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CHALLENGES IN THE MILK MARKET (INVESTMENTS, DISRUPTIONS, LOGISTICS, COMPETITIVENESS, PRICES, AND POLICY)

Collective work, edited by
Piotr Bórawski
Andrzej Parzonko
Ireneusz Żuchowski

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Wydawnictwo Ostrołęckiego
Towarzystwa Naukowego
im. Adama Chętnika
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TOMASZ ROKICKI
BARTOSZ MICKIEWICZ

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Wydawnictwo Ostrołęckiego Towarzystwa Naukowego im. Adama Chętnika
07-410 Ostrołęka, ul. Traugutta 9A
tel. 29 764-59-80
www.otn.ostroleka.pl/ct-menu-item-15
e-mail: otn.ostroleka@o2.pl

Skład: Ewa K. Czetwertyńska
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ORGANIZATION AND ECONOMIC SITUATION OF POLISH DAIRY FARMS KEEPING FADN AGRICULTURAL ACCOUNTING AND INVESTING⁴

Piotr Bórawski

University of Warmia and Mazury in Olsztyn, Poland

Andrzej Parzonko

Warsaw University of Life Science-SGGW, Poland

James Dunn

Pennsylvania State University, USA

7.1. Introduction

Dairy farming is one of the important branches of agricultural production. In recent years, a dynamic increase in cows' milk yield and milk production has been observed, which takes place mainly on farms with a conventional farming system (Runowski 2009).

The milk market was one of the most regulated in the EU. Milk quotas were an important instrument. In addition, there were intervention purchases on the milk market, as well as subsidies for the processing and storage of products. An important group of instruments were the

⁴ The research was carried out as part of a project financed by the National Science Center (NCN) in Poland, 2018/29 / B / HS4 / 00392.

regulations of foreign trade through export subsidies, tariffs and others (Hamulczuk and Stańko 2009). The liquidation of these and other instruments on the milk market meant that dairy farms had to increase the acreage and milk production in order to stay on the market. Moreover, in order to develop, they must increase the efficiency of the production scale (Parzonko 2009). At present, market factors are of greater importance in the development of milk production.

Poland's accession to the EU had a positive impact on the milk market. In addition, access to EU markets and the need to adapt farms to EU standards resulted in the improvement of sanitary and veterinary conditions and animal welfare (Korolewska 2006). Moreover, EU aid in the form of subsidies and Rural Development Programs (RDPs) had a positive effect on the development of dairy farms. Therefore, it is appropriate to study the changes that took place on dairy farms after the accession to the EU. Dairy farms implement various strategies to survive and develop. One of them is investing. Therefore, the IERIGŹ-PIB in Warsaw obtained data on dairy farms implementing investments.

The aim of the research was to find out about the economic situation and changes that took place after integration with the EU. As part of the main objective, the following specific objectives were implemented:

- assessment of changes in the area of dairy farms,
- getting to know the organization of plant and animal production,
- identification of the economic situation and its changes in dairy farms,
- evaluation of investments in dairy farms.

7.2. Characteristics of the researched dairy farms

In the years 2007-2017, the number of dairy farms keeping FADN agricultural accounting in Poland decreased from 6,474 to 4,406 (i.e. a decrease by 32%). Among the dairy farms keeping FADN agricultural accounting and implementing investments, few benefited from financial support. The largest number was in 2012 (383 farms, which constituted 8.2%).

The economic size of dairy farms increased in 2017 to PLN 45,477.3 from PLN 17,773.02 in 2007 (i.e. an increase by 255.9%). The data presented in Figure 1 clearly indicate large changes in the economic size of dairy farms, which in 2007-2017 increased by 156% (Figure 1).

