

**INFLUENCE OF MILK PRODUCTION LIMITS
ON THE DAIRY SECTOR IN THE PROVINCE
OF WARMIA AND MAZURY**

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A b s t r a c t

This paper analyses the influence of the implementation of milk quotas on the dairy sector and the situation of milk producers in the province of Warmia and Mazury and describes the changes taking place in the milk market from 2004–2009 in milk production, processing and management. The research material originated from a questionnaire-based survey conducted by the Chair of Economic and Regional Policy of the University of Warmia and Mazury in Olsztyn in close collaboration with the Agricultural Market Agency (AMA). The survey encompassed 313 milk producers from the province of Warmia and Mazury during the quota year of 2009/2010. The remaining data referenced in the publication originated from materials developed by the AMA, the Agency for Restructuring and Modernisation of Agriculture (ARMA), the Ministry of Agriculture and Rural Development (MoA) and the Central Statistical Office (GUS).

The milk production quota system was intended to prevent excessive supply of raw material on the market and trigger concentration processes in the dairy sector. On the basis of the AMA studies results, it was determined that in the six years following milk production quotas, almost 3,500 producers withdrew from the market. Additionally, an analysis of data made available by the AMA indicates that the volume of milk produced has been constantly increasing (during the years 2004–2010 the volume of wholesale milk sold from a single supplier per year increased by 58.11% in the area of the province of Warmia and Mazury).

**WPLYW LIMITOWANIA PRODUKCJI MLEKA NA SEKTOR MLECZARSKI
W WOJEWÓDZTWIE WARMIŃSKO-MAZURSKIM**

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Słowa kluczowe: system kwot mlecznych, wspólna polityka rolna, produkcja mleka.

Abstrakt

W pracy przeanalizowano wpływ wdrożenia systemu kwotowania produkcji mleka na sektor mleczarski oraz sytuację producentów mleka w woj. warmińsko-mazurskim. Podjęto też próbę charakterystyki zmian zachodzących na rynku mleka w latach 2004–2009 w dziedzinie produkcji, przetwórstwa i zarządzania. Materiał badawczy wykorzystany w pracy pochodził z ankiet przeprowadzonych przez Katedrę Polityki Gospodarczej i Regionalnej Uniwersytetu Warmińsko-Mazurskiego w Olsztynie w ścisłej współpracy z olsztyńskim oddziałem Agencji Rynku Rolnego (ARR). Badaniami objęto 313 producentów mleka z woj. warmińsko-mazurskiego w roku kwotowym 2009/2010. Pozostałe dane przytoczone w publikacji pochodziły z materiałów opracowanych przez ARR, Agencję Restrukturyzacji i Modernizacji Rolnictwa (ARiMR), Ministerstwo Rolnictwa i Rozwoju Wsi (MRiRW) oraz GUS.

System kwotowania produkcji mleka miał przeciwdziałać nadmiernej podaży surowca na rynku oraz wzmóc procesy koncentracji w sektorze mleczarskim. Na podstawie wyników badań ARR stwierdzono, że w ciągu sześciu lat od wprowadzenia limitów produkcji mleka z działalności na tym rynku wycofało się blisko 3,5 tys. producentów. Ponadto z analizy materiałów udostępnionych przez ARR wynika, że stale wzrastała ilość produkowanego mleka (w latach 2004–2010 na obszarze woj. warmińsko-mazurskiego wielkość hurtowo sprzedanego mleka rocznie od 1 dostawcy wzrosła średnio o 58,11%).

Introduction

Milk quotas, next to direct subsidies, are among the fundamental instruments functioning within the framework of the Common Agricultural Policy (CAP). Milk production limits were introduced in 1984 to inhibit excessive milk production development in the European Economic Community (EEC) member states. The integration of Poland into the European Union (EU) and integrating the agricultural sector with the CAP mechanisms initiated a process of extensive transformation of Polish agricultural producers. The milk market has seen extensive transformations since the system of milk quotas began in 2004 (KASZTELAN 2009).

Operating a farm requires not only extensive labour input but also market sensitivity. This principle is not just a consequence of Poland's accession to the EU, but is also a determining factor for continual economic development, including an evolution in the perception of the function of agriculture and changes in consumer expectations (REKLEWSKI, RUNOWSKI 2005). Intensified adjustment processes concerning the structure and scale of animal production have been accelerated by subjecting Polish agriculture to the CAP principles (ZIĘTARA 2006).

