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Costs and profitability

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UNIT COSTS OF AND INCOME FROM SELECTED PRODUCTS IN 2015 – RESEARCH RESULTS IN THE AGROKOSZTY SYSTEM

Abstract

The aim of the paper is analysis of the economic results of spring barley, grain maize, edible potatoes, sweet lupine, fodder pea and soybean in 2015 on farms having different production scale of these products. The research was held on commercial farms, which sell their production. These farms are enterprises. The results of products were influenced by the production capacity of farms, i.e. resources of land, labour and capital, their quality and the way of use, but they were also dependent on the external conditions (e.g. market, weather).

The consequence of diversification of direct and indirect costs and cost of use in the production process of own factors of production is the diversity of economic costs. The research showed that the highest economic costs were recorded for small scale cultivation of edible potatoes, sweet lupine, fodder pea and soybean. While for medium scale cultivation – spring barley and grain maize. With the increase in cultivation scale the income from management activity without subsidies – due to a farmer as an entrepreneur – generally increased or the loss decreased. The loss incurred in the production process was covered by subsides. The results indicate the advantage of the large scale of production, but it was revealed at different levels of economic account.

Keywords: unit costs, agricultural products, production scale, production profitability, management income.

JEL codes: D24, O13, Q12.

Introduction

The basic reason for running commercial agricultural production is income corresponding to expectations. It is the key goal of the farmer as an entrepreneur working on their own account (the term "on their own account" means a person incurring business risk). Execution of this objective requires, however, relevant organisation of the production process and cooperation between many factors.

Agricultural enterprise is an economic unit aimed at manufacture of agricultural products for sales or providing agricultural services for the needs of agriculture, separated in terms of organisational (constitutes a set of three factors: land, labour and capital), economic (covers expenditures from own revenues) and legal (bears not only economic but also legal liability for its operations) aspects. Thus, farmers running commercial farms, i.e. farms that direct their production for sales, have the character of enterprises. Farmers are actually enterprises (Manteuffel, 1984; Ziętara, 1998).

Agricultural enterprises operate in the environment subject to many changes, they are also affected by changes in the surrounding. Random events that happen in agriculture, such as droughts, floods or frosts, are unforeseeable, but they may have a major influence. The surrounding of agriculture also changes dynamically. The impact of external forces on agriculture (farms) much strengthened since Poland's accession to the EU. The globalization process also has its impact. These conditions are manifested, e.g., in forming the level and direction of changes in prices of agricultural products.

Research shows that costs of factors of production grow faster than product prices, this fact suggests direction of adjustments on farms. They should be directed at updating production processes, growth in production effectiveness and labour efficiency as well as substitution of live with objectified labour inputs (Runowski, 2009).

The rules operating in the market economy force farmers to increase both farming efficiency and production scale. The paper presents the production and economic results for spring barley, grain maize, edible potatoes, sweet lupine, fodder pea and soybean in 2015 on farms having different production scale of these products.

Research methodology

Empirical data characterising the researched production activities, i.e. spring barley, grain maize, edible potatoes, sweet lupine, fodder pea and soybean, were collected from individual farms located all over Poland. These farms were selected by way of nonprobability sampling from a representative sample of farms from the field of observation of the Polish FADN. The selection of farms for each activity was done independently. It was preconditioned by a defined scale of its production and farmer's approval for research. The data describing the researched

activities (agricultural products[1]) were gathered using the AGROKOSZTY system methodology. They were supplemented with the data from the Polish FADN and next processed according to the drawn up assumptions.

The research covered revenues (value of potentially commercial production per 1 ha of cultivation), costs and economic effects. A measure for assessment of obtained effects were income categories (analysed with and without subsidies), i.e. gross margin, operating income and management income. Below please find how to calculate these categories:

gross margin = production value – direct costs,
operating income = production value – total costs (direct + indirect),
management income = production value – economic costs,
or
management income = operating net value added – alternative cost of factors of production.

Subsidies (direct payments) are a form of income support for agricultural producers, in the accounts the following are considered: single area payment, greening payment and additional payment and in case of legumes also payment to protein crops. Based on data concerning the amount of payments received to the researched products on farms, where research was held and the amount of direct payment rates in 2015 and the rules of granting them, the maximum amount of payments was calculated that farmers could get upon meeting all of the required conditions. Given the objective, for which the generated information are to be used, the payments may be considered at different levels of the economic account, i.e. at the level of gross margin, operating income and management income. The accounts failed to take into account the amount of the output and input VAT.

Production value of agricultural products is the sum of value of main products and byproducts under market turnover. It is determined by market selling prices or by loco selling prices of a farm (i.e. in the area of a farm). Hence, it depends on the crop yield level and selling price of products. Losses occurring after harvest are deducted from production value (e.g. during cleaning, storage).

Direct costs reflect the costs incurred over the entire production cycle, thus they illustrate the market conditions. Twelve subsequent months of a calendar year were taken as the accounting period. However, for some plant production activities (especially winter plants) the incurred inputs and direct costs reflect the entire production cycle, i.e. all inputs and costs connected to production that occur in the year preceding the research and in the year of the research. Information on incurred inputs and direct costs in case of plant production always refer to the area of harvest of the researched activity. The components of direct costs

[1] Depending on the context, the terms "agricultural production activities" and "agricultural products" will be used interchangeably but they should be treated as identical.

from outside of a farm are determined by purchase prices, while components of costs generated by a farm (e.g. seed material) – by loco selling price of a farm. Respective cost components are reduced by the subsidies granted.

A rule regulating the eligibility of specified cost components for direct costs is simultaneous meeting of the three conditions, i.e.:

- these costs may be assigned to any specific activity without any doubt,
- their amount has a proportional link with production scale,
- they have direct impact on production volume (size and value).

Direct costs of crop production include:

- seed material and planting material (purchased or manufactured on a farm),
- purchased fertilisers[2] (*excluding lime*),
- plant protection products,
- growth regulators (*rooting agents, growth substances, defoliants*),
- insurance directly on the given activity,
- specialist costs covering:
  – specialist expenditures on crop production,
  – specialist services,
  – occasional hire to specialist works.

