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Remuneration for Own Labour in Family-Run Dairy Farms Versus the Salaries and Wages in Non-Agricultural Sectors of the Economy—Evaluation of the Situation in Poland in 2005–2022

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Abstract: Income level is a key indicator of the standard of living and the economic efficiency of undertaken activities. This paper aims to evaluate the earnings of Polish dairy farmers compared to those in other economic sectors between 2005 and 2022. The analysis covered 1688 family-run farms that participated continuously in the FADN system throughout the study period, with particular emphasis on farms that expanded their dairy cow herds. The remuneration for the labour of farmers and their families was estimated ex post by subtracting the opportunity costs of owned land and capital from farm income. The alternative cost of engaging one's own land was determined on the basis of actual rental prices for farmland occurring in the surveyed farm groups in the years analysed. This information is collected in the FADN system from which the studied group of farms was drawn. The basis for determining the alternative cost of involvement of own capital was the average interest rates on deposits for households, concluded for a period of 6 months to 1 year inclusive, reported by the National Bank of Poland. The analysed population was divided into seven groups based on the number of dairy cows maintained. The analysis focused on two three-year reference periods: 2005–2007 and 2020–2022. The results were compared with average salaries and wages in non-agricultural sectors of the economy. Structural changes in agriculture, increased productivity, and the expansion of production scale in dairy farms indicate a growing professionalisation of the sector. The rise in farm incomes during the analysed period contributed to a significant increase in the remuneration for farmers' and their families' labour. The highest growth in remuneration was observed among farms with the greatest production potential and scale. While in 2005–2007 the remuneration for labour in dairy farms was lower than in non-agricultural sectors, this situation changed in 2020–2022. During this latter period, the average remuneration for labour on dairy farms slightly exceeded the average salary and wages in other sectors of the economy.

Keywords: milk production; commercial farm; income from a family-run farm; remuneration for own labour; work productivity; Poland; FADN

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1. Introduction

The amount of remuneration for work is one of the most important indicators used to assess the standard of living of citizens across different countries [1,2]. It results from various factors, with labour productivity being the most significant [3]. Selected authors argued that, "productivity isn't everything, but in the long run it is almost everything". The ability of individual countries to improve their standard of living depends almost entirely on their capacity to increase output per worker [4]. This assertion stems, among other sources, from the observations of the classic economist Adam Smith, who, in his seminal work An Inquiry into the Nature and Causes of the Wealth of Nations, published in 1776, wrote that a nation's wealth depends on the following:

1. the skills, efficiency, and expertise with which work is performed;
2. the proportion of those who work usefully to those who do not [5].

The pursuit of high remuneration is a goal for most people, including farmers operating agricultural holdings. Throughout economic history, agricultural holdings have evolved from subsistence-based entities [6,7] into enterprises where market relations and the potential for income generation play an increasingly significant role. The pursuit of high remuneration is a goal for most people, including farmers operating agricultural holdings. Throughout economic history, agricultural holdings have evolved from subsistence-based entities [6,7] into enterprises where market relations and the potential for income generation play an increasingly significant role [8].

Currently, achieving strong financial performance—both in absolute terms and relative to the labour or capital employed—is a necessary condition for agricultural holding owners to continue farming. It enables them to support their families and invest [9,10]. Farm income serves as a key metric for evaluating the effectiveness of agricultural activity and is also considered the most important measure illustrating the dynamics of change and the competitiveness of agricultural holdings. As Kryszak et al. observe, "incomes from farming remain a key research area in agricultural studies due to their fundamental role in influencing the living standards of farming families and the development of rural areas and the agricultural sector as a whole" [11].

The structure of commercial agricultural production in Poland is dominated by livestock production, with milk production constituting a significant share [12]. Consequently, dairy cattle rearing plays a crucial role in the incomes of agricultural holdings involved in livestock farming [13]. Poland is one of Europe's major producers of milk and dairy products. In terms of production volume, Poland ranks among the top three milk producers in Europe, with Germany leading, followed by France. In 2024, Poland produced 15.6 million tonnes of milk, up from 11.9 million tonnes in 2005. In 2024, Polish exports of milk products amounted to EUR 3.410 billion, while imports stood at EUR 1.885 billion, resulting in a positive trade balance of EUR 1.525 billion. In contrast, in 2005, exports of milk products were significantly lower at EUR 899 million, while imports were EUR 175 million. These figures demonstrate the dynamic growth of the milk sector in Poland between 2005 and 2024.