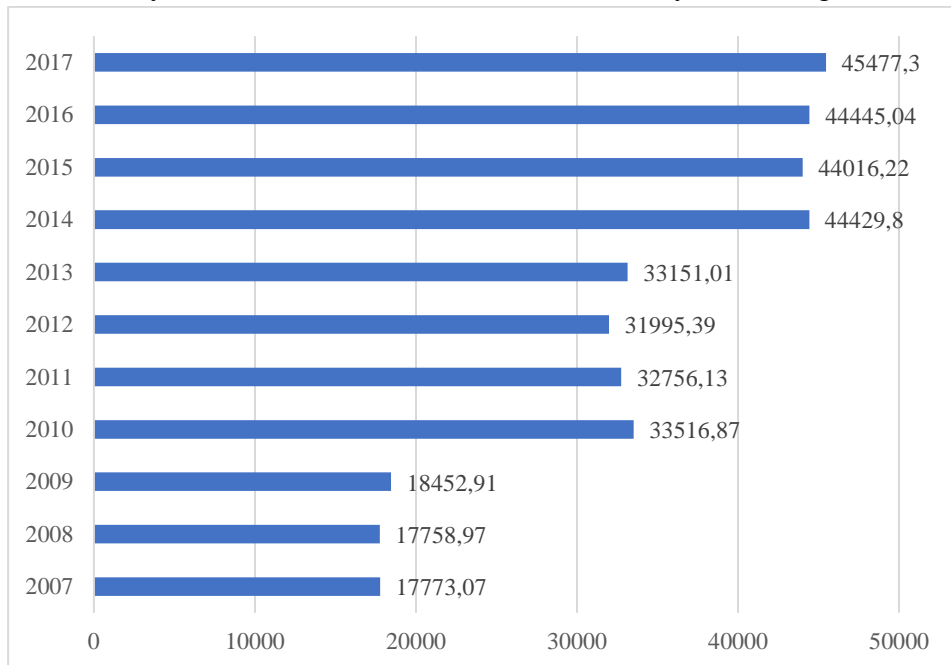


Figure 1. Economic size of dairy farms

Source: own studies based on FADN data

In the analyzed period, total labor inputs increased by 1.4%, own labor inputs by 4.1%, and hired labor inputs decreased by 35% (Table 1). The results may indicate that dairy farm owners are reducing external employment. This may be the result of investments made and difficulties in obtaining employment from the market. Labor resources in the countryside are shrinking and the owners of dairy farms, in order to stop and develop, buy machines and devices that allow them to do the work independently.

Table 1. Labor inputs in the researched dairy farms

Number of dairy farms		Year	Total labor inputs	Own labor inputs	Hired labor inputs
Total	benefiting from financial support for investments				
6474	n.o.	2007	1,91	1,78	0,13
6218	n.o.	2008	1,92	1,81	0,12
5984	320	2009	1,94	1,82	0,11
5312	289	2010	1,92	1,82	0,10
5046	336	2011	1,91	1,83	0,09
4695	383	2012	1,92	1,84	0,08
4003	130	2013	1,86	1,81	0,05
5097	148	2014	1,95	1,85	0,10
4933	185	2015	1,90	1,84	0,05
4682	n.o.	2016	1,94	1,86	0,08
4406	n.o.	2017	1,94	1,86	0,08
Changes 2017/2007	-	-	1,6	4,5	-38,5

Source: own studies based on FADN data

Land resources are an important factor in the development of dairy farms. Poland has favorable conditions for the development of milk production (Trajer and Krzyżanowska 2015). The provinces with large resources of grasslands are predisposed to the development of dairy production (Cieślik 2010). In 2007-13, the largest area was occupied by cereals, and in 2014-17 by fodder crops. The average area of UAA (Utilized Agricultural Area) in the researched farms increased from 26.4 ha in 2007 to 31.2 ha in 2017 (i.e. an increase by 18.2%). In turn, the area of field crops increased from 9.7 ha in 2007 to 15.9 ha in 2017 (i.e. an increase by 64%). The results obtained from IAFE-NRI prove that farm owners adapt crops to the needs of animal production (Table 2).

Table 2. Land resources in the researched dairy farms

Year	Farmland	Leased farmland	Crops area	Area of other field crops	The area of field crops	Orchard area	Forage crops area
2007	26,40	7,59	13,69	2,68	0,08	0,08	9,68
2008	27,68	8,12	14,44	2,45	0,10	0,10	10,42
2009	28,73	8,38	14,40	2,48	0,10	0,10	11,47
2010	28,85	8,31	13,82	2,62	0,09	0,09	11,99
2011	28,40	8,09	13,71	2,44	0,08	0,08	11,87
2012	27,94	7,87	13,60	2,25	0,07	0,07	11,74
2013	24,89	6,86	11,86	2,23	0,08	0,08	10,45
2014	30,86	9,08	13,28	2,56	0,06	0,06	14,62
2015	30,69	8,99	12,66	2,66	0,06	0,06	14,99
2016	30,81	9,12	12,38	2,48	0,06	0,06	15,58
2017	31,19	9,48	12,27	2,61	0,06	0,06	15,89
Changes 2017/2007	18,1	24,9	-10,4	-2,6	-25,0	-25,0	53,5

