010/2011) was delivered to one entity dealing with milk purchases. What is more, the number of milk suppliers per dairy considerably decreased in Podlaskie province. On average, 3 982 suppliers fell per a purchasing entity in quota year 2004/2005, whereas in quota year 2010/2011 their number was already 3 308. Two largest dairies are located in Podlaskie province. In quota year 2010/2011, “Mlekpól” Grajewo dairy purchased 1 280 298 thousand kg, which accounted for over 14% of milk purchased in Poland. The number of suppliers at the aforementioned dairy was 14 042, which suggests that average deliveries of milk per farm to that dairy were 91 177 kg.

Table 2. Changes in milk production quoting in years 2004-2010\*

Tabela 2. Zmiany w kwotowaniu produkcji mleka w latach 2004-2010

Provinces/ Województwa	Quota year/Rok kwotowy 2004/2005			Quota year/Rok kwotowy 2010/2011		
	purchases of milk/skup mleka [kg]	number of wholesale suppliers/ liczba dosta-wców hurto-wych	average purchases of milk per supplier during the year/przeciętny skup mleka od dostawcy w roku [kg]	purchases of milk/skup mleka [kg]	number of wholesale suppliers/ liczba dostawców hurtowych	average purchases of milk per supplier during the year/przeciętny skup mleka od dostawcy w roku [kg]
Podlaskie	1 787 384 166	43 805	40 803	2 558 160 176	33 076	77 343
Mazowieckie	1 780 313 006	66 405	26 810	1 561 811 452	29 269	53 360
Wielkopolskie	1 110 533 347	18 795	59 087	1 188 111 457	12 550	94 672
Łódzkie	830 507 654	44 158	18 808	856 474 065	24 485	34 979
Lubelskie	645 595 053	46 905	13 764	631 736 392	21 511	29 368
Kujawsko- pomorskie	450 994 071	13 852	32 558	570 098 137	7 970	71 534
Warmińsko- mazurskie	372 769 406	9 083	41 040	281 797 681	4 021	70 085
Świętokrzyskie	231 198 624	21 690	10 659	230 611 470	10 016	23 025
Pomorskie	206 748 726	3 658	56 520	187 163 595	2 137	87 572
Śląskie	189 638 048	12 305	15 411	167 721 491	5 095	32 919
Opolskie	185 560 712	3 664	50 644	255 811 894	2 257	113 351
Małopolskie	165 360 558	16 602	9 960	165 503 009	7 272	22 758
Podkarpackie	127 940 960	17 008	7 522	98 898 706	6 117	16 168
Zachodnio- pomorskie	125 318 434	1 223	102 468	126 095 614	798	158 095
Dolnośląskie	85 922 241	3 776	22 755	91 821 843	1 036	88 650
Lubuskie	41 810 383	735	56 885	96 937 220	625	155 071

\* Purchases of milk conducted by particular dairies located in the given voivodeship/Skup mleka prowadzony przez poszczególne mleczarnie w danym województwie

Source: see tab. 1

Źródło: jak w tab. 1

## Economic and organisation factors influencing development of milk production at agricultural farms

An analysis of regional changes causes the following question: Why are dairy farms developing in certain parts of Poland despite relatively favourable natural conditions beneficial to milk production? A survey was conducted in 106 gminas, where a decrease in the production of milk was recorded in years 2004-2010 despite relatively beneficial natural conditions.

The survey was conducted with participation of gmina employees dealing with issues related to agriculture. Results of the survey suggest that:

- local government and the policy pursued do not contribute to development of agricultural production in gminas;
- at the analysed gminas (72%), the factor determining further development of milk production at agricultural farms was the degree of investments incurred so far in connection with this segment of production; farmers who in years 2000-2006 increased milk production per farm are continuing investments in this production segment; it ought to be emphasised that the percentage share of such farmers at the analysed gminas was relatively insignificant;
- the main model of farms, in a five-year perspective (at 68% of the analysed gminas) will be a farm focused on plant production (grain + rapeseed) and work outside the farm; factors which cause this situation include first of all high capital requirements related to milk production (need to invest in livestock buildings and their equipment) as well as emerging opportunities related to work outside the farm;