Since 2005, milk production on Polish farms has been gradually increasing in both scale and intensity. This is reflected in the number of cattle maintained and in their milk yield. Between 2005 and 2024, the average milk yield per cow rose from 4147 to 6790 litres. At the same time, the number of dairy cows declined from 2,801,000 in 2005 to 2,245,000 in 2024. Meanwhile, the total cattle population, including beef cattle, increased. Due to rising production costs, growing competition from increasingly large producers, and low milk procurement prices, some farmers have opted to shift from dairy to beef cattle production [14]. Contributing factors include lower labour intensity, less competition, and the availability of support programmes for extensive production [15]. An additional incentive

for this shift is growing consumer demand for meat of particular quality—particularly beef with low cholesterol content [16]. Although beef consumption in Poland remains low, it is gradually increasing [17].

Changes in Polish dairy farms have also been influenced by broader economic transformations [18]. Between 2005 and 2023, Poland's GDP per capita rose nearly 3.5 times, from PLN 19,500 to PLN 90,400. Workers' pay increased almost threefold, from PLN 2502 to PLN 7444 per month. According to the literature, two broad groups of factors determine wages [19–21]. The first group includes microeconomic factors: employee qualifications, job-seeking intensity and duration, expectations and ambitions, employer contacts, and gender [22]. The second group includes macroeconomic factors: GDP level, inflation, unemployment rate, employment levels, labour costs, social security provisions (e.g., unemployment benefits), labour productivity, and labour regulations. Many of these variables both influence and are influenced by remuneration levels.

Despite the numerous scientific works on the problems of labour productivity in agriculture and labour profitability on farms, there is a lack of research results in the literature presenting changes in labour profitability on dairy farms in the last two decades. This is particularly interesting in the case of a country like Poland, due to certain historical conditions. Poland's accession to the EU in 2004 undoubtedly had an impact on various areas of life of Polish citizens, including those who run farms. The question arises about the rate of change in the profitability of farm labour and the rate of change in the standard of living of citizens working outside the agricultural industry.

The primary objective of this paper is to determine and compare remuneration for work on family-run farms specialising in milk production with wages in Poland's non-agricultural sectors during the period 2005–2022.

2. Materials and Methods

The predominant organisational form of agricultural holdings in Europe, including Poland, is the family-run farm [8,23]. Key characteristics include (1) reliance on unpaid family labour; (2) close integration between the household and the farm, with family labour and farm income supporting private household needs; and (3) alignment of farm objectives with family goals—typically, the gradual accumulation of wealth for inheritance [24,25]. These characteristics complicate efforts to measure the value of farmers' and family members' labour. For this reason, agricultural income or income from a family-run farm over a specified period (usually a year) is a common measure of economic performance [26]. Agricultural income is narrower in scope than income from a family-run farm, covering only the effects of agricultural activity. The latter includes funds from EU structural programmes. Both income types reflect compensation for the farmer's labour and the remuneration of capital and owned by the farming family. The Farm Accountancy Data Network (FADN) system calculates income from family-run farms.

Since most dairy-producing agricultural holdings in Poland are family-run, and the aim of this study is to compare their work remuneration with earnings in other economic sectors, it is necessary to deduct the opportunity costs of owned capital and land from farm income. The cost of using owned land was estimated based on the average ground rent paid by commercial farms. This information is indirectly collected in the FADN system (variable SE375) and presents the rent paid by the farm in question. With additional information on the number of lease surface of farmland (variable SE030), it was possible to determine the amount of rent per ha of rented land. Taking into account all farms assigned to a particular group, it was possible to determine the amount of average rent paid for leased land. The assumption was made that one's own farmland resources could be leased for a certain average rent. The opportunity cost of owned capital (excluding land) was estimated using

the average deposit interest rate for households for terms of six months to one year, as reported by the National Bank of Poland [27]. Given that farmers typically hold more capital than the average household, it was assumed that they could negotiate interest rates 20–25% higher than the published rates. Therefore, the assumed rates were 5% for 2005–2007 and 2% for 2020–2022.

Based on these assumptions, it was possible to estimate ex post remuneration for the work of the farmer and their family using the following Formula (1):

$$Wpw = DGR - KZ - KK, \quad (1)$$

Wpw—remuneration for the farmer's and family's labour
DGR—income from a family-run farm
KZ—opportunity cost of using own land
KK—opportunity cost of using own capital (excluding land)

The source data for this analysis come from the accounting records of commercial farms maintained for the FADN system by the Institute of Agricultural and Food Economics—National Research Institute in Warsaw. The analysis covers 1688 commercial farms in Poland that continuously submitted data for FADN from 2005 to 2022. This longitudinal approach allowed for an in-depth analysis. To reduce the influence of short-term climatic and economic variability, the study used averages for the periods 2005–2007 and 2020–2022.

