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ECONOMIC RESULTS OF THE MILK MARKET DEREGULATION AND THE CAP REFORM ON POLISH DAIRY FARMS IN THE YEARS 2014-2020

Abstract

Changes in the Common Agricultural Policy and especially the abolition of milk quotas will, in the coming years, determine both production organisation and economic results of farms. The research established the impact of the future milk market changes on the income of Polish specialised dairy farms in 2013-2020.

Based on FADN data, seven model farms with different size of dairy cow herds were constructed and were next subject to scenario simulations. The results obtained for the most probable scenario and for 2014-2020 point out that the profitability of farms keeping less than 20 cows will be lower than in 2011. The simulations showed that farms characterised by larger scale of milk production will reach almost identical family farm income in 2011 and 2020. Analysing management income and risks, it is possible to indicate that on farms having less than 30 cows it will take on negative values over the entire simulation period. Whereas on farms with larger cow herd, this type of profitability will reach positive values, but lower than in 2011.

Keywords: Common Agricultural Policy, milk quota, production organization, economic results, dairy farm, income.

Introduction

The milk market in the European Union is subject to many regulations affecting the operation of all participants in this market, including also milk producers. For many years, these regulations have been changing and their main objec-

tive is to prepare farmers for competing not only in the local or the European market, but also in the global market. It is difficult to determine the potential effects of the impact of these changes on the activity of specific farms, especially before the new or amended legislation enters into force. This does not mean, however, that it is pointless to search for an answer to the question: How will the milk market deregulation in the EU and the reform of the Common Agricultural Policy affect the operation of dairy farms in Poland? The results of the studies conducted so far indicate the key importance of low production costs, production scale and milk purchase prices as the factors determining the development of dairy farms (Baer-Nawrocka A. et al. 2012; Guba W., Dąbrowski J. 2012; Hamulczuk M., Stańko S. 2009; Mańko S. 2007; Sass R. 2009).

A basis to attempt to determine the economic situation of dairy farms was the dynamics of changes which may occur in the milk market after the liquidation of the quota system and the evolution of other Common Agricultural Policy instruments.

The main objective of the studies was to designate the level of profitability in dairy farms with the various production scale, functioning according to the new rules adopted for the years 2014-2020 of the CAP. The implementation of the main objective required the adoption of several specific objectives, which were, inter alia, the construction of model farms, or estimation of future revenues and costs of the milk production.

Source data and study methodology

The studies have been conducted on a basis of technical and economic parameters of farms specialised in dairy cows rearing and participating in the Polish FADN in 2011, as published by the Institute of Agricultural and Food Economics National Research Institute (IAFE-NRI) (Goraj L. et al. 2011). The analysed population consisted in total of 2,260 farms divided into 7 groups. The groups have been identified in terms of the headage of dairy cows and were described by the average values of the individual parameters calculated from farms belonging to the given group. For each group, a model farm has been constructed which allowed to carry out necessary simulations so as to determine the economic situation of the dairy farms in the years 2014-2020. The indicated simulations were made using the model TIPI-CAL (Technology Impact and Policy Impact Calculation). This is a long-time recursive model enabling a deterministic or stochastic simulation of changes taking place on farms, in ten years-time (Hemme T et al. 1997; IFCN Dairy Report 2012). All activities related to the calculation of the necessary parameters and assumptions have been subject to the requirements set by the model used in the studies.

The determination of the production and economic parameters achieved in the individual model farms required developing additional assumptions (apart from those adopted according to the FADN) related to production organisation

(e.g., herd management, on-farm production of own feed, fixed assets management, etc.). Bearing in mind the objective of the study, it has been assumed that the production size and structure of the model farms will not change in the years 2012-2020. The studies have also assumed that investment in fixed assets (excluding land) will be of replacement nature, allowing to pursue the farming activity without modifying the production technology.