Characteristics of the studied area

A questionnaire-based survey of 313 dairy farmers from all counties of the province of Warmia and Mazury was conducted. Analysis of the responses to the questions took into account the division of the surveyed population into

groups according to milk production volumes to obtain in-depth opinions from individual communities. The division into groups of very small (25 respondents with production not exceeding 70,000 kg of milk per year), small (94 respondents with production ranging from 71,000 to 150,000 kg of milk per year), medium (143 respondents with production ranging from 151,000 to 350,000 kg of milk per year), large (37 respondents with production ranging from 351,000 to 700,000 kg of milk per year) and very large (13 respondents with production exceeding 700,000 kg of milk per year) producers was made based on the product of the maximum milk productivity of cows in the province of Warmia and Mazury in 2009 (7,000 kg of milk per year) and the upper value of the ranges of heads per herd presented in the questionnaire (10, 20, 50, 100 and over 100 heads of dairy cows, respectively).

The low level of infrastructure development, shortage of human resources and poor development of enterprise are the specific characteristics of agriculture in the province. Additionally, farmers are challenged by unfavourable terrain structure, diversification of soils and a relatively short vegetation period. Unfavourable natural conditions require the possession of specialised technical facilities, which also generates higher agricultural production unit costs and results in lower profitability as compared to the other regions of the country (Development strategy of the province of Warmia and Mazury by 2020. 2005). A relatively good farm size structure is the fundamental strength of agriculture in the province of Warmia and Mazury. The average farm size in the province in 2010 was 22.95 ha, which was over twice the national average (Agencja Restrukturyzacji i Modernizacji Rolnictwa).

The surveys indicate that more than half of the dairy farmers from the province of Warmia and Mazury possessed farms ranging from 21 ha to 50 ha. Farms with areas ranging from 51 ha to 100 ha were owned by almost 28% of the respondents. Large area farms exceeding 100 ha were owned by slightly over 12% of the respondents. An analysis of the survey results confirmed that along with an increase in the level of production, the owned area of the farmed also increased. Larger production scales involved increasing the number of heads per herd, which required increasing the area of agricultural land owned.

According to the literature, farms keeping a minimum of 10 dairy cows have opportunities for development; however, this group of suppliers has the largest problems with establishing favourable cooperation with dairy plants (ZIĘTARA 2009). The largest herds, consisting of 51–100 heads of cattle were owned by 10.58% of the respondents. The largest group of milk producers surveyed (67.31%) possessed herds of 20 to 50 heads of dairy cows. The smallest herds (consisting of a maximum of 10 heads of cattle) were owned by fewer than 2% of the farms surveyed.

Milk is one of the more important products in human nutrition. According to the majority of specialists, milking is the most important job in maintaining dairy cows. All mistakes or negligence during milking influence, among others, the productivity and quality of milk and, consequently, may have a large influence on decreasing the profitability of milk production (OPRZĄDEK 2005). In recent years, the methods of obtaining milk have changed from manual milking to using advanced automated milking units.

Analysis of the results obtained from the survey conducted indicates that the most traditional technology, i.e. hand milking, was applied by only 19 milk producers. Pipeline milking devices and a milking parlour system were indicated as the main technique for obtaining milk applied by suppliers in the province. Evident progress in milking techniques and an increase in the scale of milk production should be highlighted.

The farmer plays the most important role on a farm. He makes decisions and actions which depend, among others, on his ability to see and evaluate environmental conditions (MIERZWA 2008). The age and health status of the person running the farm are important factors as they also have a major influence on the decisions related to the production process and its future.

The age structure of the surveyed population was considered favourable because of the high share of young people (compared to the other regions of the country). People aged 40–60 years (ca. 58%) dominated among the owners of the farms surveyed. Both the youngest and the oldest groups of milk producers have similar shares in the surveyed population, oscillating around 3–4%. Based on the surveys, it was confirmed that young people aged up to 25 years were searching for employment in non-agricultural sectors of the economy (HELLER 2000). This behaviour can be explained by the fact that agricultural production was, in the opinion of the respondents, a highly-demanding occupation whose economic benefits frequently did not cover the costs incurred or the labour input.

Influence of the milk quota system on dairy sector concentration in the province of Warmia and Mazury

During recent years, milk production has played an important role in the animal production market in the surveyed area. In 2008, milk production in the province of Warmia and Mazury represented close to 32.6% of the total animal production market (Główny Urząd Statystyczny). As of 2005, the milk production volume in the province of Warmia and Mazury had a similar share in the total national production. However, over the last 5 years it has not exceeded 8%.