**Table 3. Barriers hindering development of dairy farms**  
**Tabela 3. Bariery rozwoju gospodarstw mlecznych\***

Specification/Wyszczególnienie	Percentage of responses/Udział odpowiedzi [%]				
	1	2	3	4	5
Complicated procedures of applying for EU funds and preferential loans/Skomplikowane procedury ubiegania się o środki z funduszy europejskich i kredytów preferencyjnych				6	18
Growing requirements with respect to environment in the agricultural sector/Rosnące wymagania rolnośrodowiskowe					15
Method of calculating direct subsidies [per ha of AL]/Sposób naliczania dopłat bezpośrednich [na 1 ha UR]					8
Lack of possibilities to purchase land/Brak możliwości zakupu ziemi	18	25	19	8	8
Lack of successors at agricultural farms/Brak następców w gospodarstwach rolniczych	8	34	41	24	8
Possibility to work outside the farm/Możliwość pracy poza gospodarstwem				6	
Lack of respect for the profession of farmer in the local community/Brak poszanowania w lokalnym społeczeństwie dla zawodu rolnika					12
Low profitability of agricultural production/Nisko opłacalna produkcja rolnicza	21	11	29	35	10
Compact construction in villages (lack of possibilities to construct livestock buildings)/Zwarta zabudowa wsi (brak możliwości budowy budynków inwentarskich)	9			12	18
Lack of own funds/Brak własnych środków	44	30	11	9	3

\* respondents specified barriers, grading them from most important ones (1 – most important, 5 – least important)/respondenci wskazywali bariery, szeregując je od najważniejszych (1 – najważniejsza, 5 – najmniej ważna)

Source: own study

Źródło: opracowanie własne

- the main barriers hindering development of farms dealing with milk production include: 1) insignificant possibilities to increase farm area (purchase or lease of arable land), 2) high capital requirements (related to construction or modernisation of livestock buildings) and significant difficulty in using structural funds allocated to livestock buildings (it is much easier to take advantage of funds for purchase of tractors and machines), 3) relatively unprofitable production of milk in relation to the capital and labour employed, 4) lack of successors willing to continue milk production (Tab. 3).

## Conclusions

The number of commodity dairy farms in Poland is falling successively. In quota year 2004/2005, the number of farmers producing milk for sale was 323 664, whereas in quota year 2010/2011 there were only 186 820 of them (decrease by 42%). However, growth in overall milk production in Poland is observed, which indicates an increase in production volume per farm.

Polarisation of regions in terms of milk production development in Poland is growing. Particularly distinct growth in the production of milk occurred in Podlaskie province, where purchases of milk grew from 1 787 384 166 kg in quota year 2004/2005 to 2 558 160 176 kg in quota year 2010/2011. Milk production is successively falling in Podkarpackie province. In quota year 2004/2005 it was 127 940 960 kg, whereas already in quota year 2010/2011 it was only 98 898 706 kg, along with considerably falling number of dairy farms.

Surveys conducted in purposefully selected 106 gminas evidenced that the main barriers in the development of dairy farms were significant capital requirements (connected with construction or modernisation of livestock buildings) and significant difficulty in using structural funds allocated to livestock buildings. Another factor limiting development of dairy farms are insufficient possibilities to increase the farm area (purchase or lease of arable land).

Ensuring development of dairy farms in Poland requires activities which will recognise specific characteristics of milk production (high capital and labour intensity of production). Special purposes funds (structural funds or long-term low interest loans) ought to be granted to construction or modernisation of livestock buildings, which will contribute to increasing the scale of production and reducing nuisance of labour. The applied method of calculating direct subsidies – per hectare of arable land, irrespective of the kind of conducted production – will result in farmers renouncing from conducting labour intensive activities (including production of milk).

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## Streszczenie

*Przedstawiono zmiany zachodzące w produkcji mleka oraz w gospodarstwach mlecznych w latach 2004-2011 w poszczególnych regionach Polski. Podjęto próbę odpowiedzi na pytanie: jakie czynniki i w jakim stopniu determinują rozwój chowu bydła i produkcji mleka w poszczególnych regionach Polski.*

*Z przeprowadzonych badań wynika, że proces polaryzacji regionów w rozwoju produkcji mleka w Polsce zwiększa się. Wyraźny wzrost produkcji mleka miał miejsce w województwie podlaskim, w którym skup mleka zwiększył się z 1 787 384 166 kg w roku kwotowym 2004/2005 do 2 558 160 176 kg w roku kwotowym 2010/2011. Produkcja mleka sukcesywnie zmniejsza się w województwie podkarpackim. Głównymi barierami w rozwoju gospodarstw mlecznych są duże potrzeby kapitałowe (związane z budową bądź modernizacją budynków inwentarskich) i duże utrudnienia korzystania z funduszy strukturalnych wykorzystywanych na budynki inwentarskie.*

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