The accounts, which lead to calculation of income from activity, capture direct and indirect costs. Direct costs are allocated to products in a direct manner, based on respective source documents. Whereas **indirect costs** are taken from the Polish FADN database. Indirect costs can be determined as costs of readiness to production, which are incurred on account of functioning or only existence of a farm. Indirect costs of a farm are broken down into actual and estimated indirect costs (Goraj and Mańko, 2004).

Actual indirect costs include:

- farming overheads – electricity, heating and power fuel, current repairs, overhauls and inspections, services, insurance (e.g. buildings, property and vehicle), other costs, e.g. payment for water, phone;
- taxes – agricultural, forestry, on special sections, on property and other, e.g., means of transport;
- costs of external factors – costs of hired labour, lease rents and interest rates.

Estimated indirect costs cover depreciation of:

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

[2] Cost of purchased fertilisers covers also specialised taxes on fertilisation.

Indirect costs at the time of their occurrence cannot be allocated into products, these are common costs for the entire farm, distribution keys are used for their allocation. In line with the applied methodology, the indirect costs of a farm were divided between activities according to the share of production value of each of them in the production of a farm in total.

Costs of use of **own factors of production** (i.e. labour, land and capital) is an opportunity cost. In line with the adopted methodology (Skarżyńska, 2010) own labour was valued at standard rate set on the basis of the average level of remuneration in a given year paid to workers hired in the entire national economy (according to GUS). It was assumed that one full-time employee works in agriculture for 2120 hours per year. Payment per 1 hour of labour thus calculated amounted to PLN 14.73 in 2015. Lease rent was taken as the measure of land cost. The applied algorithm considers the type and class of land and tax region in line with the principles applicable for calculation of the agricultural tax[3]. Such approach means that a major impact on the amount of the estimated land cost, apart from the soil valuation class, falls to the regional location of farms which are in the research sample of respective production activities. Land rent is expressed in natural units, i.e. dt of wheat. The amount of units depends on the soil class and tax region. The value of rent was determined according to the average buying-in price of wheat in the country (in 2015 – PLN 66.83 per dt). The cost of operating capital is deemed to be the value of inputs incurred on current means of production. The cost of capital was estimated according to the percentage rate for contributions to the current account, average interest in commercial banks was assumed which in 2015 was at 0.60% annually (according to GUS). It was assumed that the working capital was frozen for 6 months. The cost of fixed capital was calculated based on the current value of involved fixed assets. It was deemed that the capital was frozen for 1 year, its average interest in 2015 was assumed at 1.70% (according to GUS) in commercial banks.

Management income is an economic category less full costs of production, which in literature are termed as economic costs (Samuelson and Nordhaus, 1995). This income is for the farmer the fee for entrepreneurship and taking up innovative activities and the use of owned knowledge and organisational skills in production process management.

The results of production activities were presented as averages for the entire research sample of farms and for groups classified according to the production scale of researched activities. Horizontal analysis was used, which compares the parameters characterising each of them on separated scale ranges. For the needs of the analysis, three scale ranges were selected, i.e. small, medium and large. But for fodder pea and soybean, due to rather small sample, it was possible to

[3] The manner of determining the amount of lease rent was developed using the principles for determining the lease rent by the Agricultural Property Agency.

select only two ranges, i.e. small and large. Cultivation area was the used scale criterion. When dividing the research sample of farms conducting respective activities into groups differing by the size of production scale, the size of the sample and distribution of the property, which was the scale criterion, were taken into account. It was assumed that the number of farms in separated scale ranges is as large as possible, the average level of the property taken as the scale criterion is close to the median of the property and limits of scale ranges are not in contact with each other. These factors decided on the selection of three or two scale ranges; as a result the number of farms in separated ranges does not cover the entire research sample.

The size of production scale ranges is relative, which means that the scale size taken as large can be considered as small for farms of different area structure and different production organisation. Moreover, given the non-probability sampling, the research results cannot be statistically generalised for all individual farms in the country. Despite this, they are an important premise as regards selection of the scale size which has the opportunity to ensure relatively high efficiency of conducted production. They also allow us to present some phenomena and correlations and in this context they give grounds to formulate conclusions referring not only to the researched sample.

The research results in a broader sense were the subject of the publication (Skarżyńska, 2016), which broadly discussed the production and economic situation of the researched agricultural production activities. In this paper, the analysis of results was synthetically captured. The results of calculations (in nominal values) were presented in tables. Given the electronic data processing technique, in some cases the sums of component parts may differ from the "total" values.

Research results

According to GUS data, 2015 was the third year in a row when the market conditions of agricultural production were unfavourable for agricultural producers. As a result of a stronger drop in prices of agricultural products sold by farmers (by 4.9%) than purchased by them (by 2.2%), the "price scissors" ratio was at an unfavourable level and amounted to 97.3%. These conditions influenced the economic results of the researched agricultural products.

In 2015, **spring barley** allowed to obtain operating income less subsidies, but its level was not high (Table 1). On average in the sample for spring barley, cultivation on the area of 8.61 ha gave PLN 717 per ha. The amount of income differed depending on the scale of cultivation, for small scale (1-3 ha) from 1 ha farmers got PLN 170, medium (6-12 ha) – PLN 550, and large (15-45 ha) – PLN 956. Along with a growth in cultivation area of spring barley – production results improved, the selling price of grains also grew, although in two first scale ranges it was similar. The factor determining the level of income was production value, in case of medium scale barley cultivation its growth dynamics was

greater than growth of costs by 17.4 percentage points (pp). Whereas on farms with large scale barley cultivation, the production value increased by 12.1% and total costs (i.e. direct and indirect in total) decreased by 4.4%. Large scale cultivation of spring barley, as compared to other scale ranges, was characterised by the highest:

- cost competitiveness – direct costs constituted 45.1% of generated gross margin less subsidies, while at medium scale – 56.2% and small – 54.5%;
- economic efficiency – profitability index (relation of production value to total direct and indirect costs) was at 148.7%, while at medium scale – 126.8%, and small scale – 108.6%.
- coverage of factors of production – net value added was higher than costs of own factors of production by 264.6%, while at medium scale of cultivation by 106.7%, and small scale – by 25.9%; this means that the highest management income less subsidies, due to a farmer as an entrepreneur and manager, was obtained from large scale cultivation of barley (806 PLN/ha), which was 2.2 times higher than the scale of income at medium scale, and 11.7 times – for small scale (Table 2).