In analysing the milk production data obtained from the surveys conducted by the Central Statistical Office, a slight increasing trend can be noticed (from 2005–2010 the volume of raw material produced in the province of Warmia and Mazury increased by 13.71%).

Nevertheless, the concern is that the milk production increase was more a result of increasing the number of dairy cattle heads and not increasing their milk productivity per head. Over the five years, milk productivity per head only increased by 4% (Tab. 1) This small productivity increase is not a good sign for future production scale increases, as increasing the herd size is less favourable than increasing the unit effectiveness level.

Table 1
Population of cows and milk production in the province of Warmia and Mazury from 2005–2009

Year	Milk production [kg]	Share in the national production [%]	Average number of cows [heads]	Productivity [kg]
2005	811,076	7.01	188,384	4,305
2006	854,004	7.34	197,221	4,330
2007	832,782	7.09	196,729	4,233
2008	862,606	7.15	197,783	4,361
2009	907,249	7.51	203,068	4,468
2010	922,278	7.74	207,882	4,549

Source: own work based on the Central Statistical Office data.

The introduction of the milk production quota system significantly accelerated the process of transformations in the dairy sector in the province of Warmia and Mazury. On the basis of the results of surveys made available by the GUS, from 2004–2010 a continual decrease in the number of active wholesale suppliers was observed in the province. Analyses conducted by the AMA (PAŁACH 2011) indicate that during the quota year of 2009/2010, there was a decrease in the number of active wholesale producers in the province of Warmia and Mazury by almost 3,500 compared to 2004/2005 (Tab. 2). A similar trend was recorded in the other regions of the country. It should be assumed that changes in both the production structure and the number of suppliers were caused by milk producers adjusting to the new quality requirements.

Much more extensive changes occurred among the direct milk suppliers. Over the six years following implementation of milk quotas, their numbers decreased by more than 77%, while the total volume of milk they supplied to the market decreased by over 75%. The data indicates an increasing concentration of milk production and decreasing popularity of direct supplies. The

Table 2

Characteristics of the dairy sector in the province of Warmia and Mazury after implementation of the milk production quota system

Item	Quotas year					
	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010
Wholesale suppliers						
Number of collaborating dairy plants	46	41	37	38	39	39
Number of active producers	12,137	11,322	10,329	9,494	9,041	8,672
Volume of milk purchased [M kg]	628.8	689.9	707.5	701.2	733.4	710.7
Production share in the national quota [%]	7.80	8.00	7.80	7.30	7.80	7.90
Direct suppliers						
Number of producers	929	432	395	345	235	211
Volume of milk traded [M kg]	6.59	3.51	3.55	3.01	1.81	1.59

Source: Rolniczy biuletyn informacyjny – Bieżące Informacje WMODR Olsztyn, nr 3/2011.

decrease of interest in direct sales can be explained by the higher transaction costs as compared to wholesale supplies. Additionally, suppliers involved in direct sales were forced to meet much higher quality requirements than wholesale suppliers¹.

Table 2 presents the outline of the general dairy sector situation in the province of Warmia and Mazury, although the surveys indicate that individual regions have different conditions for milk production. To obtain a more precise synthesis, the AMA material analysed the situation of the individual counties within the area surveyed. From 2004–2010, the largest decrease in the number of producers occurred in the counties of Nowe Miasto, Ostróda and Braniewo (by 53.78, 47.82 and 42.15%, respectively) while the smallest proportion of suppliers resigned from milk production in the counties of Pisz, Mragowo and Olecko (10.63, 12.88 and 16.44%, respectively). On this basis, however, we cannot indicate particular regions where milk production decreases or increases occurred. As indicated by surveys, producers resigning from milk production usually increased the resources of the available labour force in the regional labour market or changed their profile of activities.

According to the AMA data, during recent years the volume of wholesale milk sold by single suppliers increased continually. Over the six years of the quota system, the largest milk production concentration occurred in the

¹ Regulation of the Minister of Agriculture and Rural Development of 18.08.2004 on the veterinary requirements for milk and dairy products.

county of Nowe Miasto (an increase in milk sales from 1 supplier by as much as 137.80%) as well as Ostróda and Iława (by 89.62% and 80.15%, respectively). The lowest level of milk production concentration was observed in the counties of Kętrzyn and Goldap (by 10.26 and 20.96% respectively) (Fig. 1).