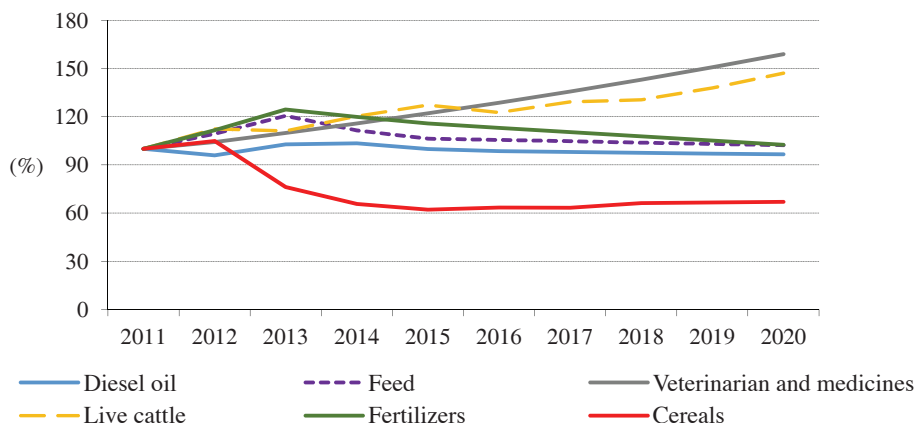


Fig. 1. Dynamics of changes in prices of selected means of production and agricultural products adopted in the studies in the years 2011-2020.

Source: own study.

The prices of products and means of production in 2012 have been established based on the indices of their changes in relation to the previous year, being the baseline year of the studies being conducted. For this purpose, the data published by the CSO and IAFE-NRI has been used. The evolution of the prices of means and factors of production and agricultural products in the years 2013-2020 has been based on the forecasts by the World Bank (*World Bank...* 2013), OECD-FAO (Skarżyńska A. 2011). In the absence of the forecasts, the prices of means of production or agricultural products have been determined based on the average rate of changes in the years 2009-2012. In accordance with the methodology adopted in the IFCN, to estimate the future prices of feed, price changes have been assumed according to the weighted average of future prices of feed components: soybean meal and maize (IFCN Dairy Report 2012). The growth rate of prices of selected means of production and agricultural products used in the studies has been presented in Fig. 1.

Due to the high degree of specialisation of the farms where the sale of milk was a primary source of revenues, three scenarios for the evolution of future purchase prices have been built. To do this, chain indices have been used, thanks to which the differences in the prices obtained by the individual model farms were

maintained. The most likely scenario (ML) used the forecasts of milk purchase prices, developed by the OECD-FAO for the EU-27 (Skarżyńska A. 2011). The basis for creating the second scenario – optimistic scenario (OPT) – was the adoption of an assumption that the milk purchase prices will be increasingly approaching the price level in the countries being the largest EU milk producers. From the Eurostat data it results that there is still a difference between purchase prices in Poland and in the EU, which ranges from 6 to 32% (Table 1). Therefore, in the OPT scenario it has been adopted that starting from 2015 (liquidation of milk quotas) the milk purchase prices in Poland and Germany may gradually become similar. This will result in a rise in the milk purchase price in 2020, which as a consequence will be by 11.2% higher than that assumed in the ML scenario.

Table 1

*Ratio of the annual average milk purchase price to purchase prices
in the selected EU countries in the years 2005-2012*

Country	2005	2006	2007	2008	2009	2010	2011	2012
Germany	0.71	0.81	0.79	0.83	0.82	0.85	0.84	n.d. ^a
Great Britain	0.86	0.91	0.94	0.92	0.80	0.96	0.96	0.85
Netherlands	0.74	0.79	0.79	0.80	0.78	0.79	0.77	0.80
Italy	0.62	0.66	0.76	0.70	0.56	0.71	0.68	0.68
Spain	0.74	0.78	0.78	0.77	0.71	0.90	0.95	0.94
Ireland	0.88	0.95	0.88	0.93	0.96	0.95	0.88	0.93
Denmark	0.74	0.76	0.70	0.77	0.72	0.79	0.82	0.83

^a No data.

Source: own study based on the Eurostat data.

The studies also included a scenario assuming the collapse of the milk purchase prices in the years 2014-2016 (pessimistic scenario). This situation can occur due to the increased supply of raw milk, which so far has been limited by production quotas. The price decrease in the pessimistic scenario (PES) has been determined based on the largest monthly decrease in the milk purchase prices, which took place in Poland after 2009 (4.43%). Therefore, in the pessimistic scenario it has been assumed that in the years 2014-2016 the milk purchase price will be annually reduced by 4.43%, while in the years 2017-2020 the growth rate of the milk purchase prices would be in line with the OECD-FAO forecasts adopted in the most likely scenario.

The studies conducted took into account also the rules of the reform of the Common Agricultural Policy, with particular regard to future direct payments. In this case, two options have been taken into account. The first option assumed shifting the funds from the rural development, in the amount of 25%, to the first pillar, which would result in higher direct payments. The other option did not

provide for such shifting. The amount of the rates was established based on the information from the Ministry of Agriculture and Rural Development (*Common Agricultural Policy...* 2013).