Source: own studies based on FADN data

An important branch of production on dairy farms is the rearing of dairy cows. Their number increased from 10.54 in 2007 to 18.56 in 2017 (Table 3). The number of remaining cattle also increased during the period considered. On the other hand, the number of sheep and goats, pigs and poultry decreased. The results demonstrate a specialization in milk production. Increasing the number of dairy cows and other cattle proves the development of this branch on farms. On the other hand, the decrease in the number of pigs proves that dairy farms are getting rid of this type of production. In addition, the decisive factor in increasing the cow population is the modernization of the raw material (Milk Market 2018). In the Polish dairy industry, there is an increase in the number of cows on the largest farms, with the simultaneous liquidation of the smallest farms. According to IERiGŻ-PIB, there are approximately 230,000 jobs in the country. farms keeping cows, of which 120 thousand are suppliers for processing plants. Increasing the number of dairy cows and thus milk production causes changes in the supply chain, transport, processing, trade, and of course has negative environmental consequences (Sonne-son and Berlin 2003).

Milk production systems in the EU vary from extensive to intensive and are implemented from lowland to mountain areas (European Commission 2000). Polish milk production systems are classified as extensive and located in lowlands, although on many farms an increase in the milk yield of cows was observed.

Table 3. Animal production (Lu)

Year	Total livestock	Dairy cows	Other cattle	Sheep and goats	Pigs	Poultry
2007	25,95	10,54	6,44	0,06	8,64	0,10
2008	26,06	11,51	7,19	0,05	7,03	0,11
2009	27,57	12,64	7,96	0,05	6,62	0,14
2010	28,86	13,21	8,63	0,05	6,70	0,12
2011	28,38	13,03	8,70	0,06	6,36	0,11
2012	27,89	12,85	8,76	0,06	6,01	0,10
2013	23,72	11,40	6,92	0,08	5,10	0,12
2014	34,10	16,69	12,43	0,05	4,73	0,10
2015	33,79	17,20	11,99	0,06	4,34	0,11
2016	34,25	17,82	12,53	0,06	3,66	0,10
2017	35,40	18,56	13,21	0,05	3,40	0,10
Changes 2017/2007	36,4	76,1	105,1	-16,7	-60,6	0,0

Source: own studies based on FADN data

Animal production is an important area of activity on dairy farms. The density of animals and the milk yield of cows were used for its evaluation. The FADN data show that the stocking density in 2007-2017 increased from 2.26 l / ha to 2.38 l / ha (i.e. an increase by 5.3%). Increasing the stocking density on the farm is the result of increasing the herd of cows and other cattle.

In turn, the milk yield of cows increased in the analyzed period from 3,984.5 kg / cow to 4,931.6 kg / cow (Table 4). In the Polish, European dairy industry, an increase in the milk yield of cows is observed. This is due to the selection of more efficient animal breeds and a better feeding system. Changes in the stocking density and milk yield of cows cause changes in milk production, which is regionally differentiated. The largest milk producers include the following voivodeships: Podlaskie,

Mazowieckie, Wielkopolskie and Warmińsko-Mazurskie (Seremak-Bulge 2005).

Table 4. Stocking density and milk yield of cows

Year	Stocking density Lu/ha	Milk yield kg/cow
2007	2,26	3894,46
2008	2,28	3986,92
2009	2,21	4092,00
2010	2,29	4081,69
2011	2,32	4160,1
2012	2,35	4238,46
2013	2,21	4094,73
2014	2,37	4550,76
2015	2,31	4609,83
2016	2,30	4751,43
2017	2,38	4931,57
Changes 2017/2007	5,3	26,6

Source: own studies based on FADN data

The value of livestock production increased in 2007-2017 by 128.9%, and milk by 178.1%, and live cattle by 193.2% (Table 5). Increasing the production of milk and live cattle proves the progressive specialization. Dairy farm owners increase the production of milk and live cattle and reduce the remaining livestock production. The observed increase in the value of milk resulted from many factors. One of them was the liquidation of the quota system in 2015. Another factor was the increase in milk prices. The elimination of milk quotas and an increase in milk production may have consequences for the dairy industry, land use, and the environment, and may lead to increased nitrogen and phosphorus emissions (Groenevel et al. 2016).