As production scale is one of the key factors influencing economic outcomes [28], the analysed farms were categorised based on the number of dairy cows kept, resulting in seven groups (Table 1). The most numerous group included 695 entities (41.2%) and comprised farms with fewer than one cow during 2005–2007, while the smallest group—those with over 50 cows—included only 10 farms. Due to FADN's confidentiality requirements, data for groups with fewer than 15 farms could not be published. The remaining groups ranged from 44 farms (maintaining 30–50 cows) to 286 farms (maintaining 1–3 cows). Over the analysed time, the herd sizes changed in many groups (Table 2).

Table 1. Grouping of analysed farms by average dairy cow herd size.

Specification	Groups by Number of Dairy Cows on a Farm							
	0.00–0.99	**1.00–2.99**	**3.00 –10.00**	**10.01 –20.00**	**20.01 –30.00**	**30.01–50.00**	**>50.00**	**In Total**
	Number of Farms in the Group							
Period A (2005–2007)	695	286	308	250	95	44	10	1688
Period B (2020–2022)	1100	66	127	135	114	93	53	1688

Source: own elaboration based on FADN data.

During 2005–2022, the most stable group was farms with up to one cow; only 6 farms increased their herd size, while the remaining 689 exited dairy farming. Among farms with up to 10 cows in 2005–2007, most reduced their herds. In the group with 10–20 cows, 45% (113 farms) increased their herds, 25.2% (63 farms) stayed the same, and 29.6% (74 farms) reduced them. Similar upward trends were observed in farms with over 20 cows. The group with more than 50 cows grew more than fivefold over the period, adding 43 farms (Table 2).

To assess remuneration levels on these farms, average earnings in Poland's economy over the same periods were used for comparison. The reference was average wages in public and private enterprises. In 2005–2007, average employment in the public and

private sectors was 3,635,000 and 9,584,000, respectively. In 2020–2022, employment rose to 15,001,000, mostly in the private sector (11,602,000 employed).

The study presents results in nominal terms. For the convenience of international readers, economic data are expressed in US dollars (USD), however currency inflation effects have to be mentioned as a factor that may influence the way in which the presented data are interpreted.

Table 2. Number of farms changing groups over the study period.

Starting Group in 2005–2007 (Number of Cows in a Herd)	Group in 2020–2022 (Number of Cows in a Herd)							
	0.00–0.99	1.00–2.99	3.00 –10.00	10.01 –20.00	20.01 –30.00	30.01–50.00	>50.00	In Total
	Number of Farms Shifting to Another Group over the Period of Analysis							
0.00–0.99		1	0	2	2	1	0	6
1.00–2.99	242		14	1	0	0	0	257
3.00–10.00	119	27		61	12	1	2	222
10.01–20.00	42	8	24		72	36	5	187
20.01–30.00	6	1	3	7		39	14	70
30.01–50.00	2	0	0	1	3		23	29
>50.00	0	0	0	0	0	1		1
In total	411	37	41	72	89	78	44	772

Source: own elaboration based on FADN.

3. Results

3.1. Changes in Farm Production Resources

Land—specifically agricultural area—is a critical production factor in farming, influencing production levels and capacity for change [29].

Farmers cultivate either owned or leased land. Average farm size across the analysed groups varied significantly and correlated with herd size (Table 3). The largest farms (with over 50 cows) had an average agricultural area of 77.2 ha in 2020–2022. It is worth noting that farms that expanded their milk production also grew in land area. For instance, farms with 10–20 cows in 2005–2007 that grew to 30–50 cows by 2020–2022 expanded their land by 16.8 ha, or 53.5% of their 2005–2007 average area (Table 3).

Farmers primarily expanded their land by leasing rather than purchasing, due to high and rising land prices. Moreover, the direct payment calculation method discouraged land sale after ceasing intensive farming. In 2020–2022, the share of leased land ranged from 9.9% (in farms reducing herds to 1–3 cows) to 40.4% (in farms with over 50 cows) (Table 4).