The income aspect of spring barley is well illustrated by the relation of economic costs of production of 1 dt of grain to selling price. In case of small scale cultivation, these costs in the price of grain amounted to 96.8%, while at medium scale – 86.5%, and large scale – 73.1%. The obtained results clearly speak for increase in production scale.

In 2015, the income situation of **dry grain maize** was not good (Table 3). On average in a research sample and at small scale maize cultivation (4-10 ha), at the level of operating income less payments, farmers incurred loss of, respectively, PLN 128 per ha and PLN 126 per ha. Income was guaranteed by medium scale (12-20 ha) and large scale (25-65 ha) cultivation of maize, respectively, at PLN 9 per ha and PLN 75 per ha. Maize yield in separated cultivation scale ranges changed in different directions, while the selling price of grain successively grew. Production value and incurred costs had impact on the level of income. In case of medium scale maize cultivation the growth dynamics of production value exceeded the growth in costs by 4 pp. Whereas on farms with large scale maize cultivation, the production value decreased by 5.7% and total costs – by 7.4%. Stronger dynamics of growth of costs than income (by 1.7 pp) stimulated income growth. Despite an unfavourable income situation, there is a clear positive effect of impact of cultivation scale. Maize cultivated at a large scale, as compared to other scale ranges, was characterised by:

- the least favourable relation between direct costs and gross margin less subsidies – these costs exceeded the margin by 5.8%, while at medium scale by 23.1%, and small scale – by 58.0%;
- the highest economic efficiency – profitability index was at 102.1%, while at medium scale – 100.2%, and small scale – 96.5%;

- partial but relatively high coverage of factors of production – net value added covered the costs of own factors in 43.9%, the highest level of their coverage was noted for farms with medium scale maize cultivation (in 46.4%), and the lowest – small scale (in 19.7%); in this situation the management income excluding the support of payments was not executed, and the loss was offset by available payments (Table 4).

In 2015, to get full coverage of economic costs it would be necessary to increase the selling price of grain or yield of maize – on average in the research sample (21.08 ha of cultivation) by nearly 14%. Whereas on farms cultivating maize on small scale (4-10 ha) – by over 18%, medium scale (12-20 ha) – by almost 11%, and large scale (25-65 ha) – by nearly 13%.

Edible potatoes in 2015 were a highly profitable activity (Table 5). On average per harvest, their cultivation amounted to 4.73 ha, and operating income less subsidies obtained per 1 ha – PLN 5853. There is a clear positive correlation between the level of income and scale of potato cultivation. In case of small scale (1-2 ha) operating income less subsidies per 1 ha amounted to PLN 5090, on medium scale (4-8 ha) – PLN 5349, and large scale (10-33 ha) – PLN 6450. Beneficial impact of cultivation scale is also clear if production results of edible potatoes are considered. Yield of tubers at large scale was by 23.9% higher compared to small scale. While the selling price of potatoes dropped along with a growth in scale. The highest was obtained by framers conducting small scale cultivation. It is assessed that it is linked to the form (buying-in – open-air market) and time of sales. Production value and incurred costs had impact on the level of income. In case of medium scale cultivation the decisive factor was lower cost (by 2.3%), because growth in production value was slight (by 0.5%). Whereas at large scale, the growth dynamics of production value by 7.3 pp exceeded cost growth. Edible potatoes cultivated at large scale, as compared to other scale ranges, was characterised by:

- relatively high cost competitiveness – direct costs constituted 30.8% of generated gross margin less subsidies, while at medium scale – 31.6%, the highest cost competitiveness was typical of potatoes cultivated at small scale, direct costs constituted 26.2% of generated gross margin less subsidies;
- the highest economic efficiency – profitability index was at 175.2%, while at medium scale – 163.4%, and small scale – 158.9%;
- high level of coverage of factors of production – net value added ensured 6.2 times coverage of their cost, while in case of medium scale cultivation of potatoes the level of coverage was 4.9 times and at small scale – 4.1 times; management income less subsides from large scale edible potato cultivation was the highest and amounted to PLN 6542 per ha; it exceeded the level of the income at medium scale by 30.3% and small scale by 51.3% (Table 6).

A relatively high management income less subsidies is a derivative of favourable relation of economic costs to the selling price of edible potatoes.

On farms cultivating potatoes at small scale the share of these costs in the price amounted to 68.5%, while at medium scale – 63.6%, and large scale – 56.5%.

In 2015, **sweet lupine** made it possible to obtain operating income less subsidies. Its level was low, on average in the sample for cultivation on the area of 7.14 ha it amounted to only PLN 43 per ha (Table 7). In selected groups of farms it was higher, but it dropped along with a growth in the lupine cultivation area. In case of small scale lupine cultivation (1-2 ha) it totalled PLN 256 per ha, medium scale (4-8 ha) – PLN 191 per ha, and large scale (10-35 ha) – PLN 94 per ha. The amount of income determined the production value whose level was strongly dependant on selling price of seeds. Comparing the price of lupine in extreme groups of farms, in case of small scale – against large scale – it was higher by 24.4%. It may be presumed that some batches of seeds from farms cultivating lupine on small scale went to the open-air markets where the prices were higher than buying-in prices (according to GUS – 2.3 times higher). The yield of lupine seeds in separated scale ranges changed in different directions, but its level was similar in groups (14.6-15.2 dt/ha). Whereas total costs (direct and indirect in total) incurred on 1 ha of lupine along with scale growth decreased. In case of medium scale sweet lupine cultivation – against small scale – dynamics of drop in production value was by 3.4 pp stronger than in case of cost drop. Whereas for large scale – against the medium scale – dynamics of drop in production value was stronger by 5.4 pp. The results of analyses indicated that large scale cultivation of sweet lupine was characterised by:

- relatively high cost competitiveness – direct costs constituted 69.2% of generated gross margin less subsidies, while at medium scale – 70.0%, the highest cost competitiveness was typical of sweet lupine cultivated at small scale, direct costs constituted 64.1% of generated gross margin;
- the lowest economic efficiency – profitability index was at 108.0% (which was predetermined by the level of revenues and major impact was exercised by low price of seeds), while at medium scale – 114.9%, and small scale – 119.2%;
- partial coverage of factors of production – in 86.0%, while for medium scale sweet lupine cultivation the net value added exceeded their cost by 9.5%, and for small scale cultivation – by 0.8%; this means that on farms cultivating sweet lupine on small and medium scale the management income less subsidies was executed, although it was very low (it amounted to, respectively, PLN 3 per ha and PLN 24 per ha), while for large scale lupine cultivation a loss was noted (PLN 31 per ha); in this case a positive role of payments was revealed, as they act as a stabilising factor which supports incomes of farmers (Table 8).

To achieve full coverage of economic costs the seed prices or sweet lupine yield would have to grow – on average in the research sample by over 8%, and for farms cultivating lupine on large scale (10-35 ha) – by over 2%. The described situation follows from unfavourable relation of economic costs per 1 dt of seed to their selling price. This relation on average in the sample amounted

to 108.5%, and for large scale – 102.4%. Whereas in case of small scale lupine cultivation the economic costs in the prices of seeds constituted 99.8%, and for medium scale – 98.4%.

In 2015, **fodder pea** made it possible to obtain operating income less subsidies (Table 9). Farmers, on average in the sample, obtained PLN 501 per 1 ha (4.18 ha of cultivation), while on small scale (1-3 ha) – PLN 356, and on large scale (5-15 ha) – PLN 407. A growth in pea cultivation area did not favour production results, as lower yields were obtained by large scale pea producers. Because of its level – despite higher price of seeds – revenues per 1 ha were lower than for small scale. Whereas total costs incurred on 1 ha of pea decreased along with a growth in scale. The dynamics of their drop was stronger than in case of revenues (by 3.3 pp), thus large scale pea producers obtained higher income per 1 ha. Results indicate that large scale fodder pea cultivation, compared to small scale, was characterised by:

- less favourable relation of direct costs to gross margin less subsidies – 63.1%, while in case of small scale cultivation it was at 52.3%; which means that against direct costs, small scale fodder pea cultivation was more competitive;
- higher economic efficiency – profitability index was at 119.8%, while at small scale – 115.6%;
- higher level of coverage of factors of production – net value added exceeded the costs of own factors of production by 120.9%, while at small scale by 57.8%; which means that higher management income less subsidies was obtained from large scale fodder pea cultivation (PLN 374 per ha), when it exceeded by 92.8% the income obtained at small scale (PLN 194 per ha) – Table 10.

Management income less subsidies is a derivative of the relation of economic costs to the selling price of seeds. In case of small scale pea cultivation the share of these costs in the price amounted to 92.7%, while at large scale – 85.0%. Subsidies, which the farmers may have gotten cultivating fodder pea, constituted income support (in separated groups of farms from PLN 1201 per ha to PLN 1281 per ha).

Soybean cultivation in 2015 was unprofitable, on average in a sample (5.38 ha of cultivation) the loss of farmers at the level of operating income less subsidies was PLN 429 per ha (Table 11). In groups of farms classified according to soybean cultivation area, operating income less subsidies was also a negative value. In case of small scale (1-3 ha) the loss per 1 ha amounted to PLN 270, and large scale (5-12 ha) – PLN 328. Assessing production and price results of soybean, no major differences were noted between groups of farms. Slightly lower revenues per 1 ha were obtained by large scale soybean producers (by 1.7%), at the same time, incurring higher costs (by 1.6%). These factors preconditioned higher drop in operating income less subsidies. Research shows that large scale soybean production – compared to small scale – was characterised by:

- less favourable relation of direct costs to the generated gross margin less subsidies – 175.0%, while in case of small scale soybean cultivation this relation amounted to 195.2%; which means that against direct costs, large scale soybean cultivation was more competitive;
- lower economic efficiency – profitability index was at 83.2%, while at small scale – 86.0%;
- lower by 30.4% loss at the level of management income less subsidies (coverage of factors of production was not executed in both groups of farms – because the net value added was a negative value); the loss was covered by subsidies and their remaining surplus constituted management income; in case of large scale soybean cultivation this income amounted to PLN 793 per ha and was higher by 23.0% than the level of the income for farms cultivating soybean at small scale (Table 12).

In 2015, to get full coverage of economic costs it would be necessary to increase the price of seed or yield of soybean – on average in the research sample (5.38 ha of cultivation) by over 40%. Whereas on farms cultivating soybean on small scale (1-3 ha) by over 38%, large scale – by over 27%.

Research of agricultural products point to differentiation of production costs and economic results depending on their cultivation scale. They most often point to the advantage of large scale, although it was revealed at different levels of economic account. The level of production value (revenues) was conditioned by production and price conditions which along with growth in scale often grew successively, sometimes their change was not in one direction only. At the level of yield, this reveals special sensitivity to unfavourable environmental conditions, and at the level of selling price – the management skills of farmers.

The amount of production costs was determined by direct and indirect costs, but their strength of impact was different depending on activity and scale size. Opportunity cost of factors of production in case of almost all activities (except for spring barley and maize) decreased along with a growth in scale. This means that the scale was most burdened by this cost. The cost of factors of production most often determined the cost of land, only as regards edible potatoes it was the cost of own labour.

The consequence of diversification of the amount of direct and indirect costs and cost of factors of production is the diversity of economic costs. Their highest level – per 1 ha – was noted at small scale cultivation of four activities (edible potatoes, sweet lupine, fodder pea and soybean) out of six researched ones. Whereas in case of two activities (spring barley, grain maize) the highest economic costs were noted for medium scale.