A decrease in the value of livestock production was recorded in individual groups: pork livestock (-40.4), poultry livestock (-25.1%), other production (-20.5) and other animals (-15.8%).

Table 5. The value of livestock production in dairy farms (PLN)

Year	Livestock production	Milk	Beef livestock	Pork livestock	Sheep livestock	Poultry livestock	Eggs	Other animals	Other production	Transfer to farm	Internal consumption
2007	88001,1	55169,0	12026,8	19638,4	55,9	394,3	121,7	578,2	1200,3	2038,8	23313,7
2008	95520,9	60162,3	13232,4	19746,0	51,4	487,1	212,9	1609,9	1910,8	2168,8	24550,9
2009	95591,0	59576,6	16539,3	19074,2	45,5	528,8	217,9	-405,7	1341,8	2032,9	24063,9
2010	108865,6	72685,9	18487,7	16821,2	47,6	418,8	242,1	147,2	1283,5	2025,9	21276,9
2011	117879,4	75939,3	21605,9	19200,6	71,8	391,6	233,1	559,5	1344,5	2048,4	24764,1
2012	126893,2	79180,5	24724,1	21580,0	95,9	364,4	223,9	713,4	1405,5	2055,0	28251,4
2013	110578,9	72746,5	18580	18272,9	99,9	347,5	226,1	287,0	1216,9	2080,9	24803,4
2014	171121,8	128024,2	28577,2	13927,1	59,4	324,3	236,9	-44,8	1346,8	1831,6	26924,4
2015	155103,1	112106,5	30342,6	11791,7	60,4	455,0	189,4	146,7	1296,7	1576,9	24686,7
2016	159949,8	115360,4	30834,3	11526,7	82,4	446,0	204,6	1483,1	1164,1	1449,9	23387,5
2017	201474,9	153451,1	35257,3	11698,7	57,1	295,4	220,6	486,7	954,3	1474,5	24151,
Changes 2017/2007	128,9	178,1	193,2	-40,4	2,1	-25,1	81,2	-15,8	-20,5	-27,7	3,6

Source: own studies based on FADN data

Another section in dairy farms is plant production. Cereal crops are used for its evaluation. Wheat yield increased in 2007-2017 from 24.36 dt / ha to 26.12 dt / ha (an increase by 7.2%).

In turn, the yield of maize increased from 3.2 dt / ha to 7.78 dt / ha (i.e. an increase by 142%). Great interest in the cultivation of maize on dairy farms results from the use of this plant as feed. CCM (Corn Cob Mix) silage is prepared from the stalks and cobs, which is used in feeding cows, which improves milk yield (Table 6).

Table 6. Yields of wheat and maize

Year	Wheat yields dt/ha	Maize yields dt/ha
2007	24,35	3,21
2008	26,74	3,28
2009	25,39	2,93
2010	23,33	2,30
2011	10,35	1,37
2012	22,59	6,70
2013	24,75	6,18
2014	29,00	7,93
2015	26,46	4,61
2016	24,13	7,48
2017	26,12	7,78
Changes 2017/2007	5,3	26,6

Source: own studies based on FADN data

Plant production is most often used as feed in livestock production. In 2017, compared to 2007, there was an increase in the value of protein plants (177.25), oil plants (69.75) and cereals (0.8%). In turn, the largest decrease in value was recorded for fodder crops (-49.5%), potatoes (-42.1%), vegetables and flowers (-41%), fruit (-40%), energy crops (-25.9%). %) and sugar beet (-5.1%). The value of plant production increased by 7.1% over the period considered, although for total production it was 75% over the period considered (table 7).