Today, farming requires substantial assets, particularly fixed assets such as vehicles (tractors, cars, trailers), machinery, farming equipment and tools, and buildings. This necessitates high capital investment. In the analysed period, the capital invested in fixed and current assets used in agricultural activity rose steadily across all farm groups—from USD 117,000 in 2005–2007 to USD 161,800 in 2020–2022, an increase of over 44%. The largest capital increases were observed on farms expanding their cattle herds. For example, farms that grew from 10–20 cows to 30–50 cows more than doubled their capital, from USD 112,500 to USD 264,800. Conversely, farms that reduced their herds, especially those going from 3–10 cows to 1–3 cows, saw capital investments decrease (Table 4).

Those managing farms constantly make decisions regarding sources of financing, both for day-to-day operations and investments. The choice of financing structure follows a certain hierarchy—internal resources are used first, and when these prove insufficient, farmers turn to external sources of capital. Finance theory often distinguishes between two models of financing economic activity. One of them is the so-called "retrospective model", in which an economic entity (including agricultural holdings) avoids credit and loans, thereby minimizing financial risk [30,31]. However, such an approach limits the scale of day-to-day operations and development opportunities and is rarely used in a free-market

economy. The second model, referred to as "prospective", involves financing investments through credit and loans. In the analysed farms, the share of liabilities (borrowed capital) in financing owned assets was relatively low in the period 2020–2022, averaging 15.3%. This indicates that farmers are reluctant to make use of various credit and loan options. The highest share of liabilities in asset financing was observed in farms that, during 2005–2007, maintained 30–50 dairy cows and increased the herd size to over 50 cows by 2022 (Table 4).

Table 3. Average land and capital resources by farm group *.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Total Agricultural Land (ha of AA)		Owned Capital Without Land (USD)	
A	**B**	**A**	**B**	**A** [(1)]	**B** [(2)]
Farms in total		30.8	39.4	116,989	161,798
Farms resigning from milk production					
1.00–2.99	0.00–0.99	21.9	28.5	85,984	94,975
3.00–10.00	0.00–0.99	22.7	27.8	89,449	99,922
10.01–20.00	0.00–0.99	29.8	33.9	107,164	112,649
Farms limiting herd size					
3.00–10.00	1.00–2.99	17.2	20.1	82,568	68,463
10.01–20.00	3.00–10.00	20.1	23.2	99,327	87,337
Farms expanding herd size					
3.00–10.00	10.01–20.00	20.2	28.6	82,915	126,238
10.01–20.00	20.01–30.00	26.7	35.5	108,339	177,055
10.01–20.00	30.01–50.00	31.4	48.2	112,525	264,758
20.01–30.00	30.01–50.00	34.7	46.3	153,562	287,333
30.01–50.00	>50.00	54.0	77.2	239,655	523,580

* A: average for the period 2005–2007. B: average for the period 2020–2022. [(1)] for the period 2005–2007 average exchange rate: 1 USD = 3.10 PLN; [(2)] for the period 2020–2022 average exchange rate: 1 USD = 3.86 PLN. Source: own elaboration based on FADN.

Table 4. Average share of leased land and external capital by farm group (%) *.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Share of Leased Land		Share of External Capital in Total Capital (Without Land)	
A	**B**	**A**	**B**	**A**	**B**
Farms in total		29.5	30.7	15.3	15.3
Farms Resigning from Milk Production					
1.00–2.99	0.00–0.99	23.1	30.7	9.1	13.8
3.00–10.00	0.00–0.99	25.2	24.9	8.3	10.7
10.01–20.00	0.00–0.99	24.0	29.7	13.0	10.7
Farms Limiting Herd Size					
3.00–10.00	1.00–2.99	10.5	9.9	5.7	6.5
10.01–20.00	3.00–10.00	16.4	22.0	7.4	4.8
Farms Expanding Herd Size					
3.00–10.00	10.01–20.00	19.8	32.2	9.9	7.4
10.01–20.00	20.01–30.00	29.2	33.5	10.7	9.1
10.01–20.00	30.01–50.00	30.9	37.3	18.7	12.3
20.01–30.00	30.01–50.00	32.3	33.3	15.3	9.1
30.01–50.00	>50.00	45.7	40.4	21.3	24.2

* A: average for the period 2005–2007. B: average for the period 2020–2022. Source: own elaboration based on FADN.

