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Costs and profitability

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UNIT COSTS OF AND INCOME FROM SELECTED PRODUCTS IN 2014 – RESEARCH RESULTS IN THE AGROKOSZTY SYSTEM

Abstract

The main aim of the paper is analysis of production and economic results of sugar beets, cow milk and live cattle in 2014 for farms having different production scale of these products. Research was held at commercial farms, which have greater development opportunities. The results of the researched products were affected by the production potential of farms, i.e. resources of land, labour and capital, their quality and manner of use, but they were also dependent on the external conditions of operation, e.g. weather or market conditions. This impact resulted in different level of changes in production volume, unit costs and implementation prices of respective products.

A consequence of differences in selected production scale sections, production and price results and incurred costs was differentiation of profitability of production, understood as a difference between the production value and costs corresponding thereto and as a quotient of production value and costs in percentages. The research showed that benefits following from a growth in production scale are clear. Greater production volume allows for generation of higher income and due to a higher level of specialisation and mechanisation of conducted works it is connected with much lower labour inputs. This results in higher labour productivity. Thus, one might expect coverage of alternative costs of land and capital.

Keywords: unit costs, sugar beets, cow milk, live cattle, production scale, production profitability.

Introduction

A farmer in the production process is continually accompanied by the economic account, which should be understood as a set of methods enabling to take decisions, that ensure selection of a solution giving satisfactory effects (Ziętara, 1998). Costs, in the production process, play a major part and their impact on the final financial result is significant. Farms generate costs which are the effect of decisions taken therein (although their level can be influenced by external factors, e.g. prices of means of production); they are generally incurred on a current basis at subsequent levels of the production process. Hence, there is a possibility of exercising control over them. Therefore, farm managers have greater possibilities of exercising current impact on the level of costs than on the volume of revenues.

Farms operate in an environment subject to multiple changes, some of them anthropogenic, others random – non-anthropogenic. Given the specificity of production processes in agriculture from the moment of undertaking decisions to the moment products appear on the market a certain period of time lapses, which is different for plant production and different, for dairy production or production of live pigs. Therefore, the costs are a key element of profitability account and the knowledge on their components and existing correlations, both within themselves and between the area of revenues and incomes, is helpful in running a farm.

Research concerning costs of production, revenues and incomes obtained from individual agricultural products are useful in determining the "economies of scale" and selection of optimum production scale for the given farming conditions. Hence, it needs to be kept in mind that a growth in production volume (given a growth in scale) influences both the amount of revenues on sales and incurred costs. Optimisation of costs is a broad issue and taking the right decision as regards production intensity[1] is not easy for a farmer. The level of technique should be taken into account, the adopted production technology, natural and economic conditions, and volume and structure of inputs. These factors – at least to some degree – are linked to the selection of production scale. The paper presents the production and economic results for sugar beets and cow milk, and live cattle at farms different in terms of production scale of these products in 2014.

Research methodology

Empirical data characterise the researched production activities, i.e. sugar beets, dairy cows and cattle for fattening, gathered at individual farms situated across Poland. These farms were selected by way of nonprobability sampling

[1] Production intensity should be understood as the level of human and non-human labour inputs incurred per utilised agricultural area (Manteuffel, 1984).

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) 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.

AGROKOSZTY system gathers quantitative and value data on the production level, incurred inputs and direct costs. The data are collected according to uniform assumptions with precisely set standards and exactly determined methodology. They enable to calculate gross margin which reflects production margin value over the incurred direct costs.

In case of plant production activities **production value** is the sum of value of primary products (e.g. roots, seeds) and by-products (e.g. beet leaves, straw) under marketing. It is determined by market selling price or by loco selling price of a farm (i.e. in the area of a farm). Hence, it depends on the crop yield level and selling price of products. Different types of losses are deducted from production value (per 1 ha). In case of livestock production, the structure of production value is different depending on the analysed activities. However, the product, for which the given production is being pursued, is always defined as the primary one (e.g. milk). Increase in live cattle (e.g. weaned calves) and one or more by-products (e.g. culled livestock) can take place regardless of the above. Loses, i.e. livestock mortality in the production process (per 1 LU or 100 kg of live weight), are deducted from production value. Upon calculation of production value for livestock production activities the value of manure and slurry, which are produced at farmer's own holding are not taken into account.

Direct costs are the components of costs, which can, undoubtedly, be assigned to a given activity. Their value is proportionally linked to production scale; they also have a direct impact on production size (volume and value).

