

## Costs and Profitability

### UNIT COSTS AND INCOME FROM SELECTED PRODUCTS IN 2019 – RESEARCH RESULTS IN THE AGROKOSZTY SYSTEM

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#### Abstract

*The main objective of the research was to assess the economic results of cow's milk, cattle for slaughter and porkers in 2019 depending on the scale of their production. The research was conducted on commercial farms whose production is intended for sales. These farms were purposively selected from a representative farm sample that was in the field of observation of the Polish FADN system. Data describing the agricultural activities were collected in the AGROKOSZTY system, and then supplemented with data from the Polish FADN database.*

*The results of the analyzed production activities were influenced by production potential of farms (i.e. resources of land, labor, and capital), their quality and the manner of use, but they were also dependent on external conditions (e.g. market). These impacts resulted in varying degrees of changes in the unit costs and product prices.*

*In 2019, the income from the analyzed production activities was within fairly wide limits. However, the positive impact of the size of the production scale was visible. In each group, there were farms where production was unprofitable, but in the case of large-scale production, the percentage of farms with an indicator below 100 was always the smallest.*

**Keywords:** unit costs, agricultural products, production scale, production profitability.

**JEL codes:** D24, O13, Q12.

## Introduction

For the purposes of making rational economic decisions, we need a set of relevant information on external and internal conditions of management, including, in particular, reliable information on costs. However, cost accounting should include information on specific management conditions. Therefore, the links between cost accounting and business practice are so important. The practical usefulness of a specific cost accounting method is most often determined by the level of precision and detail in which reality is reflected and the adaptation of the presented information on costs to decision-making needs.

When observing the evolution of cost accounting on farms, it can be noted that its role is not always appreciated by farm managers. To a certain extent, this results from the fact that until now, with the exception of farms managed by legal persons, the private sector of agriculture has not been formally obliged to report on agricultural activity. However, there are farmers who, for the purposes of management and making better decisions, keep adequate cost records and have a high level of knowledge in this regard<sup>1</sup>. Most often, this is associated with keeping agricultural accounting, which is the most important information system on farms and covers all records and calculations relating to the past, present, and future.

Information on the costs incurred on farms (as part of the accounting system) is used for the internal needs of farms, but also to achieve an external objective. In fact, it is used for pursuing the common agricultural policy of the European Union.

Costs are an important element of profitability accounting, and knowledge of their components and relations both within themselves and between the revenue and income areas is helpful in managing the farm. Farms operate in an environment subject to many changes, some of which are a consequence of human activity, while others are accidental and beyond the control of humans.

In market economy conditions, the selection of the economic objective criterion becomes particularly important, especially on commercial farms. They make their development conditional mainly upon the ability to use the basic functions of the market, i.e. information, profit-making, efficiency-boosting and balance functions (Wojciechowska-Ratajczak, 1998). The good use of these functions by the farmer allows them to achieve a competitive advantage in relation to competitors and to create stable conditions for the development of the farm. This advantage is underpinned by the farmer's continuous efforts to increase the difference between revenue and the cost of obtaining it and to minimize the production costs of products (Nieżgoda, 2009).

The study shows the economic results of the production of cow's milk, cattle for slaughter and porkers on farms differing in terms of their production scale in 2019. The results do not fully cover the issues regarding production profitability depending on scale, however, they are a good illustration of the situation, despite the relative nature of the production size, which was adopted as small, medium, and large.

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<sup>1</sup> Farmers managing commercial farms, i.e. those where production is intended for sales, are enterprises. Thus, farmers are, in fact, entrepreneurs (Ziętara, 2009).

## Materials and methodology

Empirical data describing production activities, i.e. dairy cows, cattle for slaughter and porkers were collected in 2019 on individual farms located throughout Poland. These farms were purposively selected from a representative farm sample that was in the field of observation of the Polish FADN system. The selection of the farms for the research on each activity was done independently. The prerequisite was the specific scale of its production and the farmer's consent to conduct the research. The data describing the analyzed activities were collected according to the methodology of the AGROKOSZTY system (Agricultural Product Data Collection System). They were supplemented with data from the Polish FADN database (Farm Accountancy Data Network) and then processed according to the assumptions developed.

The research covered revenues (value of potentially commercial production per 1 dairy cow and 100 kg of cattle for slaughter and porkers), costs, and economic results. The results were evaluated by means of income categories (analyzed without and with subsidies), i.e. gross margin (Augustyńska-Grzymek, Goraj, Jarka, Pokrzywa, Skarżyńska, 2000) and income from activity; the method of calculating them is presented below:

gross margin = production value – direct costs,

income from activity = production value – total costs (direct and indirect in total).