Family members are a vital asset in determining production and investment decisions in family-run farms. Their skills, self-motivation, ability to motivate co-workers, and values shape the farm's growth trajectory and its economic and organisational outcomes. Members of a close family do not receive remuneration in the form of regular wages. Instead, their compensation is the income earned from agricultural activity, which must be allocated between current consumption and planned investments. In the analysed farms, unpaid labour by the farmer and their family dominated the labour input structure. In the period 2020–2022, the proportion of labour input from hired workers in total labour input averaged 13%, showing a slight decrease compared to the average from 2005–2007 (Table 5).

Table 5. Average labour inputs in the analysed groups of agricultural holdings *.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Total Labour Input (Farmer's Family's Labour and Hired Labour) (Hour)		Share of Hired Labour in Total Labour Input (%)	
A	**B**	**A**	**B**	**A**	**B**
Farms in total		4513	4363	14.8	13.0
Farms resigning from milk production					
1.00–2.99	0.00–0.99	3907	3644	6.1	6.6
3.00–10.00	0.00–0.99	3937	3305	3.7	2.7
10.01–20.00	0.00–0.99	4452	3122	8.6	2.8
Farms limiting herd size					
3.00–10.00	1.00–2.99	3872	3364	2.6	0.1
10.01–20.00	3.00–10.00	4500	3764	3.5	0.6
Farms expanding herd size					
3.00–10.00	10.01–20.00	3993	4215	1.4	1.6
10.01–20.00	20.01–30.00	4381	4866	3.2	1.4
10.01–20.00	30.01–50.00	4504	4821	0.4	2.3
20.01–30.00	30.01–50.00	4419	5488	5.3	3.3
30.01–50.00	>50.00	5372	6819	17.4	24.0

* A: average for the period 2005–2007. B: average for the period 2020–2022. Source: own elaboration based on FADN.

According to a widely accepted principle, labour input increases in farms with large-scale production. The considerable labour demand in such farms is met by employing hired workers. In the analysed group of farms that maintained over 50 dairy cows in the period 2020–2022, the share of hired labour in the total labour input was the highest, averaging 24%. Employing external labour requires new qualifications from cattle farmers, notably in human resource management [32].

3.2. Remuneration for Work in Agricultural Holdings and Non-Agricultural Sectors

Under the system for collecting accountancy data for shaping the EU's agricultural policy (FADN), three main indicators of the economic efficiency of agricultural holdings have been proposed: (1) gross value added, (2) net value added, and (3) income from a family-run farm. Gross value added is the value of total output minus intermediate consumption, adjusted by the balance of subsidies and taxes on operating activities. In calculating this category, the origin of the employed land, labour, and capital resources is not considered—it makes no difference whether they are owned, borrowed, leased, or externally financed. Net value added is gross value added minus depreciation. Income from a family-run farm is net value added minus the cost of external production factors (wages for hired labour, interest on loans and leases) and plus the balance of subsidies and taxes on investment activity. However, it should be noted that in calculating income, only the investment grant instalment relevant to the given year is included.

In the period 2005–2022, average income from family-run farms increased across all analysed groups of entities, although the pace of change varied. The highest income was generated by farms with the greatest potential and production scale. Farms that, in 2005–2007, maintained 30–50 dairy cows and increased their herd to over 50 cows by 2022 recorded the highest income, i.e., USD 134,200 at the beginning of the analysed period and USD 177,300 in the period 2020–2022 (Table 6). Key factors contributing to income growth included improvements in technical efficiency—manifested in increased milk yield per cow—and the gradual increase in financial support from direct payments and EU investment funds.

Table 6. Average income of agricultural holdings in the analysed groups *.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Annual Income from a Family-Run Farm (USD)		Income Increase (%)
A	**B**	**A** (1)	**B** (2)	
Farms in total		18,870	48,668	158
Farms resigning from milk production				
1.00–2.99	0.00–0.99	9827	26,958	174
3.00–10.00	0.00–0.99	10,508	25,658	144
10.01–20.00	0.00–0.99	18,314	25,634	40
Farms limiting herd size				
3.00–10.00	1.00–2.99	10,508	17,140	63
10.01–20.00	3.00–10.00	17,514	22,475	28
Farms expanding herd size				
3.00–10.00	10.01–20.00	23,373	36,165	55
10.01–20.00	20.01–30.00	46,378	56,633	22
10.01–20.00	30.01–50.00	48,358	83,442	73
20.01–30.00	30.01–50.00	81,411	83,415	2
30.01–50.00	>50.00	134,222	177,327	32

* A: average for the period 2005–2007. B: average for the period 2020–2022. (1) for the period 2005–2007 average exchange rate: 1 USD = 3.10 PLN; (2) for the period 2020–2022 average exchange rate: 1 USD = 3.86 PLN. Source: own elaboration based on FADN.