Table 7. Value of plant production in dairy farms (PLN)

Year	Total production	Plant production	Cereals	Protein crops	Energy crops	Potatoes	Sugar beets	Oil crops	Vegetables, flowers	Fruit	Forage crops
2007	145075,7	55874,3	33708,9	454,1	44,6	4934,0	3631,2	2920,7	2782,7	701,8	5227,2
2008	142013,2	44581,3	25625,7	301,5	45,7	4388,4	2647,6	3942,8	2316,2	674,3	3344,5
2009	135558,9	38626,1	21984,3	363,9	40,4	4393,6	3394,8	3479,6	2290,6	592,5	1280,6
2010	161047,7	50898,7	33378,7	618,9	5,4	5672,0	2941,4	3845,9	2420,7	719,4	515,3
2011	175029,2	55305,3	38197,2	929,8	0,0	4796,7	3608,9	3997,6	2293,7	682,3	592,2
2012	189010,7	60711,9	42835,7	1240,7	3,5	3921,4	4276,4	4139,3	2166,8	645,2	669,1
2013	160780,3	48984,4	31226,6	1044,2	0,0	5021,1	3572,3	4077,2	1989,8	759,7	673,2
2014	224304,4	51835,8	36294,7	1292,2	0,0	3358,4	3939,0	5071,6	1908,2	468,6	-1221,8
2015	199557,2	43157,4	31868,5	1473,8	8,9	3599,7	2785,8	5010,9	1739,4	604,1	-4115,5
2016	209001,2	47887,2	30000,8	1353,4	34,3	3223,1	3468,8	3777,9	1401,5	487,3	3612,4
2017	254328,7	51899,5	33965,8	1258,7	33,0	2856,8	3446,1	4957,6	1642,7	420,9	2639,9
Changes 2017/2007	75,3	-7,1	0,8	177,2	-25,9	-42,1	-5,1	69,7	-4,1	-40	-49,5

Source: own studies based on FADN data

7.3. Efficiency of dairy farms keeping FADN agricultural accounting and investing

In the production process, dairy farms incur costs related to fodder and other factors. The main and the largest category in terms of value is total costs, which include intermediate consumption, depreciation and external factors costs. Direct costs, on the other hand, are part of indirect consumption.

The highest increase in value in 2017 compared to 2007 was recorded for the costs of external factors (106.2%) and depreciation (98.9%). The greatest increase in the value of external factors costs resulted from the need to hire employees, use loans, rent land and others. On the other hand, the greatest increase in the depreciation value resulted from the investments carried out, the purchase of machines, which in the initial period of use are characterized by high value. In agriculture, we calculate depreciation linearly by dividing the value by the planned number of years (Table 8).

A factor conducive to the development of milk production in Poland is lower labor costs, which make it possible to compete on European markets (Roman 2017). Recently, labor and land costs have increased significantly, which has led to a decline in the cost competitiveness of Polish dairy farms (Parzonko 2013).

Table 8. Costs in the researched dairy farms (PLN)

Year	Total costs	Indirect consumption	Direct costs	Depreciation	Costs of external factors
2007	102640,3	80211,2	58340,8	17983,9	4445,2
2008	114950,2	88570,9	64079,1	21236,8	5142,5
2009	118917,2	89620,1	64310,1	23696,3	5600,8
2010	121155,9	91070,6	62832,3	24361,7	5723,5
2011	133134,4	101970,2	71680,9	25380,5	5783,0
2012	145112,9	112870,8	80529,5	26399,7	5842,4
2013	127965,9	97433,8	68674,5	25807,1	4725,1
2014	174148,8	132779,0	94550,8	33232,1	8137,7
2015	169671,2	126920,7	90393,4	34615,4	8135,2
2016	172203,7	128462,5	91323,6	35383,6	8357,5
2017	182194,8	137254,2	96546,6	35775,1	9165,4
Changes 2017/2007	77,5	71,1	65,5	98,9	106,2

Source: own studies based on FADN data

An important aspect of the work was to learn about the economic results of dairy farms keeping FADN agricultural accounting. The data show that in 2017, compared to 2007, the value of economic results increased by over 100%. A particular increase in value was observed in the case of net value added per full-time employee (108.3%) and family farm income (108.1%). Such a large increase in the value of economic results resulted from the increase in the value of livestock production as well as subsidies and other external financial flows. It was also the result of an increase in the milk yield of cows and the production of live cattle (Table 9).