Management income less subsidies is the remuneration for the farmer for management skills and risk that he took up during the production process. Along with a growth in the cultivation scale the level of this income in general

increased (possibly the scale decreased). The highest management income less subsidies was obtained by farmers from:

- large scale cultivation of spring barley, edible potatoes and fodder pea;
- medium scale cultivation of sweet lupine.

Management income less subsidies both on average in the sample as well as on separated scale ranges was not obtained from dry grain maize and soybean, and sweet lupine, but only on average in the sample and at large-scale of cultivation. The loss incurred in the production process was covered by subsides.

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Table 1

Production, costs and income obtained from spring barley cultivation in 2015 (actual data)

Specification		Average for spring barley farms	Depending on cultivation scale (ha/farm)		
			1-3	6-12	15-45
Number of researched farms		188	37	63	28
Cultivation area	(ha)	8.61	1.96	8.32	22.31
Grain yield	(dt/ha)	44.5	37.5	45.5	46.3
Grain selling price	(PLN/dt)	59.72	57.12	56.88	62.41
			per 1 ha of cultivation		
Total production value	(PLN)	2675	2143	2604	2920
including: grain		2657	2143	2589	2889
Total direct costs	(PLN)	**894**	**756**	**937**	**907**
including: seed material		168	174	165	181
total mineral fertilisers		521	449	543	540
off-farm organic fertilisers		5	10	7	6
plant protection products		176	111	191	162
growth regulators		20	4	25	14
other		4	8	6	4
Gross margin less subsidies	**(PLN)**	**1782**	**1387**	**1667**	**2013**
Actual[a] indirect costs	(PLN)	494	619	533	478
Gross value added on activity	(PLN)	**1288**	**768**	**1134**	**1535**
Depreciation	(PLN)	398	433	425	423
Net value added on activity	(PLN)	**890**	**335**	**709**	**1112**
Cost of external factors	(PLN)	173	165	159	156
Operating income less subsidies	**(PLN)**	**717**	**170**	**550**	**956**
Subsidies[b]	(PLN)	839	872	863	814
Operating income	**(PLN)**	**1556**	**1042**	**1413**	**1770**
TOTAL COSTS	***(PLN)***	***1958***	***1973***	***2054***	***1964***
Total labour inputs	(hour)	7.5	8.6	8.4	6.5
including: own labour inputs		7.2	8.5	8.3	6.3
Economic efficiency ratios					
Profitability ratio	(%)	136.6	108.6	126.8	148.7
Total costs per 1 dt of grain	(PLN)	44.02	52.59	45.13	42.42
Total costs per PLN 1 of operating income less subsidies	(PLN)	2.73	11.62	3.74	2.05
Operating income less subsidies per 1 dt of grain	(PLN)	16.11	4.53	12.09	20.65
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	99.47	19.96	65.99	152.64
Subsidies per PLN 1 of operating income less subsidies	(PLN)	1.17	5.13	1.57	0.85
Share of subsidies in operating income	(%)	53.9	83.7	61.1	46.0

[a] Actual indirect costs excluding the costs of external factors.

[b] Subsidies include single area payment, greening payment and additional payment.

Table 2

Economic costs and management income depending on spring barley scale of cultivation in 2015 (PLN/ha)

Specification		Average for spring barley farms	Depending on cultivation scale (ha/farm)		
			1-3	6-12	15-45
Net value added on activity		**890**	**335**	**709**	**1112**
Payment for own labour		106	125	123	92
Operating income on involvement of capital and management		**784**	**210**	**586**	**1019**
Land costs		180	129	199	194
Cost of operating and fixed capital		18	12	21	19
Management income less subsidies		**586**	**69**	**366**	**806**
Subsidies		839	872	863	814
Management income		**1425**	**941**	**1229**	**1620**
Cost of factors of production		304	266	343	305
Economic costs		2089	2074	2238	2113
Share of cost of factors of production in economic costs	(%)	14.6	12.8	15.3	14.4
Cost of factors of production per 1 dt of grain	(PLN)	6.83	7.09	7.54	6.59
Economic costs per 1 dt of grain	(PLN)	46.94	55.31	49.19	45.64
Relation of economic costs of production of 1 dt of grain to selling price	(%)	78.6	96.8	86.5	73.1

Table 3

Production, costs and income obtained from grain maize cultivation in 2015 (actual data)

Specification		Average for maize farms	Depending on cultivation scale (ha/farm)		
			4-10	12-20	25-65
Number of researched farms		79	20	22	17
Cultivation area	(ha)	21.08	7.31	15.53	39.95
Dry grain yield	(dt/ha)	63.2	59.2	62.3	55.3
Grain selling price	(PLN/dt)	60.69	59.34	62.06	66.01
			per 1 ha of cultivation		
Total production value	**(PLN)**	**3833**	**3511**	**3866**	**3647**
including: grain		3833	3511	3866	3647
Total direct costs	**(PLN)**	**2028**	**2150**	**2134**	**1875**
including: seed material		572	502	589	529
total mineral fertilisers		943	951	928	877
off-farm organic fertilisers		14	-	24	7
plant protection products		180	186	182	182
growth regulators		0	-	1	-
other		318	511	409	280
Gross margin less subsidies	**(PLN)**	**1804**	**1361**	**1733**	**1772**
Actual[a] indirect costs	(PLN)	804	693	741	758
Gross value added on activity	**(PLN)**	**1000**	**668**	**991**	**1014**
Depreciation	(PLN)	713	511	625	650
Net value added on activity	**(PLN)**	**287**	**157**	**367**	**364**
Cost of external factors	(PLN)	414	283	358	289
Operating income less subsidies	**(PLN)**	**-128**	**-126**	**9**	**75**
Subsidies[b]	(PLN)	815	840	840	807
Operating income	**(PLN)**	**687**	**714**	**849**	**882**
TOTAL COSTS	***(PLN)***	***3960***	***3637***	***3858***	***3572***
Total labour inputs	(hour)	9.3	10.7	9.2	8.7
including: own labour inputs		8.3	10.4	8.7	8.6
Economic efficiency ratios					
Profitability ratio	(%)	96.8	95.5	100.2	102.1
Total costs per 1 dt of grain	(PLN)	62.71	61.47	61.92	64.66
Total costs per PLN 1 of operating income less subsidies	(PLN)	x	x	453.08	47.89
Operating income less subsidies per 1 dt of grain	(PLN)	-2.02	-2.12	0.14	1.35
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	-15.43	-12.05	0.98	8.66
Subsidies per PLN 1 of operating income less subsidies	(PLN)	x	x	93.28	10.75
Relation of subsidies to operating income		1.19	1.18	0.99	0.91

[a] Actual indirect costs excluding the costs of external factors.