The increase in income obtained by farms, accompanied by constant or declining labour input from the farmer and their family (Table 5), contributed to a significant rise in the profitability of own labour during the analysed period. In farms that substantially increased the number of dairy cows, income from the farmer and their family's own work more than tripled (Table 7).

The rising profitability of own labour led to a noticeable increase in the calculated remuneration for work (Table 8). Based on the adopted methodology, the average remuneration for the farmer and their family's work in the analysed group of farms increased more than threefold during the analysed period—from USD 3.1 per hour in 2005–2007 to USD 7.5 per hour in 2020–2022. The highest increase was observed in farms with the greatest potential and production scale. In farms that grew their herd to over 50 cows, remuneration increased by USD 26.2 per hour (Table 8).

When analysing the calculated remuneration level for work performed by farmers and their families on Polish dairy farms, it is worth identifying benchmarks to assess the changes. Undoubtedly, farmers compare their results with those in non-agricultural sectors. Therefore, comparing remuneration for farm work with that in other sectors of the economy is justified.

Table 7. Profitability of the farmer and their family's own work in the analysed groups of farms *.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Average Annual Income from a Family-Run Farm per Person Working Full Time (USD/FWU) *		Income Increase (%)
A	B	A (1)	B (2)	
Farms in total		10,387	12,487	20.2
Farms resigning from milk production				
1.00–2.99	0.00–0.99	5968	17,824	198.7
3.00–10.00	0.00–0.99	6129	15,104	146.4
10.01–20.00	0.00–0.99	9613	17,876	86.0
Farms limiting herd size				
3.00–10.00	1.00–2.99	6774	10,803	59.5
10.01–20.00	3.00–10.00	9613	13,575	41.2
Farms expanding herd size				
3.00–10.00	10.01–20.00	8065	20,130	149.6
10.01–20.00	20.01–30.00	10,258	26,010	153.6
10.01–20.00	30.01–50.00	11,548	39,430	241.4
20.01–30.00	30.01–50.00	14,516	34,352	136.6
30.01–50.00	>50.00	25,290	82,435	226.0

* A: average for the period 2005–2007. B: average for the period 2020–2022. (1) for the period 2005–2007 average exchange rate: 1 USD = 3.10 PLN; (2) for the period 2020–2022 average exchange rate: 1 USD = 3.86 PLN. Source: own elaboration based on FADN.

Table 8. Remuneration for own work in the analysed groups of agricultural holdings.

Average Number of Dairy Cows in a Herd in Different Farm Groups		Average Rate of Remuneration for Own Labour (USD/Hour) *		Increase in Farm Income (%)
A	B	A (1)	B (2)	
Farms in total		3.1	10.6	241
Farms resigning from milk production				
1.00–2.99	0.00–0.99	1.4	6.8	387
3.00–10.00	0.00–0.99	1.5	5.6	261
10.01–20.00	0.00–0.99	2.6	6.6	149
Farms limiting herd size				
3.00–10.00	1.00–2.99	1.4	3.8	168
10.01–20.00	3.00–10.00	2.7	5.2	88
Farms expanding herd size				
3.00–10.00	10.01–20.00	1.4	8.1	469
10.01–20.00	20.01–30.00	3.0	10.7	261
10.01–20.00	30.01–50.00	3.2	16.3	416
20.01–30.00	30.01–50.00	4.6	14.1	207
30.01–50.00	>50.00	8.9	35.1	296

* A: average for the period 2005–2007. B: average for the period 2020–2022. (1) for the period 2005–2007 average exchange rate: 1 USD = 3.10 PLN; (2) for the period 2020–2022 average exchange rate: 1 USD = 3.86 PLN. Source: own elaboration based on FADN.

Remuneration in the Polish economy increased steadily from 2005 to 2022, nearly doubling by the end of the period (Table 9). The rate of change varied over time and across sectors. On an annual average basis, the hourly remuneration in the entire economy increased by USD 0.25. The largest increase occurred in 2008, whereas in 2009, remuneration declined slightly relative to the previous year (Table 9). It is important to note that exchange rates significantly influenced the results. In 2022, a sharp increase in the

USD/PLN exchange rate caused the average hourly rate expressed in USD to be lower than in 2021.

Table 9. Average hourly rate in selected sectors of the economy in Poland (2005–2022) (USD *).