Table 9. Economic results of the researched dairy farms (PLN)

Year	Gross value added	Net value	Income from family farms	Net added value per full-time employee	Income from family farms PLN per a full-time employee
2007	80382,5	62398,7	56480,4	30296,4	31349,0
2008	77428,9	56192,1	50771,0	27291,3	27548,4
2009	72326,4	48630,1	43013,5	23428,8	23196,7
2010	99589,7	75227,9	70192,5	36959,9	37774,7
2011	101670,6	76289,5	71109,7	38031,3	38242,7
2012	103751,4	77351,7	72026,8	39102,6	38710,6
2013	91384,6	65577,6	61802,4	34506,3	33806,2
2014	121354,4	88122,3	81529,9	42409,9	43111,0
2015	103269,6	68654,2	61782,9	34633,0	33067,8
2016	140089,2	104705,6	97981,6	52563,9	52734,0
2017	161406,4	125631,3	117542,9	63114,8	63701,2
Changes 2017/2007	100,8	101,3	108,1	108,3	103,2

Source: own studies based on FADN data

7.4. Equipping dairy farms with fixed and current assets

Dairy farms and farms keeping FADN accounting use total assets in their production, which include fixed and current assets. The analyzes show that in 2017, compared to 2007, an increase in all fixed assets was recorded. The largest increase in value was recorded for land, which increased by 535%. Such a large increase in the value of land results from the fact that land resources are used to produce milk. Moreover, after accession to the EU, an increase in demand for land was recorded, which translated into an increase in its value. Direct payments and other financial streams increased the price of agricultural land.

Buildings used to keep animals in good conditions were another group of assets (an increase of 146.6%). A rapid increase in value was also recorded for the livestock, the value of which increased by 139%. The smallest increase in value was recorded in the case of machines and tools (Table 10).

Table 10. Value of fixed assets on dairy farms (PLN)

Year	Total as-sets	Fixed assets	Land	Buildings	Machines and equipment	Basic herd
2007	487276,3	408141,7	96879,38	164501,4	112298,5	34462,41
2008	530119,5	446961,1	97986,26	178884,1	132637,4	37453,3
2009	947860,3	857697,2	466374,9	190259,5	159569,4	41493,39
2010	976621,6	876486,6	477098,7	193058,1	161538,3	44791,62
2011	1009846,3	899003,3	484076,1	193229,6	174978,2	46719,5
2012	1043071	921519,9	491053,4	193401,1	188418	48647,44
2013	965232,7	858649,5	456098,8	180804,8	177064,4	44681,6
2014	1268557	1133488	584805,0	234754,7	244920,1	69008,27
2015	1266561	1134890	583554,0	234943,2	244565,2	71827,72
2016	1297213	1146976	597051,7	236412,9	237202,6	76308,96
2017	1350251	1184840	615158,3	242735,1	244566,3	82380,3
Changes 2017/2007	177,1	190,3	535,0	146,6	117,8	139,0

Source: own studies based on FADN data

Dairy farms and FADN farms keep current assets in the production process. It consists of stocks of agricultural products and long and short-term liabilities. Its management is one of the important aspects of the functioning of both enterprises and farms (Wasilewski and Chmielewska 2006). It allows for the maintenance of financial liquidity, optimization of the structure of current assets and the implementation of an appropriate financial structure related to the minimization of costs (Sierpińska and Wędzik 1997).

The data show that in 2017, compared to 2007, an increase in the value of all current assets was recorded (Table 11).

Table 11. Value of current assets on dairy farms (PLN)

Year	Current assets	Stock of agricultural products	Total liabilities	Long-term liabilities	Short-term liabilities
2007	79134,6	33054,2	52164,9	38885,9	13279,0
2008	83158,4	37500,9	58186,0	44394,1	13791,9
2009	90163,1	32861,9	63306,9	47793,7	15513,2
2010	100135,0	39424,9	63410,8	48370,7	15040,1
2011	110843,2	44872,7	62115,0	47072,7	15042,3
2012	121551,3	50320,6	60819,2	45774,7	15044,5
2013	106583,2	42824,7	47689,9	36155,2	11534,8
2014	135069,2	50623,0	82639,7	64703,9	17935,7
2015	131671,2	43614,9	82275,1	63586,5	18688,6
2016	150237,0	46877,9	80720,5	62212,6	18507,9
2017	165410,8	52578,2	88200,4	67170,5	21029,9
Changes 2017/2007	109,0	59,1	69,1	72,7	58,4

Source: own studies based on FADN data

The sum of fixed and current assets reduced by long-term and short-term liabilities gives the capital of farms (Figure 2). Its value on dairy farms increased in 2007-2017 by 190%.