Fig. 1. Average milk sales from 1 supplier in the province of Warmia and Mazury in the quota year of 2009/2010 and the actual change as compared to the quota year 2004/2005 [K kg]

Source: own work based on the AMA 2010 data.

It should be assumed that the willingness to increase the profit margin generated by the farm and the necessity of recovering the costs incurred on investments by adjusting the quality of raw material produced to the market conditions were the causes for the increased sales.

Poland's integration to the EU facilitated the establishment of cooperation and competition with the economies of the other member states. Although entering the new market offered new opportunities to Polish agriculture, it should also be remembered that membership in such a large organisation also resulted in threats resulting from the western partners' advantages in the fields of technology and experience (FABIRKIEWICZ et al. 2008). The decision to include the Polish dairy sector into the European Union milk production quota system was a concern for producers. The fears of farmers concerned mainly the possibility of being allocated limits below their scale of production. After over six years of the milk quota system operation in Poland, it now seems clear that those concerns were unjustified and milk producers have adjusted the level of their production perfectly to meet the new market conditions.

Evaluation of the milk market

Following Poland's accession to the European Union, the dairy sector was covered by community law. As of 2004, the situation in the Polish milk market also started becoming dependent on the EU market situation. It should be pointed out that Poland's accession to the EU, in addition to stabilisation of agricultural policy, resulted in the requirement to accept and observe the community legal regulations concerning production methods, environment protection and animal welfare. Additionally, milk producers had to meet the increasing demands of consumers concerning the quality and price of dairy products (SŁONIEWSKI 2005).

The conducted surveys did not show any clear opinion concerning the situation in the milk market after the implementation of milk quotas. Only slightly more than 1/3 of the respondent milk producers in their evaluation of the situation in the raw material market after 2004 declared that it was subject to perceptible improvement. That result shows (according to the producers) that the main goal of the quotas (i.e. stabilisation of supply in the milk market and of the prices for raw material) was not fully achieved. The worst opinions on the quota system's influence on the Polish dairy sector were held by the group of the smallest producers – 28%, while the most positive opinions were presented by the largest ones – 46.15% (Tab. 3).

Table 3
Evaluation of the milk market after the implementation of the milk quota system with division of producers according to milk production [in %]

Production groups [K kg]	Evaluation of the milk market after implementation of the milk quota system			
	improved	deteriorated	did not change	no opinion
	[%]			
Up to 70	12.00	28.00	28.00	32.00
71–150	28.72	23.41	28.73	19.14
151–350	38.46	25.17	23.08	13.29
351–700	38.14	26.73	18.92	16.21
Over 700	46.15	15.39	30.77	7.69
Average for the population surveyed	32.69	25.64	25.00	16.67

Source: own work based on surveys.

It is possible that the negative opinion on the quota system reflected the collapse of the equilibrium mechanisms in the milk market between 2007 and 2008. Producers, convinced that the quotas would protect that production sector against negative consequences of the economic crisis were surprised by

the low effectiveness of the CAP instrument. Although the system of milk quotas was not evaluated too positively by the respondents, more than a half of them stated that elimination of production limits would lead to deterioration of the situation in the milk market. That result shows that the producers were more supportive of retaining the milk quotas system even though, in their opinion, it was not perfect. Their support for the quotas was probably based on their fear of adjusting to the new conditions in the milk market.

Milk as a commodity possesses a defined price which, in a market economy, is determined by the volumes of demand and supply. Despite periodic declines in the milk market, an increasing trend can be observed in milk prices (KOGUT 2006). Stabilisation of supplies was one of the major goals for implementation of the milk production quota system, which was to result in maintaining milk prices at the level satisfying both the milk producers and the consumers (MALAK-RAWLIKOWSKA 2005). In 2000, the average price was PLN 0.78 per 1 dm³, while in 2009 the dairy plants paid PLN 0.90 per 1 dm³ of milk (Główny Urząd Statystyczny). The producers surveyed declared that the system of milk quotas had a significant influence on milk prices in the market. Unfortunately, although they assumed that milk quotas were intended to regulate the supply of milk to the market and, consequently, stabilise prices, producers frequently declared that its influence was the opposite. Almost 40% of the respondents did not notice any influence of quotas on the economic situation in the milk market.