Year	In Total	Selected Sectors of the Economy			
		Industry	Construction	Trade	Scientific Activity
2005	4.62	4.67	4.34	4.28	7.28
2006	5.07	5.12	4.95	4.68	8.19
2007	6.23	6.25	6.44	5.81	9.78
2008	7.89	7.84	8.35	7.31	12.74
2009	6.36	6.36	6.64	5.85	10.40
2010	6.80	6.91	7.01	6.17	10.51
2011	7.27	7.42	7.47	6.59	10.71
2012	6.84	7.04	6.79	6.14	9.84
2013	7.26	7.49	7.05	6.48	10.48
2014	7.54	7.74	7.37	6.75	10.92
2015	6.53	6.65	6.46	5.87	9.65
2016	6.48	6.56	6.45	5.91	9.59
2017	7.17	7.23	7.18	6.65	10.37
2018	8.03	8.11	8.11	7.46	11.55
2019	8.05	8.12	8.12	7.51	11.34
2020	8.30	8.36	8.28	7.76	11.69
2021	9.11	9.16	9.01	8.56	12.82
2022	8.92	8.84	8.76	8.27	12.37

* USD exchange rate according to the National Bank of Poland Source: own elaboration based on https://bdl.stat.gov.pl (accessed on 1 April 2025).

Comparing remuneration for farmers and their families with average pay in non-agricultural sectors of the Polish economy reveals significant changes. In 2005–2007, calculated average remuneration for farm work was lower than that in other sectors. By 2020–2022, the situation had reversed, with average farm remuneration slightly exceeding that in non-agricultural sectors. A major factor influencing farm remuneration was the scale of activity, which depended on production potential, including the number of cows owned. In 2020–2022, Polish farms maintaining 20–30 dairy cows achieved work remuneration comparable to the average in other economic sectors. In contrast, farms with over 50 cows recorded remuneration that was, on average, 3.8 times higher than in other sectors.

4. Discussion

Remuneration and the related concept of labour efficiency are fundamental in a market economy [33]. Commercial farmers aim to earn income that compensates their labour at a level not lower than that of other sectors, while also generating surpluses for investment [34,35]. This is a demanding goal due to the unique nature of agricultural activity [36] and the sector's place in the modern division of labour [37]. Agriculture is inherently biological [38]. This causes it to be an activity closely linked to a specific resource such as land [39]. Due to the necessity of using land, agriculture still follows the classical three-factor production model. Labour productivity—and consequently remuneration—depends on the productivity of land and capital. Low land productivity leads to low labour productivity [3]. This is one of the

arguments for maintaining direct payments and other financial support mechanisms for agriculture worldwide [40–42].

When discussing remuneration for family labour, it is important to recognise that in today's labour division, farmers are positioned as producers of mass commodities at the start of the food distribution chain [43]. As mass commodity producers, farmers have limited pricing power; prices are largely determined on global markets. To achieve incomes that compensate their labour comparably to other sectors, farmers are often compelled to scale up production [44]. Research by Wilczyński and Kołoszycz shows better temporal viability among larger-scale farms in the EU. Most farm groups remained in the "survival" phase, struggling to cover unpaid labour costs. Inclusion of direct payments improved temporal viability only in farms with the smallest economic sizes [45]. Analysis of IFCN data indicates that in 2006, farms with the largest production scales—mainly in the USA, Australia, and New Zealand—had the highest technical labour productivity. A typical Australian farm with 605 cows had a productivity of 430 kg of milk per hour of labour, while a typical Polish farm with 60 cows had productivity 8.6 times lower [46]. Research in Turkey revealed that feed costs were the major production expense [47] and that larger farm size reduced unit production costs and increased income. Improved income in larger farms stemmed not only from higher milk output but also from the greater value of livestock [48]. The effect of farm size on economic outcomes is also supported by research in other countries [49–51].

The issue of low labour productivity and remuneration is especially prominent in countries where, for historical reasons, farms have limited production capacity (land and capital). In the work published before Poland's EU accession, W. Ziętara noted that agricultural labour productivity in Poland—measured by GDP contribution—was 4 to 8.7 times lower than in non-agricultural sectors. There was a strong link between economic productivity and farm size [52]. Z. Gołaś noted that EU accession gave a strong boost to agricultural productivity. In the post-accession period, real labour productivity (net value added) increased by over 35% compared to the pre-accession period, while profitability (farm income) grew by over 112% [53]. Pawlak and Poczta observed that real income in Poland's agricultural sector doubled between 2005 and 2022, while income across 27 EU countries rose by 30% [54]. Many authors argue that rising wages in non-agricultural sectors have also driven productivity and remuneration increases in agriculture [55–59]. Ziętara and Adamski noted that from 1995 to 2011, wages in non-agricultural sectors increased fivefold, while input prices in agriculture nearly tripled and agricultural product prices doubled—trends common in all market economies [60,61].