[b] Subsidies include single area payment, greening payment and additional payment.

[-] – means that the phenomenon did not exist.

[x] – means that calculations were unjustified.

Table 4

Economic costs and management income depending on grain maize scale of cultivation in 2015 (PLN/ha)

Specification		Average for maize farms	Depending on cultivation scale (ha/farm)		
			4-10	12-20	25-65
Net value added on activity		**287**	**157**	**367**	**364**
Payment for own labour		122	154	128	127
Operating income on involvement of capital and management		165	4	239	237
Land costs		623	620	621	624
Cost of operating and fixed capital		81	25	42	78
Management income less subsidies		**-539**	**-641**	**-424**	**-466**
Subsidies		815	840	840	807
Management income		**276**	**199**	**416**	**341**
Cost of factors of production		826	799	791	829
Economic costs		4372	4152	4290	4113
Share of cost of factors of production in economic costs	(%)	18.9	19.2	18.4	20.2
Cost of factors of production per 1 dt of grain	(PLN)	13.07	13.50	12.70	14.99
Economic costs per 1 dt of grain	(PLN)	69.18	70.14	68.86	74.38
Relation of economic costs of production of 1 dt of grain to selling price	(%)	114.0	118.2	111.0	112.7

Table 5

Production, costs and income obtained from edible potato cultivation in 2015 (actual data)

Specification		Average for edible potato farms	Depending on cultivation scale (ha/farm)		
			1-2	4-8	10-33
Number of researched farms		138	59	31	15
Cultivation area	(ha)	4.73	1.34	5.57	18.00
Potato yield[a]	(dt/ha)	248	218	229	270
Potato selling price	(PLN/dt)	56.89	62.99	60.18	55.63
			per 1 ha of cultivation		
Total production value	**(PLN)**	**14 098**	**13 730**	**13 792**	**15 025**
including: tubers		14 098	13 730	13 792	15 025
Total direct costs	**(PLN)**	**3 237**	**2 854**	**3 312**	**3 538**
including: seed material		1 554	1 701	1 696	1 576
total mineral fertilisers		979	621	811	1 239
off-farm organic fertilisers		23	36	71	-
plant protection products		520	399	553	582
growth regulators		11	6	1	14
other		150	91	181	128
Gross margin less subsidies	**(PLN)**	**10 861**	**10 876**	**10 479**	**11 487**
Actual[b] indirect costs	(PLN)	2 191	3 016	2 318	1 841
Gross value added on activity	**(PLN)**	**8 671**	**7 860**	**8 161**	**9 646**
Depreciation	(PLN)	1 835	2 132	1 845	1 838
Net value added on activity	**(PLN)**	**6 836**	**5 728**	**6 316**	**7 808**
Cost of external factors	(PLN)	982	638	967	1 358
Operating income less subsidies	**(PLN)**	**5 853**	**5 090**	**5 349**	**6 450**
Subsidies[c]	(PLN)	861	877	866	847
Operating income	**(PLN)**	**6 714**	**5 967**	**6 215**	**7 298**
TOTAL COSTS	***(PLN)***	***8 245***	***8 639***	***8 443***	***8 575***
Total labour inputs	(hour)	81.6	95.5	86.8	64.9
including: own labour inputs		66.9	78.2	66.4	53.0
Economic efficiency ratios					
Profitability ratio	(%)	171.0	158.9	163.4	175.2
Total costs per 1 dt of potatoes	(PLN)	33.25	39.63	36.87	31.76
Total costs per PLN 1 of operating income less subsidies	(PLN)	1.41	1.70	1.58	1.33
Operating income less subsidies per 1 dt of potatoes	(PLN)	23.60	23.35	23.36	23.89
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	87.48	65.07	80.55	121.75
Subsidies per PLN 1 of operating income less subsidies	(PLN)	0.15	0.17	0.16	0.13
Share of subsidies in operating income	(%)	12.8	14.7	13.9	11.6

[a] Potato yield less losses during storage.

[b] Actual indirect costs excluding the costs of external factors.

[c] Subsidies include single area payment, greening payment and additional payment.

[-] – means that the phenomenon did not exist.

[x] – means that calculations were unjustified.

Table 6

Economic costs and management income depending on edible potato scale of cultivation in 2015 (PLN/ha)

Specification		Average for edible potato farms	Depending on cultivation scale (ha/farm)		
			1-2	4-8	10-33
Net value added on activity		**6836**	**5728**	**6316**	**7808**
Payment for own labour		986	1152	978	780
Operating income on involvement of capital and management		**5850**	**4576**	**5338**	**7028**
Land costs		197	191	200	242
Cost of operating and fixed capital		157	60	116	244
Management income less subsidies		**5496**	**4325**	**5022**	**6542**
Subsidies		861	877	866	847
Management income		**6357**	**5202**	**5888**	**7389**
Cost of factors of production		1340	1403	1294	1266
Economic costs		8602	9405	8769	8484
Share of cost of factors of production in economic costs	(%)	15.6	14.9	14.8	14.9
Cost of factors of production per 1 dt of potatoes	(PLN)	5.40	6.44	5.65	4.69
Economic costs per 1 dt of potatoes	(PLN)	34.69	43.14	38.29	31.42
Relation of economic costs of production of 1 dt of tubers to selling price	(%)	61.0	68.5	63.6	56.5

Table 7

Production, costs and income obtained from sweet lupine cultivation in 2015 (actual data)