The income of agricultural producers is supported by subsidies received under the common agricultural policy. Based on the data on the level of subsidies received for the analyzed production activities on the farms where the research was conducted, the amounts of direct payment rates in 2019, and the rules for granting them, the maximum level of subsidies to be received by farmers, provided that all required conditions were met, was calculated. It should be added that the amount of VAT due and charged is not included in the calculations.

**The value of (potentially commercial)** production of agricultural products is the sum of the value of main products and by-products placed on the market. In the case of livestock production, the production value structure varies according to the analyzed activity. However, the product for which the given production is conducted is always referred to as the main product (e.g. milk). Independently, there may be an increase in livestock for slaughter (e.g. calves after weaning) and one or more by-products (e.g. culled animals).

The production value, in the case of livestock production, is calculated according to the annual average selling prices of individual products (i.e. market prices and/or farm-gate prices). According to the methodology, the production value is reduced by the losses, i.e. death losses of animals during the production process (per 1 head or per 100 kg of livestock). When calculating the production value for livestock production, the value of manure and slurry produced on the farm is not taken into account.

**The direct costs** of crop and livestock production reflect the costs incurred throughout the production cycle and illustrate the current market conditions. The accounting period covers 12 consecutive months of the calendar year (except winter plants: in their case the inputs and direct costs incurred reflect the whole production cycle). In the case of the analyzed animal production activities, reference to the direct costs of crop production, in accordance with the methodology, applies only to non-commercial crop production activity (e.g. maize grown for green forage, legumes grown for green forage or fodder plants from meadows and pastures). In the case of rearing dairy cows and other ruminants, roughage (green forage, silage, hay) is necessary. These feedstuffs are usually produced on the farm, as their availability on the market is low if they are even available at all.

The set of direct costs, by which livestock production value is reduced, reflects the current market conditions. The components of direct costs coming from outside of the farm are determined according to the purchase prices, while the cost components produced on the farm (e.g. own feedstuffs from commercial products) are determined according to the farm-gate prices. The exception are own feedstuffs from non-commercial products (e.g. maize silage) which are valued according to the direct costs incurred for their production. The individual cost components are reduced by subsidies granted.

The rule governing the inclusion of specific cost components in the direct costs is that they must meet all three conditions, i.e.:

- these costs can be attributed without any doubt to the specific activity,
- their amount is proportionate to the production scale,
- they have a direct impact on the production size (volume and value).

This means that the cost of a service consisting in harvesting maize for green forage using a combine harvester cannot be included in the direct costs. This cost meets the first and second condition for the direct costs; however, it does not meet the third condition, namely, it does not affect the production size. The cost of purchase, renovation, and depreciation of buildings, vehicles, and agricultural machinery, as well as the purchase cost of fuel, cannot be included in the direct costs. The gross margin calculation does not include payment for the labor of the farm user and family members and the cost of paid labor (except hiring for specialized work).

**The direct costs of crop production include:**

- seed and planting material (*purchased or produced on the farm*),
- purchased fertilizers<sup>2</sup> (*without agricultural lime*),
- plant protection products,
- growth regulators (*rooting agents, growth agents, defoliant*s),
- insurance relating directly to the activity in question,
- specialized costs including:
  - specialized expenditure for crop production,
  - specialized services,
  - occasional hiring for specialized work.

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<sup>2</sup> The cost of purchased fertilizers also includes specialized fertilizer taxes.

**The direct costs of livestock production include:**

- the cost of animals introduced into the herd for the purpose of restocking,
- the cost of feedstuffs which are divided into:
  - external feedstuffs (*mainly purchased*),
  - feedstuffs from the farm which are divided into:
    - own feedstuffs from potentially commercial products,
    - own feedstuffs from non-commercial products,
- rents for the use of the fodder area leased for a period of less than one year (*per UAA and per non-UAA, e.g. mountain pastures*),
- animal insurance relating directly to the activity in question (*e.g. cows*),
- medicines and veterinary products (*including semen for insemination*),
- veterinary services (*insemination, castration, protective vaccination*),
- specialized costs including:
  - specialized expenditure for livestock production,
  - specialized services,
  - occasional hiring for specialized work.

The direct and indirect costs are included in the accounts used to calculate income from activity. The direct costs are attributed directly to products based on relevant source documents. On the other hand, the indirect costs are derived from the Polish FADN database. The indirect costs may be defined as production readiness costs which are incurred due to the operation or only the existence of the farm. The indirect costs of the farm are divided into actual and estimated indirect costs (Goraj and Mańko, 2004).