Direct costs of plant production include:

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

[2] Costs of fertilisers from purchase cover also specialist fertilisation taxes.

Direct costs of livestock production include:

- livestock comprising respective activities for herd replacement,
- feed divided into:
  – off-farm feed (mainly from purchase),
  – own farm feed divided into:
    - own feed from potential commodity products,
    - own feed from non-commodity products,
- lease rents for use of forage area leased for a period shorter than one year (*in UAA and area not classified as UAA, e.g. mountain grasslands*),
- insurance of livestock concerning directly a given activity (*e.g. cows, heifers*),
- veterinary medicines and means (*including semen for insemination*),
- veterinary services (*insemination, castration, vaccination*),
- specialist costs covering:
  – specialist expenditures on livestock production,
  – specialist services,
  – occasional hire for specialist works.

The set of direct costs, by which the production value is lowered, is different for plant and livestock production. But in both cases they reflect the current market conditions. The components of off-farm direct costs are determined by purchase price, while the components of costs generated on farm (e.g. seed material, own feeds from commodity products) – by loco selling prices of a farm. An exception is – for livestock production – own feed from non-commodity products (e.g. maize silage), which is valued by direct costs incurred for its production. Respective cost components are reduced by the awarded subsidies.

The cost account for livestock production activities does not consider the value of plant production by-products (e.g. straw, beet leaves) manufactured and used as feed or bedding at own holding of a farmer.

The specialist costs are costs, which have a direct link to a defined activity and increase the quality and value of the final product. For plant production activity an example of a specialist costs is a cost of: energy carriers used for drying of products, preparation of products for sales or making analyses enabling to determine the fertilisation needs of plants. For livestock production activity, specialist costs cover, e.g., the costs of bedding used in the production process of a given activity, means for preservation and storage of feeds, classification of livestock or disinfection of livestock buildings.

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:

- general inputs – electricity, heating and power fuel, current repairs, overhauls and inspections, services, insurance (e.g. buildings, property and vehicles), 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.

Indirect costs cannot be allocated to products upon generation. These are joint costs for the entire farm, distribution keys are used for their division. The distribution key for the research held was the share of production value for each activity in the total production value of a farm. To this end, the Polish FADN database identified farms running activities researched under the AGROKOSZTY system; the algorithm of indirect cost distribution was applied individually for each farm and activity. The scheme of the cost and income account for production activity is presented below.

Scheme 1

Manner of calculation of respective income categories for agricultural production activities

I		**Production value**
II	-	*Direct costs*
III	**=**	**Direct margin less subsidies**
IV	-	*Actual indirect costs (excluding the costs of external factors)*
V	**=**	**Gross value added from activity**
VI	-	*Estimated indirect costs – depreciation*
VII	**=**	**Net value added from activity**
VIII	-	*Costs of external factors*
IX	**=**	**Income from activity less subsidies**
X	+	*Subsidies*
XI	=	**Income from activity**

Income from activity is the margin generated after deduction of direct and indirect costs from production value, and increased by subsidies. Upon calculation of income from activity the output and input VAT amounts are not considered.

The tables presenting the research results include data on labour inputs (own and hired) incurred for a given activity, which are gathered in the AGROKOSZTY system. This record allows determining labour-intensity of production. In case of plant production activity the register includes works involved in pre-sowing preparation of the soil, cultivation works and works linked to harvest and seed drying. Whereas for livestock production activity these are mainly works involved in livestock handling and provision of feed and inputs incurred on production of own non-commodity feed. This record does not cover labour inputs which are linked to the operation of a farm as a whole. This concerns administrative works, general farm works or labour inputs incurred on repairs of buildings or machinery.

Based on the number of working hours incurred on production of individual products, the income form activity is calculated less subsides per 1 hour of own labour. This reflects the level of coverage of the labour inputs of a farmer and his family by income obtained per 1 ha of crops or production of 100 kg of live cattle. For the needs of the analysis, a farmer's work was valued according to the normative rate set based on the average level of remuneration of employees working in the entire national economy (according to GUS). It was assumed that one full-time employee works in agriculture 2,120 hours per year. Thus calculated payment for 1 hour of own work in 2014 amounted to PLN 14.29. However, it needs to be noted that capturing the own labour inputs in value terms for individual farms is always conventional.