Specification		Average for sweet lupine farms	Depending on cultivation scale (ha/farm)		
			1-2	4-8	10-35
Number of researched farms		167	35	44	31
Cultivation area	(ha)	7.14	1.59	5.59	16.48
Seed yield	(dt/ha)	14.5	15.2	14.6	14.9
Seed selling price	(PLN/dt)	90.54	104.95	101.02	84.39
			per 1 ha of cultivation		
Total production value	**(PLN)**	**1309**	**1591**	**1473**	**1257**
including: seed		1309	1591	1473	1257
Total direct costs	**(PLN)**	**529**	**621**	**606**	**514**
including: seed material		257	283	290	255
total mineral fertilisers		153	196	181	140
off-farm organic fertilisers		1	11	2	-
plant protection products		106	119	118	103
growth regulators		9	10	11	11
other		3	3	4	5
Gross margin less subsidies	**(PLN)**	**780**	**969**	**866**	**743**
Actual indirect costs[a]	(PLN)	341	382	345	341
Gross value added on activity	**(PLN)**	**439**	**588**	**521**	**402**
Depreciation	(PLN)	303	266	247	215
Net value added on activity	**(PLN)**	**136**	**322**	**274**	**187**
Cost of external factors	(PLN)	93	66	83	94
Operating income less subsidies	**(PLN)**	**43**	**256**	**191**	**94**
Subsidies[b]	(PLN)	1232	1293	1261	1210
Operating income	**(PLN)**	**1274**	**1549**	**1452**	**1303**
TOTAL COSTS	***(PLN)***	***1266***	***1335***	***1282***	***1163***
Total labour inputs	(hour)	5.8	10.3	6.0	5.4
including: own labour inputs		5.4	10.2	5.8	4.9
Economic efficiency ratios					
Profitability ratio	(%)	103.4	119.2	114.9	108.0
Total costs per 1 dt of seed	(PLN)	87.59	88.06	87.92	78.11
Total costs per PLN 1 of operating income less subsidies	(PLN)	29.68	5.21	6.71	12.44
Operating income less subsidies per 1 dt of seed	(PLN)	2.95	16.90	13.09	6.28
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	7.93	25.03	32.92	19.08
Subsidies per PLN 1 of operating income less subsidies	(PLN)	28.88	5.05	6.61	12.93
Share of subsidies in operating income	(%)	96.7	83.5	86.9	92.8

[a] Actual indirect costs excluding the costs of external factors.

[b] Subsidies include payments to protein crops, single area payment, greening payment and additional payment.

[-] – means that the phenomenon did not exist.

Table 8

Economic costs and management income depending on sweet lupine scale of cultivation in 2015 (PLN/ha)

Specification		Average for sweet lupine farms	Depending on cultivation scale (ha/farm)		
			1-2	4-8	10-35
Net value added on activity		**136**	**322**	**274**	**187**
Payment for own labour		79	151	85	72
Operating income on involvement of capital and management		**57**	**172**	**189**	**115**
Land costs		160	162	158	139
Cost of operating and fixed capital		9	7	7	7
Management income less subsidies		**-112**	**3**	**24**	**-31**
Subsidies		1232	1293	1261	1210
Management income		**1120**	**1296**	**1285**	**1179**
Cost of factors of production		248	320	251	218
Economic costs		1420	1588	1449	1287
Share of cost of factors of production in economic costs	(%)	17.4	20.1	17.3	16.9
Cost of factors of production per 1 dt of seed	(PLN)	17.14	21.10	17.19	14.61
Economic costs per 1 dt of seed	(PLN)	98.27	104.79	99.39	86.45
Relation of economic costs of production of 1 dt of seed to selling price	(%)	108.5	99.8	98.4	102.4

Table 9

Production, costs and income obtained from fodder pea cultivation in 2015 (actual data)

Specification		Average for fodder pea farms	Depending on cultivation scale (ha/farm)	
			1-3	5-15
Number of researched farms		87	49	19
Cultivation area	(ha)	4.18	1.88	8.38
Seed yield	(dt/ha)	26.1	28.8	24.2
Seed selling price	(PLN/dt)	99.80	91.56	101.79
			per 1 ha of cultivation	
Total production value	**(PLN)**	**2604**	**2638**	**2466**
including: seed		2602	2638	2460
Total direct costs	**(PLN)**	**906**	**906**	**954**
including: seed material		427	412	463
total mineral fertilisers		294	279	331
off-farm organic fertilisers		-	-	-
plant protection products		179	208	155
growth regulators		6	6	5
other		1	1	-
Gross margin less subsidies	**(PLN)**	**1698**	**1733**	**1512**
Actual[a] indirect costs	(PLN)	517	633	451
Gross value added on activity	**(PLN)**	**1181**	**1100**	**1060**
Depreciation	(PLN)	421	570	377
Net value added on activity	(PLN)	760	530	684
Cost of external factors	(PLN)	259	174	276
Operating income less subsidies	**(PLN)**	**501**	**356**	**407**
Subsidies[b]	(PLN)	1236	1281	1201
Operating income	**(PLN)**	**1737**	**1636**	**1608**
TOTAL COSTS	***(PLN)***	***2103***	***2282***	***2058***
Total labour inputs	(hour)	7.0	8.3	6.7
including: own labour inputs		6.8	8.3	6.7
Economic efficiency ratios				
Profitability ratio	(%)	123.8	115.6	119.8
Total costs per 1 dt of seed	(PLN)	80.67	79.21	85.16
Total costs per PLN 1 of operating income less subsidies	(PLN)	4.20	6.42	5.05
Operating income less subsidies per 1 dt of seed	(PLN)	19.22	12.35	16.85
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	73.87	42.98	61.05
Subsidies per PLN 1 of operating income less subsidies	(PLN)	2.47	3.60	2.95
Share of subsidies in operating income	(%)	71.2	78.3	74.7

[a] Actual indirect costs excluding the costs of external factors.

[b] Subsidies include payments to protein crops, single area payment, greening payment and additional payment.

[-] – means that the phenomenon did not exist.