**The actual indirect costs include:**

- overhead costs – electricity, fuel, propellant, current repairs, maintenance and inspections, services, insurance (e.g. buildings, property, and transport), and other costs, such as payment for water, telephone, and agricultural lime.
- taxes – agricultural tax, forest tax, tax on special branches, property tax, and other taxes, e.g. on means of transport,
- costs of external factors – cost of paid labor, rents, and interest.

**The estimated indirect costs include depreciation of:**

- buildings and structures,
- machinery and technical equipment,
- means of transport,
- drainage equipment,
- orchards and perennial plantations,
- intangible assets,
- completed investments in foreign fixed assets.

The indirect costs cannot be divided among products at the time they are incurred; these are common costs for the whole farm, and division keys are used to divide them. According to the methodology used, the indirect costs of the farm have been divided among activities according to the share of the production value of each activity in the total farm production value.

The tables presenting the results of the research also contain the data on labor input (unpaid and paid) incurred for the activity, as specified in the AGROKOSZTY system. This record allows for determination of the labor-intensity of production. In the case of livestock production activities, this is mainly work related to animal handling (cleaning, milking) and feed administration, and to the production of the farm's own non-commercial feedstuffs. Labor input associated with the operation of the farm as a whole is not recorded. This refers to administrative and general work or labor input spent on renovating buildings or machinery.

Based on the number of working hours spent in producing individual products, income from activity without subsidies per 1 hour of unpaid labor is calculated. It reflects the degree to which the labor input of the farmer and their family is covered by the income from producing 100 kg of livestock or per 1 dairy cow. For the purpose of the analysis, unpaid labor input has been valued at the predetermined rate established based on the average salary for employees employed in the entire national economy in a given year (according to the Polish Central Statistical Office). It has been assumed that one full-time employed person works in agriculture for 2,120 hours a year. The parity payment for 1 hour of work in 2019 was PLN 18.58<sup>3</sup>. However, it should be noted that the recognition of unpaid labor input on individual farms, in value terms, is always conventional (Skarzyńska and Abramczuk, 2020).

The results of the analyzed production activities were presented on average in the study sample of the farms and in the groups classified according to their production scale. For the purposes of the analysis, three scale ranges were selected, i.e. small, medium, and large. The scale criterion used for cattle for slaughter was the level of net production measured by the annual weight gain obtained in a herd of cattle for slaughter older than 1 year (dairy breeds and meat and dairy breeds), for porkers the scale criterion was the level of net livestock production measured by the annual weight gain obtained in a herd of fatteners, and for dairy cows the scale criterion was the number of cows kept on the farm. When dividing the sample of the farms pursuing individual activities into groups differing in terms of the production scale, the sample size and distributions of the characteristic which was the scale criterion were taken into account. The assumption was that the number of farms in the identified scale ranges should be as large as possible, that the average level of the characteristic used as a scale criterion should be similar to the median of this characteristic, and that the limits of the scale ranges should not be tangent. As a consequence, the number of the farms in the identified ranges does not cover the whole study sample.

The size of the production scale ranges is relative, which means that the scale size adopted as large can be considered small on farms with a different area structure and a different production organization. Moreover, due to the purposive selection of the sample, the results of the research cannot be statistically generalized to all individual farms in the country. Nevertheless, they are a prerequisite for selecting the scale size which can guarantee the relatively high efficiency of the production.

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<sup>3</sup> Own calculations based on data from the Polish Central Statistical Office.

They also allow for the presentation of certain phenomena and relations which were revealed following the division of the study sample of the farms.

The results of the research were, to a broader extent, the subject of a publication (Skarżyńska and Abramczuk, 2020), in which the production and economic situation of the analyzed agricultural production activities was extensively discussed. In this article, the analysis of the results was provided in a synthetic manner. The results of the calculations (at nominal values) are provided in the tables. Owing to the electronic data processing technique, in some cases, the sums of components may differ from the provided “total” values.

## Results

According to data from the Polish Central Statistical Office (2020), the market conditions for agricultural production improved in 2019, compared to 2018. With a greater rise in the prices of agricultural products sold by individual farms (by 15.1%) than in the average prices of goods and services purchased for the purposes of consumption, current agricultural production, and investments (by 3.2%), the price index (“price scissors”) was favorable to agricultural producers and stood at 111.6% (compared to 94.4% in 2018).