Assessing production efficiency in groups of farms differing by scale size, the analysis covered the level of production value and total costs (direct and indirect in total) incurred on its generation, the relations between these variables are expressed by the profitability index. To describe it and assess the level of differentiation in the groups of farms the selected statistical measures were used: 5% and 95% percentile, median, quartile deviation, position coefficient of variation (Sobczak, 2007). The marginal cost, which is the measure of total cost response to the growth in the production volume, was also calculated (Samuelson and Nordhaus, 1995). In the conducted research the marginal and unit (average) cost calculation was based on the average results for respective sections of production scale.

The results of production activities were presented as averages for the entire research sample of farms and for groups separated according to the production scale of respective activities. For the needs of the analysis three scale sections were selected – small, medium and large. The applied scale criterion for plant production activity was cultivation area, for live cattle – the net production level measured by the volume of the annual weight increase obtained per herd of cattle for fattening above 1 year old (dairy breeds, and dairy and meat breeds), and for dairy cows – the number of cows kept per a farm. 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 feature, which was the scale criterion, were taken into account. It was assumed that the number of farms in separated sections of the scale was possibly the largest, the average level of the feature taken as the scale criterion was close to the median of the feature and limits of scale sections were not in contact with each other. These factors decided on the selection of three scale sections; as a result the number of farms in selected section does not cover the entire research sample.

The size of production scale sections is relative, which means that the scale size taken as large can be considered 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 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 and Jabłoński, 2015), 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 graphically and included in tables. Given the electronic technique of data processing, in some cases the sums of components can differ from the given "total" values.

Research results

According to GUS data, 2014 was the third year in a row when the market conditions of agricultural production were unfavourable for agricultural producers (GUS, 2016). A drop in prices of agricultural products sold by individual farms amounted to 6.5%. The prices of goods and services purchased for current agricultural production needs and for investments also decreased, but the decrease was only 1.7%. This means that the relation of agricultural product prices to the prices of means of production deteriorated. As a result, the price relation ratio ("price scissors") was at 95.1 (in 2013 – 99.1, and in 2012 – 97.8). These conditions influenced the economic results of researched products, i.e. sugar beets, cow milk and live cattle.

The research results show that in 2014 **sugar beet** growers did not lose on their cultivation (Table 1). An average for a research sample of farms cultivating sugar beets on 9.31 ha was income less subsidies amounting to PLN 2,773 per ha. Its level differed depending on the area of sugar beets cultivation. Along with its growth an improvement in the production and price results of sugar beets was noted. Cultivation costs also grew, but the dynamics of their growth

was weaker than for revenues (i.e. production value). As a result of these conditions sugar beets cultivated at a large scale (15-45 ha) ensured the highest income – PLN 2,963 per ha. At average scale (6-12 ha) its level was lower by 9.1% and amounted to PLN 2,693 per ha. The least favourable situation was that of farmers cultivating sugar beets at small scale (1-4 ha). Income less subsidies obtained per 1 ha was PLN 2,117 and against the medium scale it was lower by 21.4%, and large – by 28.6%. The factor determining the level of income was production value – in case of sugar beet cultivation at medium scale its growth dynamics was greater than growth of costs by 7.2 percentage points (pp) and at large scale by 1.5 pp. Sugar beets, cultivated at large scale, against other scale sections, were characterised by the highest:

- cost competitiveness – direct costs constituted 43.7% of generated gross margin less subsidies, while at medium scale – 48.2% and small – 50.0%;
- economic efficiency – profitability index (relation of production value to total costs) was at 149.3%, while at medium scale – 147.3%, and small scale – 137.4% (Table 4).

Benefits following from an increase in cultivation scale can be seen also upon comparing marginal values (average results for separated scale sections were considered). For large scale sugar beet cultivation the marginal production cost of 1 dt of roots (PLN 8.42 per dt) was higher by 0.8% than the average cost (in total), and at medium scale the average cost was higher – by 1.5% (Figure 1). Nonetheless, marginal production cost of 1 dt of roots both at medium and large scale did not exceed the cut-off cost, i.e. the price of roots. At both scale sections the intensity limit was not exceeded, which means that the growth in production value was higher than the costs incurred on its production. A growth in scale at the given intensity level was a rational move.