The CAP reform alters the requirements for the farms applying for subsidies to the operational activity. Since 2015 – in addition to the cross-compliance requirement – the farmers have been required to use climate- and environment-friendly agricultural practices (greening). Due to the fact that the analysed model farms meet these requirements, mainly due to possessed grassland and structure of sowings adapted to the feed needs of the animals, no additional scenarios related to greening were created. Besides, as shown by the studies conducted so far, meeting the requirements related to, for example, greening can to a low extent affect the activity of the dairy farms (Baer-Nawrocka A. et al. 2012).

The result categories of the farms have been calculated according to the FADN methodology. The studies used the full cost accounting allowing to define management and risk income, which required including in the economic calculation the costs of own production factors: land, labour, capital (opportunity costs). An analysis of the national and foreign literature has shown that the valuation of opportunity costs of own land is carried out based on average lease rent (Skarżyńska A. 2011; Goraj L., Mańko S. 2011; EDF Report 2012; IFCN Dairy Report 2012). The cost of own land in the model farms has been determined at the level of average lease rent paid in the group of the farms identified by the FADN, depending on the kept headage of dairy cows.

The cost of using own capital in the farm is defined as the equivalent of income lost due to not depositing this capital on a bank account. In determining this cost, the division of capital into fixed and working capital is often used. To value this type of the opportunity cost we may use the average interest rates of deposits on current accounts (working capital) and long-term deposits (fixed capital) in commercial banks (Skarżyńska A. 2011, 2012). In the IAFE-NRI studies, the weighted average profitability of 52-week Treasury bills in the financial year is used (Goraj L. et al. 2011). The solution contained in this work has been basically based on the approach adopted in the paper by Goraj and Mańko (2011). The value of the farm assets has been reduced by the value of own land while working assets, included in total capital, were considered as the value of a non-breeding herd and the value of stocks of agricultural products. Therefore, funds being a component of personal property of the farmer's family were omitted. The contractual cost of capital in the years 2013-2020 was estimated based on the annual average interest rate of 6-12-month deposits in commercial banks in the years 2005-2012.

The last estimated opportunity cost was the cost of own labour. It has been specified as a product of own labour inputs, expressed in AWU and the average net remuneration in a given year. The forecast changes in remunerations in the years 2013-2020 have been calculated using the average growth rate of average gross remuneration in the national economy in the years 2009-2012.

Characteristics of the analysed farms

The major features and organisational parameters of the model farms have been presented in Table 2. In analysing the figures in the table, we may notice that the majority of the parameters are correlated with the headage of dairy cows in the model farms. The milk yield of cows on the farm keeping their largest number is higher almost twice than on the farm with the smallest herd. With the increase in the number of cows, the following increase as well: owned utilised agricultural area, stocking density of animals per 100 ha of the utilised agricultural area, share of the leased area in land resources and hired labour inputs used in the milk production. A reverse trend is characteristic of total labour inputs which decrease in the analysed test farms as the headage of dairy cows increases.

From the studies on the differences between the parameters of the individual farms it results that the smallest labour efficiency, measured as the milk production volume per labour input, was characteristic of the farms keeping up to 10 cows. In those farms, it did not exceed 10 kg per hour, whereas in the farms whose herd of cows exceeded 30 heads it was more than four times higher. With the significant diversification of the parameters listed in Table 2, determined by the milk production scale, two parameters must be considered independent from the production volume, and their values were similar. The first one was the capital of the farm (from PLN 27 to 32 thousand per cow), and the other – a share of permanent grassland in the utilised agricultural area, ranging from 30 to 40%.

Table 2

Basic parameters of the model farms in 2011

Parameters	Measure unit	Model farms specialised in rearing of dairy cows, by headage of dairy cows						
		M-4	M-8	M-12	M-17	M-25	M-34	M-60
Headage of dairy cows in the model farm	head	4	8	12	17	25	34	60
Milk yield of cows	kg/animal	3562	4002	4252	4803	5322	5933	6649
Stocking density of animals	LU/100 ha of utilised agricultural area	51.2	75.0	86.8	105.9	111.1	119.6	127.5
Farm capital	thousand PLN/cow	31.8	29.4	27.0	28.6	27.3	29.6	29.0
Utilised agricultural area	ha	10.5	14.9	21.2	24.8	33.4	43.6	71.9
Share of PG in the UAA	%	39.1	37.7	36.1	33.2	35.1	36.5	30.9
Share of the leased area in land resources	%	12.5	17.6	23.4	22.5	27.7	31.7	35.3
Total labour inputs	h/cow	763.2	466.4	306.6	244.4	175.5	136.6	100.7
Share of hired labour inputs in total labour inputs	%	0.7	0.6	1.1	2.0	4.3	6.4	21.4
Share of the milk production value in the total production of the farm	%	41.3	51.4	51.8	59.5	67.5	71.5	76.5

Source: own study based on (Goraj L. et al. 2011).