In 2019, **milk production** generated income (Table 1). The best results were achieved by farmers keeping large cow herds (45-120 head). On these farms, income without subsidies per 1 cow was PLN 3,635. For the medium-scale production of milk (15-40 cows), income was 46.7% lower, amounting to PLN 1,938/cow. The poorest results were obtained by small-scale milk producers (5-10 cows): income without subsidies per 1 cow was PLN 851, which was 56.1% lower compared to the medium scale and 76.6% lower compared to the large scale. The relation between the amount of income and the number of cows in the herd is clear.

The milk yield of cows was the main factor stimulating the gradual increase in the production value and income without subsidies. As the herd of cows grew, so did their milk yield, the price of milk, but also the costs of keeping 1 head. However, the growth rate of revenues was greater than that of costs, by 14.7% for the medium scale and by 17.0% for the large scale. As a result, a gradual increase in income was observed. The marginal analysis showed that the increase in costs was reasonable. In the case of the medium- and large-scale milk production, the intensity limit was not exceeded; the costs grew more slowly than the production value. An increase in the production value by PLN 1 required an increase in the costs by PLN 0.74 for the medium scale and by PLN 0.62 for the large scale.

The research results showed that the large-scale production of milk, when compared to other ranges, was characterized by the highest:

- cost competitiveness – the direct costs accounted for 51.0% of the gross margin without subsidies, for 69.4% in the case of the medium scale and for 68.0% in the case of the small scale;
- production and technical efficiency – the share of gross margin in the production value was 66.2%, while for the medium-scale production of milk it was 59.0% and for the small-scale production – 59.5%;

- economic efficiency – the production profitability index amounted to 149.5%, whereas for the medium scale it was 130.0%, and for the small scale – 115.6%.

The positive effect of the milk production scale is also indicated by the results of the economic efficiency indices. As the scale increases, the production costs of 1 liter of milk decrease, with a simultaneous increase in income without subsidies per 1 liter of milk and per PLN 100 of total costs. On the farms with the large-scale production of milk, the percentage of farms where the profitability index did not exceed the profitability threshold was the lowest – 4.3%, whereas for the medium scale it was 14.3%, and for the small scale – 21.7% (Table 4). The decreasing labor input per 1 cow also demonstrates the benefit of the larger-scale production of milk. In this situation, income without subsidies per 1 hour of unpaid labor grew and, as a result, on the farms with the medium- and large-scale production of milk, full payment of unpaid labor was possible (valued at the parity labor payment rate – PLN 18.58/hour). On the other hand, for the small-scale production of milk, this was only possible in 24.1%. Another positive effect of scale is the decreasing share of the costs in the price of 1 liter of milk: for the small scale it amounted to 99.2%, for the medium scale – 85.4%, and for the large scale – 72.3%.

In 2019, in the study sample on average and in the small (5-20 dt) and medium (25-50 dt) scale, the production of **cattle for slaughter** was not profitable (Table 2). The revenues provided only partial coverage of the costs incurred. However, the positive effect of scale is visible. The losses of producers gradually decreased as the scale increased. As a result of the favorable changes, mainly in terms of the costs, cattle for slaughter produced on the large scale (55-200 dt) did not generate any losses and income was generated without subsidies.

On average in the sample, the loss at the income level without subsidies was PLN 19 per 100 kg of cattle for slaughter, for the small scale (PLN 5-20 dt) – PLN 145, and for the medium scale (25-50 dt) – PLN 104. On the other hand, when producing cattle for slaughter on the large scale (55-200 dt), producers received income which amounted to PLN 25/100 kg cattle for slaughter. The main factor determining the specific level of profitability of cattle for slaughter was the costs of production. As the scale increased, they decreased, and as a consequence, there was a decreasing loss of income without subsidies and an increase in the profitability expressed as a percentage ratio of revenues to costs. The results of the research showed that the large-scale production of cattle for slaughter was characterized by the most favorable:

- production and technical efficiency – the share of gross margin in the production value was 38.4%, while for the medium-scale production of milk it was 32.2%, and for the small-scale production – 27.1%;
- economic efficiency – the profitability index amounted to 104.0%, whereas for the medium scale it was 85.9%, and for the small scale – 82.2%;
- the ratio of the total costs of production of 1 kg cattle for slaughter to the selling price was 0.96, while for the medium-scale production it was 1.16, and for the small-scale production – 1.22.