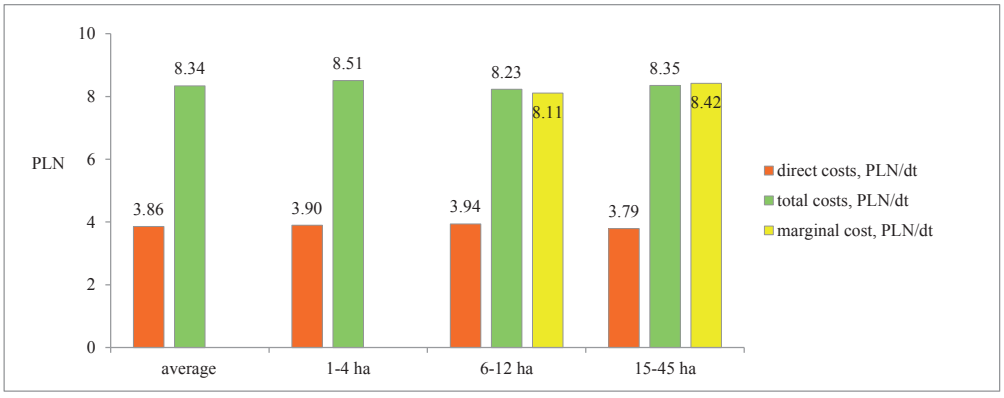

Fig. 1. Production costs of sugar beets depending on their production scale in 2014.
Source: own elaboration based on data from AGROKOSZTY system and the Polish FADN.

A larger area of sugar beets boosted a drop in labour-intensity of their cultivation. At large scale, against small scale, total labour input (own and hired) incurred per 1 ha was lower by 39.8% and own labour input by 58.0%. This influenced the level of income on activity less subsidies that fell per 1 hour of own labour. Its level was exceeded manifold by parity rate for labour coverage (PLN 14.29 per hour) – for small scale 6.4 times, medium scale – 11.9 times, and large scale – 21.4 times. The beneficial effect of scale impact is clear.

In 2014, **milk production** made it possible to earn income, but its level calculated per 1 cow was highly differentiated depending on the number of cows in a herd (Table 2). The best results were obtained by farmers keeping from 50 to 100 cows – income on activity less subsidies per 1 cow was at PLN 3,842. For medium scale milk production, e.g. a herd of 20-45 cows, the income was by 22.5% lower and was at the level of PLN 2,977. Whereas in case of small scale milk production (5-15 cows) the income less subsidies amounted to PLN 1,381 per cow. Compared to medium scale it was by 53.6% lower and large scale by 64.1%. The correlation between the level of income and number of cows per farm is evident. The key factor differentiating production value, and also the level of income was milk yield of cows. Along with a growth in the cow herd per farm their milk yield and milk price grew. Costs of breeding 1 cow also grew. The raise in production value was stronger than that of costs, though: medium scale – by 19.7 pp, and large scale – by 8.4 pp. Gradual growth in income was the result.

The results of the marginal account indicate that the growth in costs in subsequent scale sections was justified. This resulted in higher milk yield and its growth per 1 litre – for farms keeping from 20 to 45 cows – was linked to a growth in costs by PLN 1.02. This level was by 2.9% lower than the unit average cost (PLN 1.05). Intensification of milk production at farms keeping large herds of cows (50-100 heads) also had positive effects. The marginal cost of production of 1 litre of milk was at PLN 0.97 and was by 4.0% lower than the average unit cost (PLN 1.01 per litre). Thus, the marginal cost pushed down the average cost (Figure 2). Both at medium and large scale the production intensity limit was not exceeded, which means that the costs grew slower than production value. Its growth by PLN 1 required an increase in costs at medium scale by PLN 0.65 and at large scale by PLN 0.59.

Growth in the scale was noted along with a drop in costs of production of 1 litre of milk and PLN 1 of income less subsidies, and simultaneous growth in income less subsidies that fell to 1 litre of milk. An advantage of large production scale over small in the first case was 10.6%, in the second – 54.5%, and in the third – 93.5%. Large scale milk production was also characterised by the highest:

- cost competitiveness – direct costs constituted 46.1% of generated gross margin less subsidies, while at medium scale – 57.4% and small – 71.3%;
- economic efficiency – profitability index was at 159.2%, while at medium scale – 147.2%, and small scale – 127.0% (Table 4).