Study results

The results of the analysis of the economic situation in the Polish dairy farms in the changing Common Agricultural Policy have been divided into three areas. The first one applied to revenues from the agricultural production and the amount of subsidies received by the farms, the second – to the production costs and the third – to income achieved by the model farms. The income situation has been determined using family farm income and management and risk income.

The figures showing the results of the conducted studies present in detail (bar chart) the functioning of the model farms in the most likely scenario. In the case of the optimistic scenario (OPT) and pessimistic scenario (PES), the results have been presented synthetically, by marking them with the points of different shapes. Due to technical limitations, the analysed farms have been divided into two groups depending on the size of the cow herd. It was also decided to present the results of the studies concerning five years out of the entire 10-year period of analysis, which have been considered the most important. Particular interest was raised by the results obtained during the period related to the liquidation of the milk quota system (2014-2016), and a complement to the analyses was the inclusion of the information about the economic situation in the baseline year (2011) and in the last year of the simulation (2020).

The simulations carried out for the most likely scenario have shown that in almost all model farms the production value in the years 2014-2016 is at the nearly the same level as in the baseline year of the studies (Fig. 2). This means that the foreseen changes in the prices of agricultural products (especially, milk purchase prices) are at the level of 2011. Only the M-4 model farm can be characterised by the production value increase by 9% in 2016 when compared to 2011. This results from the 30% higher quantity of milk sold, which until 2015 was limited by the milk quota.

The forecast built for the most likely scenario indicates that in 2020 in all model farms the production value increased in relation to the first year of the analysis. An increase from 10 to 18%, determined primarily by the assumed higher milk purchase prices, is expected.

The assumptions of the pessimistic and optimistic scenarios in the conducted studies illustrate the changes in the amount of revenues from the sale of milk. In Fig. 2 and 3, we may see a regularity consisting in the fact that in the case of farms with the greater production scale the changes in the amount of revenues are larger. In the M-4 model farm, revenues in the optimistic scenario in 2020 will be by 3.6% higher compared with the most likely scenario. On the other hand, in the M-60 farm this value will be 7.9%. In the case of the pessimistic scenario, it is expected that the M-4 farm in 2020 will be characterised by the revenue level lower by 3.2% in relation to the most likely scenario. The biggest difference in revenues between the most likely scenario and pessimistic scenario in the M-60 farm and in 2020 will amount to 7.1%.

According to the forecast, the amount of subsidies expected for the years 2014-2020 for the farmers rearing dairy cattle will be similar as in 2011.

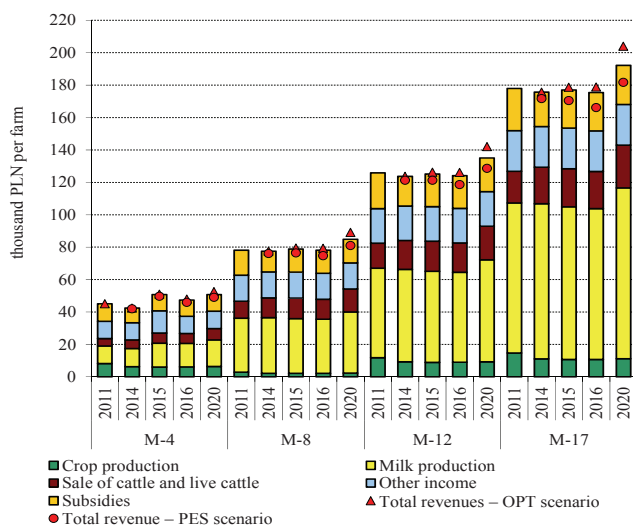


Fig. 2. Revenues of model farms having a cow herd not exceeding 20 heads, in various scenarios of changes in the milk market.

Source: own study.