When analyzing the results regarding cattle for slaughter at the level of the gross margin, a gradual increase in this gross margin was found per PLN 100 of direct costs, PLN 100 of the production value, and 1 hour of unpaid labor. The marginal analysis indicates that in the case of the medium scale, the intensity limit was exceeded, which means that the costs increased faster than the production value: an increase in the production value by PLN 1 required an increase in the costs by PLN 1.11. On the other hand, with the large scale, the increase in the costs was slower: an increase in the production value by PLN 1 required an increase in the costs by PLN 0.85. This means that an increase in the production scale from medium to large was reasonable.

Despite the generally unfavorable situation in the study sample, there were farms where cattle for slaughter were profitable. In assessing the scale of this phenomenon from the perspective of the whole sample, it was nearly one in two farms. This was determined by the lower production costs. On average, on these farms the profitability index was 126.3% and income from activity without subsidies was PLN 133/100 kg of gross cattle for slaughter.

In 2019, in the study sample on average and in the identified scale ranges, the production of **porkers** was not profitable (Table 3). The revenues provided only partial coverage of the costs incurred. However, the results of the research refer to the annual average production and price conditions and do not fully reflect the changes that took place throughout the year, for example, in the prices of feedstuffs or the purchase prices of porkers. Therefore, the interpretation of the results cannot be clear-cut, as the study sample contained entities where porkers were profitable.

On average in the sample, the loss at the income level without subsidies was PLN 41; for the small scale (5-25 dt) it was PLN 182, for the medium scale (50-300 dt) it was PLN 41, and for the large scale (350-1,500 dt) – PLN 20. Although income from the production of porkers was negative, the positive effect of scale is visible. The marginal analysis shows that an increase in the production scale from medium to large was reasonable in economic terms. This is evidenced by a weaker increase in the costs. In both ranges, the limit of production intensity was exceeded. The costs grew faster than the production value. In the medium scale, the increase in the costs was 5.1% higher than the increase in the production value; in the large scale, it was 2.5% higher. These relations were illustrated by a smaller decrease in income. The results of the research showed that the large-scale production of porkers was characterized by the most favorable:

- economic efficiency – the production profitability index amounted to 96.4%, whereas for the medium scale it was 92.8%, and for the small scale – 72.6%,
- the ratio of the total costs of production of 1 kg porkers to the selling price was 1.04, while for the medium-scale production it was 1.08, and for the small-scale production – 1.38.

When analyzing the results of porkers at the level of the gross margin, a gradual increase in this gross margin was found per 1 hour of unpaid labor. The advantage of the large scale when compared to the medium scale was 38.6%, and in relation

to the small scale it was almost 4-fold. In addition, big differences are visible, given the loss in income. In the case of the large fattening scale, when compared to the medium scale, the loss was 2.1 times lower, and in relation to the small scale it was 9.1 times lower. This was mainly determined by a gradual decrease in the production costs.

Despite unfavorable results, the sample included farms (representing 28.6%) which did not suffer losses and received income from the production of porkers. Its level per 100 kg of gross porkers was PLN 58 and its profitability index was PLN 112.2%. The prerequisite for economic success was a sufficiently large scale of production; as a result, the cost burden of porkers (mainly indirect) was relatively low. The relatively favorable selling price of porkers was also important to some extent.

### Conclusions

In conclusion, it should be stated that in 2019, there was a fairly wide range of income provided by the production of milk, cattle for slaughter, and porkers. This was due to the varying degree of changes in terms of the production size, unit costs, and selling prices of individual products. However, in each case, the positive impact of the production scale was visible. The costs incurred resulted from the production technology used and the involvement of farm resources. Their amount was determined by the direct and indirect costs, but the impact of these aggregates was different depending on the activity and the production scale.

A larger production scale brings many benefits, mainly due to the increased production volume, which results in lower unit costs of producing products, thanks to higher labor productivity and the distribution of fixed (indirect) costs over a larger number of units. It is also important to make minor improvements in the method of producing products through the accumulation of production experience by the farmers. A consequence of this experience may be benefits resulting from the introduction of more radical changes in production techniques, which improves the production technology, increases the production capacity of existing assets (e.g. more efficient use of pigpens or specialized machinery) and increases the efficiency of management.

Any rational decision should be a result of considerations geared towards selecting an option that would provide a real chance to achieve the objectives pursued. The available funds, resources (tangible and intangible), and financial opportunities, as well as the applicable law should be taken into account. In addition, it is important to consider not only the current benefits but, above all, the consequences of the planned decision (e.g. economic, environmental).