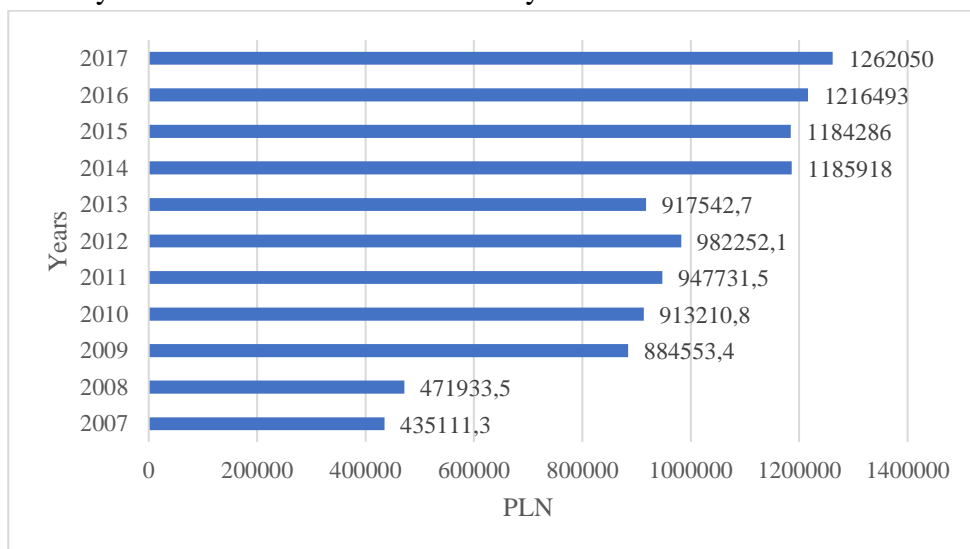


Figure 2. Equity of dairy farms

Source: own studies based on FADN data

7.5. Investments in dairy farms

Investments are one of the strategies of dairy farms. Their aim is to increase the competitive potential of farms. Investments carried out in dairy farms allow for their modernization and their adaptation to EU standards (Pietrzak 2014). As a result of the investments carried out, production costs are reduced, production capacity improved, as well as changes in supply and sales (Sierpińska and Jachna 1997). Moreover, the implemented investments in dairy farms contribute to the introduction of new technologies and improvement of milk quality and animal welfare (Bewley 2010). The benefits of the investments also include improved labor productivity, keeping farms in good condition, greater implementation of technology and increased herd of animals (Pouch and Trouré 2018).

Generally, according to the FADN methodology, investments are divided into gross and net investments. Net investments are gross investments minus depreciation. The highest value was observed for gross investments, the value of which increased from PLN 29,827.47 in 2007 to PLN 48,587 in 2017 (63%). Dairy farms invest in machinery, buildings and structures, animals and land (Table 12). In the conditions of strong market competition, investing is a necessary activity to stay on the market.

Table 12. Investment value (PLN)

Year	Gross investment	Net investment	Subsidies to investment
2007	29827,5	11843,6	1413,3
2008	24898,6	3661,8	1756,2
2009	30081,1	6384,7	1646,4
2010	32529,6	8167,8	2239,1
2011	38089,6	12708,9	2373,4
2012	43649,7	17250,0	2507,7
2013	28049,5	2242,5	2275,0
2014	41962,5	8730,5	3440,1
2015	33546,7	-1068,7	2806,9
2016	26550,6	-8832,9	2749,4
2017	48587,2	12812,1	2507,6
Changes 2017/2007	62,9	8,2	77,4

Source: own studies based on FADN data

7.6. Operating subsidies

With the accession to the EU, Polish agriculture was included in the instruments of the common agricultural policy. These include various measures targeting farms to modernize them and improve their competitiveness. These activities are not only a kind of financial aid, but also an incentive to conduct investments (Malak-Rawlikowska et al. 2007). The broad support included financial aid, consulting, training, and access to means of production (Dries and Swinnen 2004).

One of the most important instruments are direct payments. Dairy farm owners can benefit from operating subsidies, agri-environmental subsidies, subsidies for less favored areas and other subsidies for rural development. Among them, subsidies to operating activities constitute the greatest value.