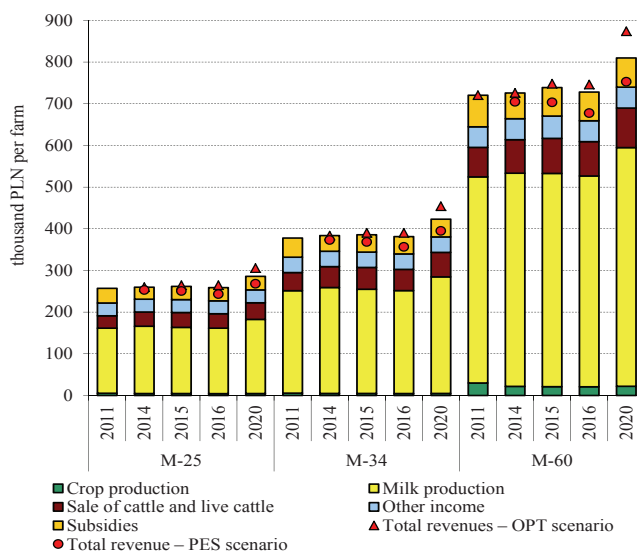


Fig. 3. Revenues of model farms with a cow herd exceeding 20 heads, in various scenarios of changes in the milk market.

Source: own study.

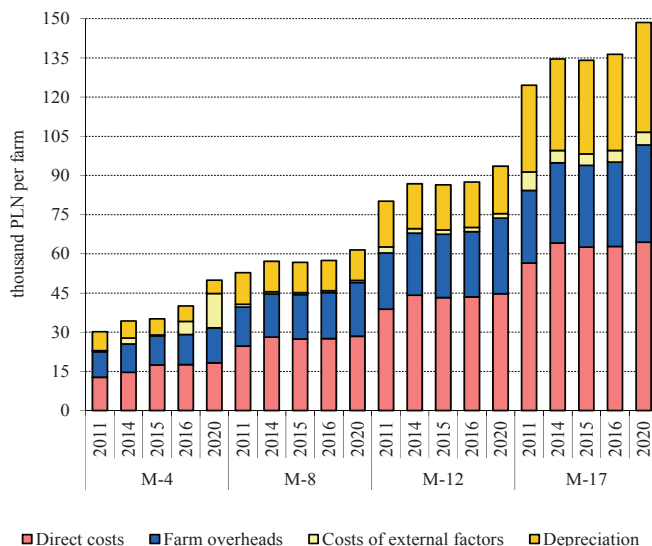


Fig. 4. Production costs in the model farms with a cow herd not exceeding 20 heads

Source: own study.

The situation regarding the changes in production costs in the analysed farms, as presented in Figures 4 and 5, indicates that until 2020 they will demonstrate an upward trend. In the majority of the analysed farms, the rise in the costs between the first and the last year of the simulation will be 7-9%. Only in the M-4 farm, it will be higher and exceed 16%. In the years 2014-2016, the stabilisation of production costs is expected, and their rise is possible after 2017.

The entire forecast period, starting with 2014, is characterised by a relatively constant level of direct costs, which means that it is not their amount which will determine the expected rise in production costs in the analysed model farms. According to the calculations made, two types of costs will affect the rise in production costs to the greatest extent, namely: farm overheads and depreciation. The factor determining which of the listed types of costs is most important for the level of production costs is the size of the owned cow herd. In the farms whose herd does not exceed 15 heads, represented by the M-4, M-8 and M-12 model farms, crucial for the future rise in production costs are farm overheads. On the other hand, in other farms the rise in production costs will be increasingly dependent on depreciation costs.

The production cost structure presented in Fig. 6 shows that with the increase in the number of reared cows the share of direct costs in total production costs increases. In the M-4 model farm this share exceeds 40%, while in the M-34 and M-60 farms it is by 10% higher. The reverse regularity takes place in case of farm overheads whose share in the structure of costs decreases with the increasing number of cows. In the majority of the objects, the share of these two

types of costs (direct costs and farm overheads) accounts for about 75% of total production costs and it is them which substantially determine the current and future profitability of the agricultural production.

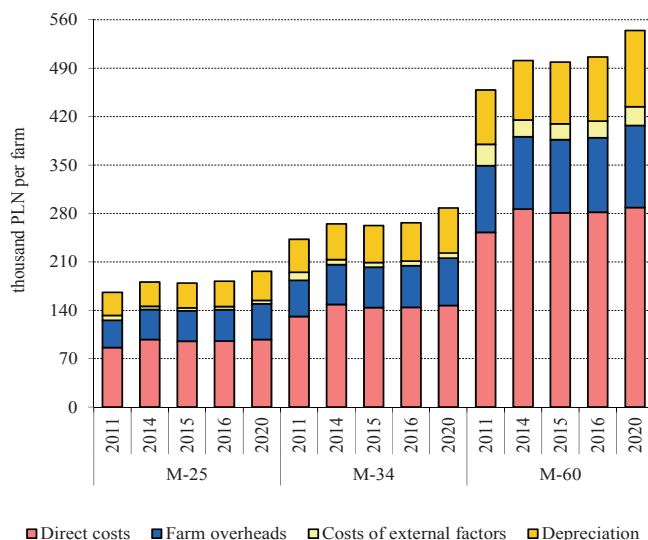


Fig. 5. Production costs of the model farms with a cow herd exceeding 30 head.