The unfavourable relation between the milk purchasing prices and the production costs during the surveyed quota years forced the dairy farmers to conduct a milk production cost analysis. It should be highlighted that the profit of dairy farms is determined not only by milk prices but, above all, the costs of its production. The cost of feeding the dairy cows, i.e. the costs of producing or purchasing feed, is the most important item of expenditures (ca. 40–60% of the total milk production costs) (KOWALSKI 2009). The remaining costs include electricity and water consumption charges, maintenance of the technical facilities and labour costs.

Interventionism in the milk market

In analysing the experiences of the developed economies, it can be concluded that the free market mechanisms, as well as providing benefits, also result in negative consequences to the economy of the country by increasing the disproportions in the level of regional, economic and social development. Supporters of full liberalism say that price fluctuations in the market represent the normal situation, which has a positive influence on increasing

economic effectiveness. Unfortunately, the process of adjustment of milk producers to the market demands usually progresses much slower and less efficiently than in other sectors of the economy. That characteristic is correlated with the length and natural conditions of the individual production cycles (KISIEL 2001, 2002).

In surveying the opinions of selected milk producers from the province of Warmia and Mazury, it was established that up to 64.74% of them expected more extensive state intervention in the milk market; although the larger the producer was, the lower the expectations related to state aid were. Almost 3/4 of the smallest milk producers wanted more extensive state involvement in the milk market. Those expectations could result from the unfavourable economic situation of small scale milk producers and the inability to compete in the free market. Every fourth respondent stated that the regulations in the milk market at that time were at a sufficient level (Fig. 2).

The European Union milk market is governed by numerous legal and administrative regulations whose main aim is to adjust the raw material supply to the market demand. According to the free market economic principles, the so-called “invisible hand” of the market is the best in stimulating the size of demand and supply. Unfortunately, that mechanism usually offers benefits to the stronger party, which increases the disproportions in agricultural population incomes (MICHNA, MIEROŚLAWSKA 2009).

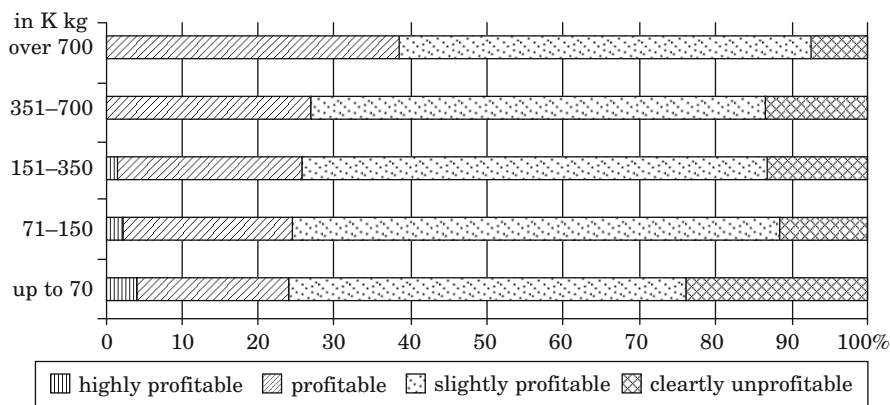


Fig. 2. Level of milk production profitability according to milk production volume [K kg]
Source: own work based on surveys.

The questionnaire-based surveys were conducted immediately after a deep collapse of prices in the milk market, which was reflected in the responses concerning production profitability. In view of the conducted surveys, it was concluded that milk production was the least profitable for farmers with milk

production under 70 K kg. In every group of producers, low opinions concerning milk production profitability dominated (Fig. 2). Additionally, an analysis of opinions expressed by milk producers showed a peculiar regularity: with a decrease in production scale, the percentage of producers declaring that milk production is highly profitable increases. Considering the fact that a larger scale of production should translate into reducing costs and decreasing expenditures, large and very large milk producers should theoretically be more satisfied with the economic results of their farms.