One of the problems in the functioning of dairy farms is environmental pollution. Dairy farms produce large amounts of organic fertilizers and gases. The Common Agricultural Policy (CAP) provides financial support for more environmentally friendly agriculture (Cederberg and Mattsson 2000).

An important group of payments are payments to less-favored areas. Under Polish conditions, they cover a large part of the country. Farmers can apply for agri-environmental subsidies aimed at preserving the values of the natural environment. As emphasized by Czyżewski et al. (2019), agri-environmental payments contribute to the sustainable development of agriculture. The smallest group in terms of value were other subsidies for rural development.

Table 13 presents the subsidies obtained by dairy farms in Poland.

Table 13. Subsidies (PLN)

Year	Subsidies for operating activities	Agri-environmental subsidies	Subsidies for less-favored areas	Other subsidies for rural development
2007	16262,9	951,9	2147,9	657,4
2008	25139,9	1619,9	3286,1	581,7
2009	27689,6	1765,1	3166,5	557,5
2010	30420,9	2197,9	3141,6	468,0
2011	29562,3	2143,8	2971,5	691,5
2012	28703,6	2089,6	2801,5	690,8
2013	29220,4	2575,7	2816,5	155,2
2014	31158,6	2594,0	3103,7	263,9
2015	32143,5	1564,5	3015,8	1462,3
2016	61219,9	1464,8	3099,1	619,4
2017	45236,7	1313,8	3093,4	816,2
Changes 2017/2007	178,2	38,0	44,0	24,2

Source: own studies based on FADN data

7.7. Investment subsidies

Farmers can obtain subsidies for their investments. They play an important role not only in the modernization of farms and enterprises and their modernization, but also in the functioning of the capital market (Mojsoska and Gerasimoski 2012).

Among all subsidies, the largest value is that of subsidies for the purchase / overhaul of machinery and equipment. Under these subsidies, farmers can obtain non-returnable aid amounting to 50% of eligible purchase costs.

The second important group are subsidies under the program facilitating the start of young farmers. In the meaning of the provisions applicable to these subsidies, a young farmer is a person under 40 years of age.

The next group consisted of subsidies for buildings or major renovation of buildings. These investments improve animal welfare and facilitate milking and feeding (Table 14).

Table 14. Investment subsideis (PLN)

Year	Subsidies for the purchase of agricultural land	Subsidies for the establishment of permanent crops	Grants for the construction / renovation of drainage	Subsidies for construction / major renovation of buildings	Subsidies under the program to facilitate the start of young farmers	Subsidies for the purchase / major renovation of machinery and equipment
2007	0,0	0,0	0,0	0,0	0,0	0,0
2008	0,0	0,0	0,0	0,0	0,0	0,0
2009	0,0	0,0	0,0	256,9	58,5	6249,2
2010	0,0	0,0	0,0	646,1	42,3	5883,2
2011	0,0	0,0	0,0	141,2	639,1	1434,7
2012	8,4	0,0	0,0	165,5	623,0	9325,7
2013	0,0	0,0	6,7	360,9	81,7	3072,2
2014	4,9	19,6	0,0	193,4	210,0	3052,3
2015	101,3	0,0	0,0	308,6	1419,0	3846,0
2016	0,0	0,0	0,0	0,0	0,0	34,2
2017	0,0	0,0	0,0	0,0	0,0	0,0

Source: own studies based on FADN data

7.8. Summary and conclusion

The dairy farms recorded the development in case of farm area, organization and production. Such a situation was the results of increasing competitiveness of Polish dairy farms.

Almost all characteristics of dairy farms increased. The milk yield of cows increased in the analyzed period from 3,984.5 kg / cow to 4,931.6 kg / cow. This is due to the selection of more efficient animal breeds and a better feeding system.

The equity value on dairy farms increased in 2007-2017 by 190%. Such results can be the effect of investment which increased the value of machinery. Moreover, the value of land increased in the period as the results of increased demand for land not only from agriculture but also from non-agricultural sectors.

The investment value increased in the period under study. Such a situation is the effect of utilization of public support from the EU. The EU is increasing the competitiveness of dairy farms by different tools, for example subsidies and Rural Development Program.

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