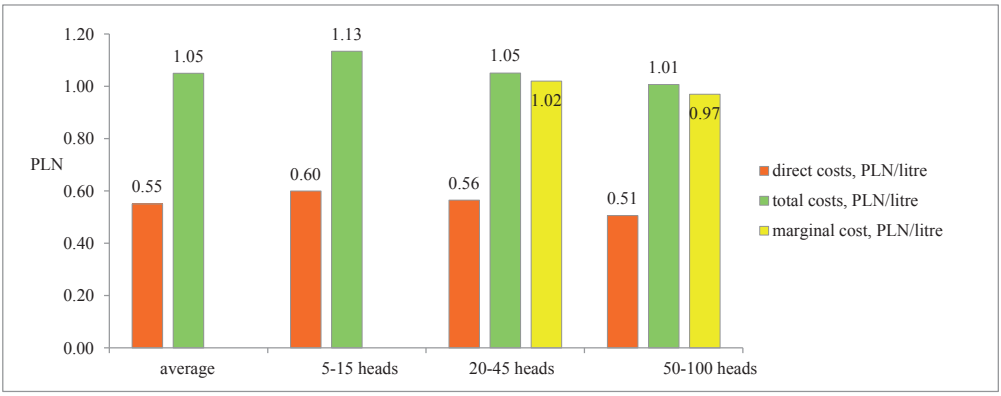

Fig. 2. Milk production costs depending on the size of cow herd in 2014.
Source: own elaboration based on data from AGROKOSZTY system and the Polish FADN.

A positive scale effect, and thus milk production specialisation, was lower than labour inputs incurred for keeping dairy cows. Total labour inputs (own and hired in total) calculated per 1 cow at large scale – against small scale – were lower by 123.6 hours and own labour inputs by 133.3 hours. This has a major impact on the level of income less subsidies that fell per 1 hour of own work. Its level in relation to the parity rate of work coverage (PLN 14.29 per hour) points to a positive scale effect. For medium and large scale milk production, this income exceeded the parity rate, respectively, by 2.2 and 4.7 times, while for small scale – own labour was covered only in 51%. When add the subsidies (single area payment per forage area for 1 cow), the income per 1 hour of own labour was still lower than the parity rate of labour coverage – it constituted only 71% of its level.

In 2014, at most of farms from the research sample, revenues from production of **live cattle** did not ensure full coverage of incurred costs, i.e. direct and indirect in total (Table 3). The loss at the level of income from activity less subsidies calculated per 100 kg of live cattle was from PLN 202 at small scale and PLN 81 at large scale. The key factors determining a defined level of profitability of live cattle were production costs. Regardless of revenues, which depended on the selling price of live cattle, along with a drop in costs, decreasing loss on income was noted and a growth in profitability expressed as a percentage relation of revenues to costs. A growth in production of beef stimulated a drop in costs. At small scale (5-15 dt) production of 1 kg of live cattle costed PLN 8.36, at medium scale (20-45 dt) – PLN 7.94, and at large (50-240 dt) – PLN 7.07. A decrease in costs was determined by both direct and indirect costs. Selling price of live cattle was also important – in the researched set the highest (PLN 6.34 per kg) was achieved by small scale producers of live cattle, and the lowest

(PLN 6.11 per kg) – at medium scale. Consequently, revenues from sales of 100 kg of live cattle covered the incurred costs: at small scale in 75.8%, medium scale in 77.0%, and large scale in 88.6% (Table 4).

Losses on production of live cattle decreasing along with a growth in scale, and simultaneously the scale of impact on their level are explained by marginal account. At medium scale the marginal cost was lower by 2.6% than the average and at large scale by 7.2% (Figure 3). Moreover, for medium scale the marginal cost of production of 1 kg of live cattle exceeded the cut-off cost (i.e. selling price) by 26.5%, while at large scale by only 4.8%. This means that a growth in scale to large size was justified. This is also evidenced by the fact that at medium scale live cattle production, the increase in costs was by 28.8% greater than the increase in production value, whereas at large scale – by only 3.4%. Support in the form of subsidies to involved forage area did not have any major effect on the improvement in the income situation of live cattle. As a result, own labour inputs remained unpaid.

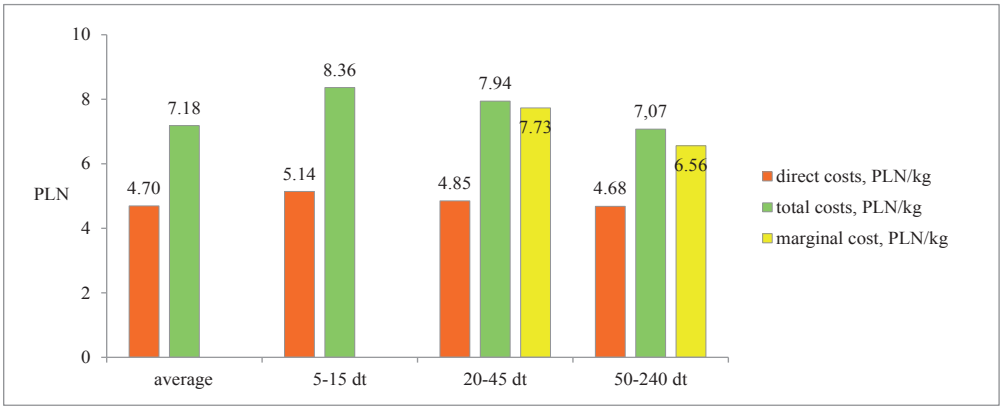

Fig. 3. Production costs of live cattle depending on the net production scale of live cattle in 2014. Source: own elaboration based on data from AGROKOSZTY system and the Polish FADN.