Conclusions

Many restructuring and concentration processes in the domain of agricultural raw material production have taken place in Poland since its accession to the European Union. Gradually, the number of active milk suppliers has decreased while milk production has moved to regions where the concentration of herds, production of cheap volume feed and favourable natural conditions, make dairy farming more profitable (<http://rolnicy.com/mleczarstwo>). It should be highlighted that limiting milk production may influence the production structure in diversified ways. Milk quotas, first of all, limit production and result in a decrease in the numbers of small herds and an increase in unit productivity. On the other hand, milk quotas limit unrestricted production development and frequently force the purchase or lease of quotas, which results in the necessity of bearing additional costs. The analyses conducted indicate that during the quota year of 2009/2010, in the province of Warmia and Mazury there was a decrease in the number of active wholesale producers by almost 3,500 as compared to 2004/2005 and, in the case of direct suppliers, by over 77% (718 producers). Additionally, during the six years of the milk quota system, a concentration of milk production has taken place. From 2004–2010 a decrease by 15.22% in the number of entities purchasing milk was also observed. In every county of the province, an increase in the volume of milk sold per wholesale supplier was recorded (on average by 58.11%).

The introduction of CAP principles to the Polish milk market has forced producers to adjust to new, uncertain conditions. Small, unprofitable farms (with an area not exceeding 10 ha) have been gradually withdrawing from milk production (during the quota years surveyed they represented just under 8% of the total population). The questionnaire-based surveys were conducted following the collapse of the milk market, so the system of quotas was evaluated very poorly by the producers – almost 1/4 of them declared that it had a negative influence on the raw material market. Additionally, almost 3/4 of the respondents stated that production in their case was slightly profitable or unprofitable (58.00% and 14.04%, respectively).

Preventing excessive milk production, acceleration of production concentration and relative stabilisation of milk and dairy product prices should be viewed as the main positives of the milk quota system. The market economy mechanisms have forced changes in the conditions of farming. Achievement of success in the agricultural market, including the milk market, depends, above all, on modernising production resources to improve technical, productive, breeding and, most importantly, economic-financial efficiency.

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Reference

- Agencja Restrukturyzacji i Modernizacji Rolnictwa (www.arimr.gov.pl).
- FABIRKIEWICZ A., KOSSOWSKI W., WYSZYŃSKI A. 2008. *Czynniki decydujące o możliwościach towarowej produkcji mleka w polskich gospodarstwach rolniczych*. Problemy Inżynierii Rolniczej, 4. Główny Urząd Statystyczny (<http://www.stat.gov.pl>).
- HELLER J. 2000. *Regionalizacja obszarów wiejskich w Polsce*. Wydawnictwo IERiGŻ, Warszawa.
- KASZTELAN P. 2009. *System regulacji produkcji mleka w Polsce*. Roczniki Nauk Rolniczych, G, 96(1).
- KISIEL R. 2001. *Zastosowanie wybranych metod rachunku ekonomicznego w optymalizacji produkcji rolniczej*. Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego, Olsztyn.
- KISIEL R. 2002. *Optymalizacja wydajności jednostkowej krów w rolnictwie polskim*. Postępy Nauk Rolniczych, 4.
- KOGUT A. 2006. *Wybrane problemy przemysłu mleczarskiego i obszary innowacyjności*. <http://www.rsi.podkarpackie.pl>
- KOWALSKI M. 2009. *Jak obniżyć koszty produkcji mleka? Hoduj bydło z głową*, 4. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
- MALAK-RAWLIKOWSKA A. 2005. *Ekonomiczne i organizacyjne skutki wprowadzenia systemu regulacji produkcji mleka w wybranych krajach Unii Europejskiej i w Polsce*. Wydawnictwo SGGW, Warszawa.
- MICHNA W., MIEROSŁAWSKA A. 2009. *Strategia rozwoju gospodarstw rolnych i wsi w długiej perspektywie oraz w ujęciu przestrzennym : synteza wyników badań prowadzonych w okresie 2005–2009*. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
- OPRZADEK A. 2005. *Prawidłowy system doju i postępowania z mlekiem. Strategie walki z mastitis*. W: *Poradnik producenta mleka*. Red. Z. Reklewski, H. Runowski. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
- PAŁACH R. 2011. *Kwotowanie produkcji mleka sprzyja koncentracji produkcji mleka w gospodarstwach rolników województwa warmińsko-mazurskiego*. Bieżące Informacje WMODR Olsztyn, 3(275).
- Poradnik producenta mleka*. 2005. Red. Z. Reklewski, H. Runowski. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
- SŁONIEWSKI K. 2005. *Uwarunkowania prowadzenia gospodarstw specjalizujących się w produkcji mleka*. W: *Poradnik producenta mleka*. Red. Z. Reklewski, H. Runowski. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
- ZIĘTARA W. 2006. *Stan i kierunki zmian w produkcji mleka w Polsce*. Roczniki Nauk Rolniczych, G, 93(1).