Table 10

Economic costs and management income depending on fodder pea scale of cultivation in 2015 (PLN/ha)

Specification		Average for fodder pea farms	Depending on cultivation scale (ha/farm)	
			1-3	5-15
Net value added on activity		**760**	**530**	**684**
Payment for own labour		100	122	98
Operating income on involvement of capital and management		**660**	**408**	**585**
Land costs		205	205	197
Cost of operating and fixed capital		12	9	14
Management income less subsidies		**442**	**194**	**374**
Subsidies		1236	1281	1201
Management income		**1678**	**1475**	**1575**
Cost of factors of production		318	336	309
Economic costs		2162	2444	2091
Share of cost of factors of production in economic costs	(%)	14.7	13.7	14.8
Cost of factors of production per 1 dt of seed	(PLN)	12.18	11.66	12.80
Economic costs per 1 dt of seed	(PLN)	82.93	84.83	86.53
Relation of economic costs of production of 1 dt of seed to selling price	(%)	83.1	92.7	85.0

Table 11

Production, costs and income obtained from soybean cultivation in 2015 (actual data)

Specification		Average for soybean farms	Depending on cultivation scale (ha/farm)	
			1-3	5-12
Number of researched farms		53	20	16
Cultivation area	(ha)	5.38	1.92	8.36
Seed yield	(dt/ha)	13.1	14.0	13.6
Seed selling price	(PLN/dt)	117.65	118.64	120.19
			per 1 ha of cultivation	
Total production value	**(PLN)**	**1537**	**1659**	**1631**
including: seed		1537	1659	1631
Total direct costs	**(PLN)**	**1108**	**1097**	**1038**
including: seed material		565	563	504
total mineral fertilisers		394	354	395
off-farm organic fertilisers		-	-	-
plant protection products		128	168	104
growth regulators		12	13	16
other		9	0	19
Gross margin less subsidies	**(PLN)**	**429**	**562**	**593**
Actual[a] indirect costs	(PLN)	412	438	472
Gross value added on activity	**(PLN)**	**17**	**124**	**121**
Depreciation	(PLN)	284	352	261
Net value added on activity	**(PLN)**	**-267**	**-228**	**-140**
Cost of external factors	(PLN)	162	42	189
Operating income less subsidies	**(PLN)**	**-429**	**-270**	**-328**
Subsidies[b]	(PLN)	1251	1284	1238
Operating income	**(PLN)**	**822**	**1014**	**909**
TOTAL COSTS	***(PLN)***	***1966***	***1929***	***1959***
Total labour inputs	(hour)	6.7	9.2	6.2
including: own labour inputs		6.6	9.2	6.1
Economic efficiency ratios				
Profitability ratio	(%)	78.2	86.0	83.2
Total costs per 1 dt of seed	(PLN)	150.51	137.95	144.40
Operating income less subsidies per 1 dt of seed	(PLN)	-32.86	-19.32	-24.21
Operating income less subsidies per 1 hour of own labour inputs	(PLN)	-65.13	-29.38	-54.14
Relation of subsidies to operating income		1.52	1.27	1.36

[a] Actual indirect costs excluding the costs of external factors.

[b] Subsidies include payments to protein crops, single area payment, greening payment and additional payment.

[-] – means that the phenomenon did not exist.

Table 12

Economic costs and management income depending on soybean scale of cultivation in 2015 (PLN/ha)

Specification		Average for soybean farms	Depending on cultivation scale (ha/farm)	
			1-3	5-12
Net value added on activity		**-267**	**-228**	**-140**
Payment for own labour		97	135	89
Operating income on involvement of capital and management		**-364**	**-363**	**-229**
Land costs		244	265	206
Cost of operating and fixed capital		11	11	9
Management income less subsidies		**-619**	**-639**	**-445**
Subsidies		1251	1284	1238
Management income		**632**	**645**	**793**
Cost of factors of production		352	411	305
Economic costs		2155	2298	2076
Share of cost of factors of production in economic costs	(%)	16.3	17.9	14.7
Cost of factors of production per 1 dt of seed	(PLN)	26.94	29.43	22.49
Economic costs per 1 dt of seed	(PLN)	165.04	164.37	152.99
Relation of economic costs of production of 1 dt of seed to selling price	(%)	140.3	138.6	127.3

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KOSZTY JEDNOSTKOWE I DOCHODY WYBRANYCH PRODUKTÓW W 2015 ROKU – WYNIKI BADAŃ W SYSTEMIE AGROKOSZTY

Abstrakt

Celem artykułu jest analiza wyników ekonomicznych jęczmienia jarego, kukurydzy na ziarno, ziemniaków jadalnych, łubinu słodkiego, grochu pastewnego oraz soi w 2015 roku w gospodarstwach o różnej skali produkcji tych produktów. Badania przeprowadzono w gospodarstwach towarowych, czyli takich, które swoją produkcję przeznaczają na sprzedaż. Jednostki te mają charakter przedsiębiorstw. Na wyniki badanych produktów wpływ miał potencjał produkcyjny gospodarstw, czyli zasoby ziemi, pracy i kapitału, ich jakość oraz sposób wykorzystania, ale było także ich uzależnienie od warunków zewnętrznych (np. rynkowych, pogodowych).

Następstwem zróżnicowania kosztów bezpośrednich i pośrednich oraz kosztu zaangażowania w proces produkcji własnych czynników wytwórczych jest zróżnicowanie kosztów ekonomicznych. Z badań wynika, że najwyższe odnotowano przy uprawie na małą skalę ziemniaków jadalnych, łubinu słodkiego, grochu pastewnego i soi. Natomiast przy uprawie na skalę średnią – jęczmienia jarego i kukurydzy. Wraz ze wzrostem skali uprawy dochód z działalności z tytułu zarządzania bez dopłat, należny rolnikowi jako przedsiębiorcy, na ogół zwiększał się, ewentualnie malała strata. Stratę powstałą w procesie produkcji pokryły dopłaty. Wyniki badań wskazują na przewagę dużej skali, chociaż ujawniała się ona na różnych poziomach rachunku ekonomicznego.

Słowa kluczowe: koszty jednostkowe, produkty rolnicze, skala produkcji, opłacalność produkcji, dochód z zarządzania.

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