Source: own study.

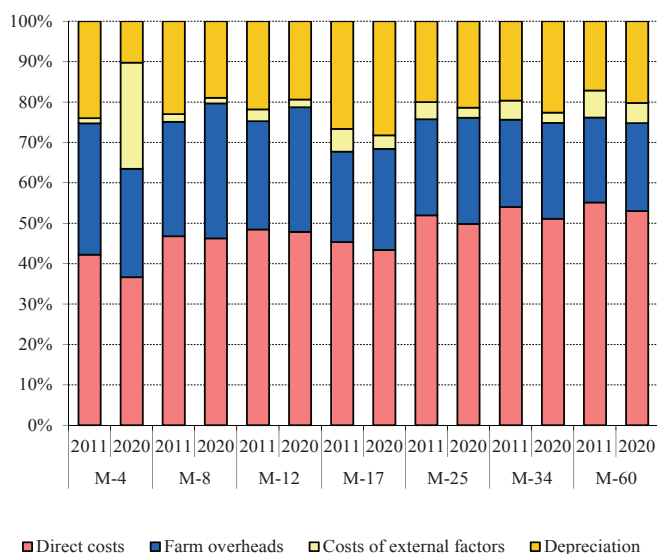


Fig. 6. Production cost structure of the model farms in 2011 and 2020.

Source: own study.

In studying the dynamics of the production cost structure, we may point to small changes in the share of the individual types of costs in total production costs. Only in the farm model with the smallest cow herd (M-4), the share of costs of external factors is significantly increased: from 1 to 26%. This situation is associated with the amount of interest which must be paid by the farm for purchased machinery and equipment to renew the machinery park.

The study on the profitability has been divided into two stages. At the first stage, the profitability measured by family farm income has been assessed. The second stage consisted in calculating management and risk income by deducting opportunity cost from the family farm income.

The results obtained allowed to identify two groups of the farms. The first group is characterised by a decline in family farm income between the first and the last year of the simulation in the most likely scenario. This situation will occur in the M-4, M-8, M-12 and M-17 model farms, i.e. those with a cow herd not exceeding 20 heads (Fig. 7). The other group consists of the farms with similar family farm income in 2011 and 2020 (ML scenario). This group includes the model farms with the population of cows exceeding 20 heads, i.e. M-25, M-34 and M-60 farms (Fig. 8).

The analysis of the results obtained for the most likely scenario in the farms belonging to the first group showed that in 2020 the profitability will decrease from 8 to 95% when compared to 2011 (when excluding from this analysis the model farm keeping the smallest number of cows, the range is 8-10%). In the group of the farms with a cow herd not exceeding 20 heads (excluding the M-4 farm) in 2014 family farm income will be reduced by about 20% when compared to 2011. In the years 2014-2016, despite the observed fluctuations in family farm income, the situation can be considered as relatively stable as changes in income calculated on a year-on-year basis will not exceed 8%.

According to the assumptions of the optimistic scenario, in 2020 the profitability in most model farms with the number of cows not exceeding 20 heads will be higher by about 6-10% when compared to 2011. The exception is the M-4 farm, in which a decline in income over the entire period of study is forecast. These are the predictions, despite the fact that the optimistic scenario assumes a price rise between the first and the last year of the analysis by more than 26%. The factor determining the indicated decrease in the profitability is the increased level of costs by more than 61%, which is forecast to occur in the same period.

The calculations made for the pessimistic scenario showed that in the years 2011-2020 there will be a decline in family farm income in all model farms. In the group of the farms keeping from 5 to 20 cows, this decline will be by 20-25%, while the M-4 farm as the only model farm in 2020 will record negative income in the amount of PLN 1,800.

The study results for the group of farms with a cow herd exceeding 20 heads show that in the most likely scenario family farm income in the first and the last

year of the simulation will be comparable (Fig. 8). In 2014, as in the first group of the analysed farms, income will be lower than in 2011 by around 15%. Not before 2020, will it be possible to expect that the model farms keeping more than 20 cows reach the level of family farm income similar to that in the baseline year.