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Table 1

*Production, costs, and income from the production of cow's milk in 2019 (actual data)*

Specification		On average per farm keeping dairy cows	Depending on the production scale (number of cows/farm)		
			5-10	15-40	45-120
Number of farms in the research		148	23	70	23
Annual average number of dairy cows	(head)	27.3	7.9	26.3	64.4
Milk yield of cows	(liter)	6,344	4,548	5,808	7,391
Milk yield of cows	(PLN/liter)	1.33	1.21	1.30	1.37
<b>Per 1 dairy cow</b>					
<b>Total production value</b>	<b>(PLN)</b>	<b>9,264</b>	<b>6,293</b>	<b>8,390</b>	<b>10,986</b>
including: milk		8,446	5,481	7,545	10,157
calf weaned		430	459	469	362
culled dairy cow		388	352	375	466
<b>Total direct costs</b>	<b>(PLN)</b>	<b>3,395</b>	<b>2,548</b>	<b>3,437</b>	<b>3,709</b>
including: restocking		579	552	616	656
off-farm feedstuffs		1,500	544	1,439	1,796
own commercial feedstuffs		601	964	644	507
own non-commercial feedstuffs		318	270	338	304
others		397	217	400	445
<b>Gross margin without subsidies</b>	<b>(PLN)</b>	<b>5,869</b>	<b>3,745</b>	<b>4,953</b>	<b>7,277</b>
Actual indirect costs <sup>a</sup>	(PLN)	1,656	1,469	1,503	1,864
<b>Gross value added from activity</b>	<b>(PLN)</b>	<b>4,213</b>	<b>2,276</b>	<b>3,450</b>	<b>5,413</b>
Depreciation	(PLN)	1,177	1,213	1,113	1,271
including: buildings and structures		340	515	292	354
machinery and equipment		503	392	471	586
means of transport		332	302	349	328
<b>Net value added from activity</b>	<b>(PLN)</b>	<b>3,036</b>	<b>1,062</b>	<b>2,337</b>	<b>4,142</b>
The cost of external factors	(PLN)	415	211	399	507
<b>Income from activity without subsidies</b>	<b>(PLN)</b>	<b>2,621</b>	<b>851</b>	<b>1,938</b>	<b>3,635</b>
Subsidies <sup>b</sup>	(PLN)	736	984	903	473
<b>Income from activity</b>	<b>(PLN)</b>	<b>3,357</b>	<b>1,835</b>	<b>2,840</b>	<b>4,108</b>
<b>TOTAL COSTS</b>	<b>(PLN)</b>	<b>6,643</b>	<b>5,441</b>	<b>6,452</b>	<b>7,351</b>
Total labor input	(hours)	89.6	190.2	100.6	52.1
including: unpaid labor input		84.1	189.9	97.7	41.2
<b>Economic efficiency indices</b>					
Total costs per liter of milk	(PLN)	1.05	1.20	1.11	0.99
Income from activity without subsidies per 1 liter of milk	(PLN)	0.41	0.19	0.33	0.49
Income from activity without subsidies per PLN 100 of total costs		39.45	15.64	30.03	49.45
Cost of off-farm feedstuffs in direct costs	(%)	44.2	21.4	41.9	48.4
The cost of own commercial feedstuffs in direct costs	(%)	17.7	37.8	18.7	13.7
Consumption of concentrate feedstuffs, per 1,000 liters of milk	(PLN)	3.00	3.20	3.30	2.82
Subsidies per PLN 1 of income from activity without subsidies	(PLN)	0.28	1.16	0.47	0.13
Share of subsidies in income from activity	(%)	21.9	53.6	31.8	11.5

<sup>a</sup> Actual indirect costs without the cost of external factors.

<sup>b</sup> Subsidies include: payment for cows (i.e. per head eligible for support) per 1 dairy cow and single area payment, greening payment, and additional payment per fodder area involved.

Source: based on own research.

Table 2

*Production, costs, and income from the production of cattle for slaughter in 2019 (actual data)*