5. Conclusions

The dominant organisational form in European—and particularly Polish—agriculture is the family-run farm. A key characteristic of this form is that most work is performed by family members, with minimal use of hired labour. Farmers in such settings do not receive formal wages; instead, the farm income is expected to compensate for their labour, invested capital, and land. Although they do not receive formal remuneration, family farmers expect their income to allow for reinvestment and compensation at a level no lower than in other sectors. Research on Polish commercial farms from 2005–2022 has revealed the following trends:

1. Polish dairy farms are significantly smaller in terms of production scale compared to similar farms in Western Europe, primarily due to historical factors.
2. The period from 2005 to 2022 witnessed substantial changes in the number, technology, and production scale of dairy farms in Poland. The number of farms with up to 10 cows declined. Among farms maintaining 10–20 cows at the start of the analysed

period, around 45% significantly increased their herd size by 2022; about 25% maintained a similar herd size, while nearly 30% partially or entirely liquidated their herds. A trend toward increasing dairy cattle herds and production scale was particularly evident among farms that already maintained more than 20 cows in 2005–2007.

3. The increase in production scale among the analysed farms was accompanied by a growth in land use and the deployment of owned capital. Farms with 10–20 cows at the beginning of the period that expanded their herds to 30–50 cows by 2022 recorded, on average, a 53.5% increase in agricultural area. The highest growth in invested capital was also noted among farms that expanded from 10–20 to 30–50 cows—capital investment nearly doubled.
4. Rising farm incomes contributed to a substantial increase in the remuneration for farmers' and their families' labour. According to the adopted methodological assumptions, average hourly remuneration rose from USD 3.1 to USD 7.5 over the study period.
5. Farm potential and production scale were decisive factors in determining remuneration levels. Farms maintaining more than 50 dairy cows recorded significantly higher profitability and labour productivity. Among farms that expanded their herds to over 50 cows, the hourly remuneration increased by USD 26.2.
6. In 2005–2007, the average remuneration for farmers' and their families' labour was lower than in Poland's non-agricultural sectors. This trend reversed in 2020–2022, when dairy farm remuneration slightly exceeded average wages in other sectors. On farms with more than 50 dairy cows, average labour remuneration was 3.8 times higher than in the non-agricultural economy.
7. The research highlights structural limitations of agricultural activity arising from its biological nature and the role of farmers as raw material producers in the global supply chain. This limits their influence on agricultural product prices. Rising input costs continue to make it difficult for agriculture to offer competitive earnings, thereby reinforcing the sector's reliance on support mechanisms such as direct payments and income stabilization tools.
8. Although labour productivity in Polish agriculture was historically low, it increased significantly following Poland's accession to the EU. This improvement resulted from modernisation, better access to technology, and integration with the European market. The economic performance of farms at the beginning of the third decade of the 21st century may also have been affected by global market disruptions caused by the COVID-19 pandemic and the war in Ukraine.

The findings presented do not exhaust the topic of evaluating remuneration levels in Polish dairy farms or comparing them with wages in other sectors of the economy. Several important questions remain for further research:

- Can farms achieve income parity without support from external funds?
- Is there justification for continued support of farm modernisation and consolidation, including the development of agricultural policy instruments that enable production scale expansion and increased farming efficiency?
- What is the level of wages for work on dairy farms compared to farms with other lines of production?
- What is the level of wages generated for work on Polish family dairy farms compared to wages in other countries (especially the EU)?

These findings may offer valuable insights for policymakers and agricultural organisations working to enhance the competitiveness of the dairy sector.

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Abbreviations

The following abbreviations are used in this manuscript:

AA	Agricultural area
DGR	Income from a family-run farm
FADN	The Farm Accountancy Data Network Multidisciplinary Digital Publishing Institute
FWU	Family Work Unit
KK	Opportunity cost of using own capital (excluding land)
KZ	Opportunity cost of using own land
SUP-RIM	Network of Universities of Life Sciences—Development of Innovative Dairy Farming
Wpw	Remuneration for the farmer's and family's labour

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