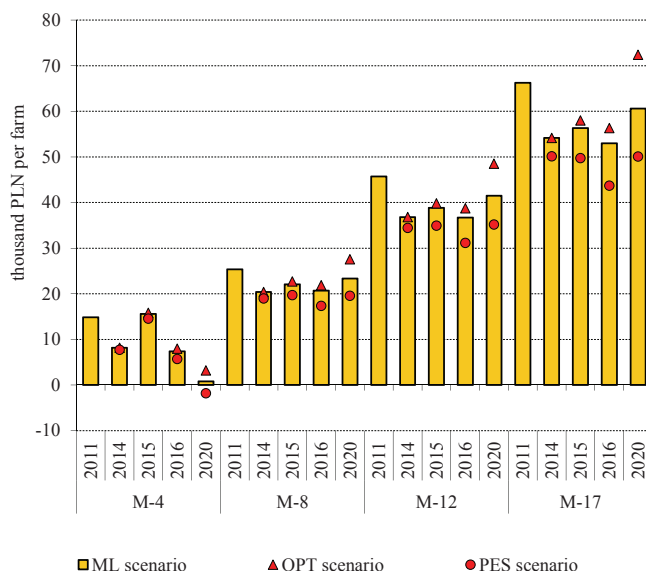


Fig. 7. Family farm income in the model farms with a cow herd not exceeding 20 heads.

Source: own study.

In the optimistic scenario, it is envisaged that the income situation of the farms whose cow headage exceeds 20 heads will be characterised by similar trends as in the most likely scenario. It must be stressed that in 2020, when compared to 2011, under the assumptions of the optimistic scenario, the profitability will significantly increase (from 20 to 26%).

In turn, the result of the simulations made for the pessimistic scenation will be the deterioration of the income situation of the farms belonging to the second analysed group in the years 2011-2016. This situation will improve only in 2020, however, family farm income will be still by about 20% lower than in 2011 (Fig. 8).

The second type of the analysed profitability was management and risk income, in the analysis of which the calculations included opportunity costs of using own factors of production. Fig. 9, illustrating the study results for the group of the model farms with a cow herd not exceeding 20 heads, shows that all farms are characterised by negative management and risk income, regardless of the applied scenario for the development of the future situation in the milk market. In 2020, we can see a two- or even three-fold decline in this type of the profitability in relation to 2011.

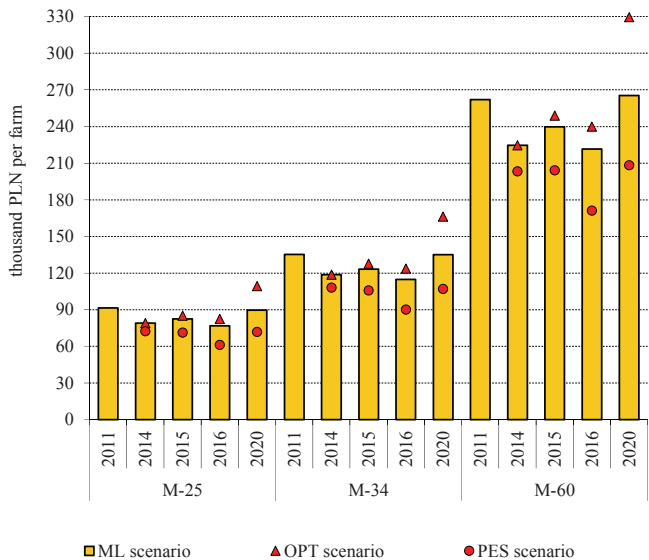


Fig. 8. Family farm income in the model farms with a cow herd exceeding 20 heads.
Source: own study.

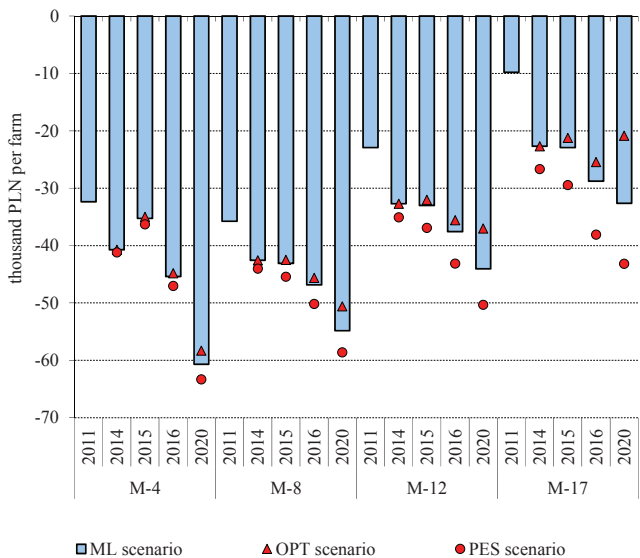


Fig. 9. Management and risk income in model farms with herd of cows not exceeding 20 heads
Source: own study.