Specification		On average per farm producing cattle for slaughter	Depending on the net production scale (dt/farm)		
			5-20	25-50	55-200
Number of farms in the research		82	18	29	21
Net production of cattle for slaughter (increase) <sup>a</sup>	(dt/farm)	46.23	13.10	35.55	97.25
Gross production of cattle for slaughter <sup>b</sup>	(dt/farm)	83.43	29.52	62.32	174.54
Annual average selling price of cattle for slaughter	(PLN/kg)	6.46	6.68	6.36	6.52
<b>Per 100 kg gross cattle for slaughter</b>					
<b>Production value</b>	<b>(PLN)</b>	<b>646</b>	<b>668</b>	<b>636</b>	<b>652</b>
<b>Total direct costs</b>	<b>(PLN)</b>	<b>412</b>	<b>488</b>	<b>431</b>	<b>402</b>
including: restocking		301	393	284	301
off-farm feedstuffs		37	34	53	34
own commercial feedstuffs		52	48	67	45
own non-commercial feedstuffs		17	9	21	16
others		5	3	6	4
<b>Gross margin without subsidies</b>	<b>(PLN)</b>	<b>234</b>	<b>181</b>	<b>205</b>	<b>250</b>
Actual indirect costs <sup>c</sup>	(PLN)	123	189	132	113
<b>Gross value added from activity</b>	<b>(PLN)</b>	<b>110</b>	<b>-8</b>	<b>73</b>	<b>138</b>
Depreciation	(PLN)	99	120	135	85
including: buildings and structures		34	37	53	26
machinery and equipment		34	40	42	30
means of transport		31	42	39	28
<b>Net value added from activity</b>	<b>(PLN)</b>	<b>11</b>	<b>-128</b>	<b>-63</b>	<b>53</b>
The cost of external factors	(PLN)	30	17	41	28
<b>Income from activity without subsidies</b>	<b>(PLN)</b>	<b>-19</b>	<b>-145</b>	<b>-104</b>	<b>25</b>
Subsidies <sup>d</sup>	(PLN)	66	101	79	56
<b>Income from activity</b>	<b>(PLN)</b>	<b>47</b>	<b>-44</b>	<b>-25</b>	<b>81</b>
<b>TOTAL COSTS</b>	<b>(PLN)</b>	<b>665</b>	<b>813</b>	<b>740</b>	<b>627</b>
Total labor input	(hours)	12.1	16.1	14.0	9.7
including: total labor input		11.8	16.1	14.0	9.4
<b>Economic efficiency indices</b>					
Gross margin without subsidies per PLN 100 of direct costs	(PLN)	56.69	37.08	47.43	62.25
Gross margin without subsidies per PLN 100 of the production value	(PLN)	36.18	27.05	32.17	38.37
Gross margin without subsidies per for 1 hour of unpaid labor	(PLN)	19.73	11.24	14.62	26.73
Total costs of producing PLN 1 of the production value	(PLN)	1.03	1.22	1.16	0.96
Direct costs in the total costs	(%)	62.0	59.9	58.3	64.1
Cost of off-farm and own commercial feedstuffs in the total costs of feedstuffs	(%)	83.8	89.9	84.8	83.1

<sup>a</sup> Net production of cattle for slaughter is the annual weight gain obtained in the herd of fatteners older than 1 year.

<sup>b</sup> Increase + weight of purchased animals.

<sup>c</sup> Actual indirect costs without the cost of external factors.

<sup>d</sup> Subsidies include: payment for cattle (i.e. per head eligible for support) per 100 kg of cattle for slaughter and single area payment, greening payment, and additional payment per fodder area involved.

Source: based on own research.

Table 3

*Production, costs, and income from the production of porkers in 2019*

Specification	On average per farm producing porkers	Depending on the production scale net (dt/farm)		
		5-25	50-300	350-1500
Number of farms in the research	119	23	55	22
Net production of porkers (increase) <sup>a</sup>	(dt/farm) 267.57	13.41	144.38	665.94
Gross production of porkers <sup>b</sup>	(dt/farm) 462.40	21.84	251.68	1117.22
Annual average selling price of porkers	(PLN/kg) 5.26	4.82	5.29	5.27
<b>Per 100 kg gross porkers</b>				
<b>Production value</b>	<b>(PLN) 526</b>	<b>482</b>	<b>529</b>	<b>527</b>
<b>Total direct costs</b>	<b>(PLN) 454</b>	<b>383</b>	<b>422</b>	<b>441</b>
including: restocking	278	222	253	250
off-farm feedstuffs	105	69	75	108
own commercial feedstuffs	64	86	88	73
others	7	6	6	10
<b>Gross margin without subsidies</b>	<b>(PLN) 72</b>	<b>99</b>	<b>107</b>	<b>86</b>
Actual indirect costs <sup>c</sup>	(PLN) 51	145	69	50
<b>Gross value added from activity</b>	<b>(PLN) 21</b>	<b>-46</b>	<b>38</b>	<b>36</b>
Depreciation	(PLN) 47	119	64	42
including: buildings and structures	18	59	23	18
machinery and equipment	16	26	20	12
means of transport	13	33	19	11
<b>Net value added from activity</b>	<b>(PLN) -27</b>	<b>-165</b>	<b>-26</b>	<b>-5</b>
The cost of external factors	(PLN) 14	17	15	14
<b>Income from activity without subsidies</b>	<b>(PLN) -41</b>	<b>-182</b>	<b>-41</b>	<b>-20</b>
Subsidies	(PLN) -	-	-	-
<b>Income from activity</b>	<b>(PLN) -41</b>	<b>-182</b>	<b>-41</b>	<b>-20</b>
<b>TOTAL COSTS</b>	<b>(PLN) 567</b>	<b>664</b>	<b>569</b>	<b>546</b>
Total labor input	(hours) 2.4	10.4	3.9	2.3
including: total labor input	2.3	10.4	3.9	2.0
<b>Economic efficiency indices</b>				
Gross margin without subsidies per PLN 100 of direct costs	(PLN) 15.86	25.94	25.38	19.55
Gross margin without subsidies per for 1 hour of labor in total	(PLN) 30.10	9.57	27.55	38.18
Total costs of producing PLN 1 of the production value	(PLN) 1.08	1.38	1.08	1.04
Direct costs in the total costs	(%) 80.1	57.6	74.1	80.7
Cost of off-farm feedstuffs in total costs of feedstuffs	(%) 62.1	44.7	45.9	59.6