According to the most likely scenario, it is envisaged that in the second group of the model farms (cow herd exceeding 20 heads) the income situation will be much better than in the case of the farms keeping less than 20 cows (Fig. 9 and 10). Both in the M-34 farm and in the M-60 farm, management and risk income throughout the analysed decade is characterised by positive values. However, in 2020 this profitability is expected to decrease in relation to 2011.

In the optimistic scenario, it is forecast that as from 2018 the M-34 and M-60 farms will achieve higher management and risk income than in 2011. In Fig. 10, illustrating only the last year of the analysis, the increase in income (referring the results to 2011) in the M-34 farm will be by 54% while in the M-60 farm – about 45%.

The occurrence of the trends included in the pessimistic scenario in the milk market will result in a significant decrease in the profitability in the farms whose cow herd exceeds 20 head. Starting with 2016, the M-34 farm will be characterised by negative management and risk income, while in the M-60 farm (comparing the first and the last year of the analysis) income will decrease by about 50%.

The studies on the future development of the profitability in different scenarios of changes in the milk market have shown that in the model farms, as the headage of cows increased, the gap between income obtained in the pessimistic scenario and that obtained in the optimistic scenario increased. We can only mention that in the M-4 farm, this gap in 2020 was about PLN 5 thousand, while in the M-60 farm it exceeded PLN 120 thousand. This means that in the farms with a larger cow herd the profitability will be more sensitive to any changes in production costs or milk purchase prices.

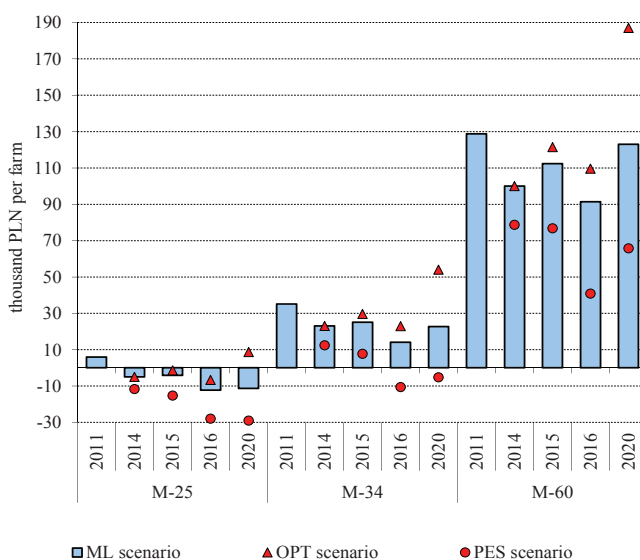


Fig. 10. Management and risk income in the model farms with a cow herd exceeding 20 heads. Source: own study.

Summary

The conducted studies allowed to estimate the impact of changes in the Common Agricultural Policy, with particular regard to the liquidation of the production quota system for the farms specialising in the milk production. Depending on the potential development of the situation in the milk and milk product market, three scenarios determining the future functioning of the farms have been developed. Based on the study results, it can be concluded that the liquidation of production limits will increase revenues generated in the analysed model farms. This will not be visible in the first years after the liquidation of quotas, but in a longer term. Fundamental determinants of the forecast revenue growth will be the increased production volume and the possible rise in the raw milk purchase price.

The profitability analysis has been carried out based on family farm income and management and risk income. As it is apparent from the conducted studies, the reform of the Common Agricultural Policy will have a negative impact on the income situation of the farms with a cow herd not exceeding 20 heads. Those farms should, therefore, make significant changes in the rationalisation of production costs or to increase their production scale. The failure to take these actions may lead to a need for withdrawal from the market, due to the increasingly lower profitability of the production.

The calculation of management and risk income taking into account opportunity costs of own factors of production has shown that only those model farms whose herd of cows exceeds 30 heads were characterised by positive values of this type of profitability. This means that only the managers of these farms are able to receive payment for decisions they make and the risk of pursuing the activity they accept.

From the conducted studies it results that in the years 2011-2020 the profitability in the analysed model farms will be subject to significant fluctuations. This variability will be determined by the liquidation of milk production quotas. Consequently, in the years 2016-2020 the profitability level in the analysed model farms adopts lower values than in 2011, regardless of the assumed scenario of changes in the milk market.

In the course of the conducted studies, it has also been observed that when compared to the previous shape of the Common Agricultural Policy, the instruments adopted for the years 2014-2020, i.e. greening or the amount of direct payments, should not significantly affect the economic situation of the farms rearing dairy cattle.

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