<sup>a</sup> Net production of porkers is the annual weight gain obtained in the herd of fatteners.

<sup>b</sup> Increase + weight of purchased animals.

<sup>c</sup> Actual indirect costs without the cost of external factors.

[-] – indicates that the given phenomenon has not occurred.

Source: based on own research.

Table 4  
*Selected descriptive statistics of the profitability index in the identified production scale ranges of the analyzed production activities in 2019<sup>a</sup>*

Specification	Cow's milk			Cattle for slaughter			Porkers		
	5-10	15-40	5-120	5-20	25-50	55-200	5-25	50-300	350-1500
On average	(%) 115.6	130.0	149.5	82.2	85.9	104.0	72.6	92.8	96.4
Percentile 5%	(%) 87.6	83.7	104.4	45.1	47.3	75.2	61.2	69.9	78.6
Median	(%) 119.1	129.2	152.0	86.4	95.7	106.0	78.1	86.8	100.9
Percentile 95%	(%) 162.1	221.0	209.0	124.3	155.6	158.2	105.3	135.7	135.7
Quartile deviation	(p.p.) 16.4	24.6	23.3	17.7	19.6	16.7	9.0	13.0	9.2
Positional coefficient	(%) 13.8	19.0	15.3	20.5	20.5	15.7	11.5	15.0	9.1
Percentage of farms with the profitability index below 100	(%) 21.7	14.3	4.3	66.7	58.6	38.1	91.3	69.1	45.5

<sup>a</sup> criterion for selecting the production scale as in Tables 1-3.

## KOSZTY JEDNOSTKOWE I DOCHODY WYBRANYCH PRODUKTÓW W 2019 ROKU – WYNIKI BADAŃ W SYSTEMIE AGROKOSZTY

### Abstrakt

*Głównym celem badań była ocena wyników ekonomicznych produkcji mleka krowiego, żywca wołowego i żywca wieprzowego w gospodarstwach różniących się skalą ich produkcji w 2019 roku. Badania przeprowadzono w gospodarstwach towarowych, czyli takich, które swoją produkcję przeznaczają na sprzedaż. Gospodarstwa te wybrano celowo z reprezentatywnej próby gospodarstw, która znajdowała się w polu obserwacji systemu Polski FADN. Dane opisujące badane działalności zebrano w systemie AGROKOSZTY, a następnie uzupełniono danymi z bazy Polskiego FADN.*

*Na wyniki badanych działalności produkcyjnych wpływ miał potencjał produkcyjny gospodarstw (tj. zasoby ziemi, pracy i kapitału), ich jakość i sposób wykorzystania, ale zależały także od warunków zewnętrznych (np. rynkowych). Oddziaływania te skutkowały różnym stopniem zmian w zakresie kosztów jednostkowych oraz cen realizacji produktów.*

*W 2019 roku dochód, jaki zapewniły badane działalności produkcyjne, mieścił się w dość szerokich granicach. Korzystny wpływ wielkości skali produkcji był jednak widoczny. W każdej grupie występowały gospodarstwa, w których produkcja była nieopłacalna, ale w przypadku dużej skali odsetek gospodarstw ze wskaźnikiem poniżej 100 zawsze był najmniejszy.*

**Słowa kluczowe:** koszty jednostkowe, produkty rolnicze, skala produkcji, opłacalność.

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