Despite the basically unfavourable situation, there were farms for which live cattle production was profitable in each scale section. Assessing the scale of the phenomenon from the viewpoint of the entire research sample – it was the case for each fourth one. This was mainly determined by lower production costs. On average, profitability index for these farms was 114.3% and income on activity less subsidies – PLN 80 per 100 kg of gross live cattle. As a result, own labour inputs were covered in 79%. Upon adding subsidies to involved forage area, the income on activity (including subsidies) amounted to PLN 102 and enabled coverage of own labour.

To sum up, it may be stated that in 2014 the level of income, which was guaranteed by researched production activities, was within quite broad limits. This was caused by different level of change as regards production volume, unit costs and prices of implementation of respective products. However, in case of each activity the beneficial impact of the size of production scale was evident.

The research held proved that larger production scale was always accompanied by its higher efficiency; hence differences in incomes were clearer than those in production value. High efficiency is a factor stimulating income growth. It is assessed that higher production scale is also linked to higher level of modernity and therefore it was more competitive as regards the incurred labour inputs. It was also more competitive as regards direct costs, which makes it possible to recognize that production was characterised by higher cost competitiveness.

The research was held at commercial farms[3], which have greater development opportunities. Targeted production makes it easier to a farmer to achieve the goal, which is income at adequately high level. Production size is important from the economic perspective, hence when there is no direct impact on price formation a farmer can decide on the production volume by defining its scale (e.g. cultivation area), all together taking into account the efficient use of owned factors of production (i.e. land, labour, capital). Making decisions the farmers should consider different variants of action, because each selection is linked to certain consequences. Hence, informed and skilful decision-making is important and this can be facilitated by cost analysis which enables to take economic decisions based on rational criteria.

[3] Commercial farms, i.e. farms which allocate their production for sales, have the character of enterprises. Hence, farmers are actually entrepreneurs (Ziętara, 2009).

Table 1

Production, costs and income obtained from sugar beet cultivation in 2014 (actual data)

Specification		Average for sugar beet farms	Depending on cultivation scale (ha per farm)		
			1-4	6-12	15-45
Number of researched farms		149	43	46	28
Cultivation area	(ha)	9.31	2.62	8.43	24.77
Root yield	(dt/ha)	701	665	692	719
Selling price for roots	(PLN/dt)	12.26	11.69	12.11	12.43
			Per 1 ha of cultivation		
Total production value	**(PLN)**	**8,613**	**7,773**	**8,387**	**8,970**
including: roots		8,592	7,773	8,382	8,939
Total direct costs	**(PLN)**	**2,702**	**2,593**	**2,726**	**2,727**
including: seed material		653	654	643	651
total mineral fertilisers		1,203	1,148	1,190	1,230
off-farm organic fertilisers		4	-	13	-
plant protection products		792	732	804	807
growth regulators		13	11	24	9
other		38	48	51	29
Direct margin less subsidies	**(PLN)**	**5,911**	**5,181**	**5,661**	**6,243**
Actual[a] indirect costs[a]	(PLN)	1,607	1,630	1,590	1,592
Gross value added on activity	**(PLN)**	**4,305**	**3,551**	**4,071**	**4,651**
Depreciation	(PLN)	946	1125	909	952
including: buildings and structures		164	327	162	121
machinery and equipment		416	371	403	451
means of transport		350	421	342	351
Net value added on activity	**(PLN)**	**3,358**	**2,426**	**3,162**	**3,699**
Cost of external factors	(PLN)	585	309	469	736
Income on activity less subsidies	**(PLN)**	**2,773**	**2,117**	**2,693**	**2,963**
Subsidies[b]	(PLN)	3,272	3,054	3,193	3,303
Income on activity	**(PLN)**	**6,045**	**5,170**	**5,886**	**6,267**
TOTAL COSTS	***(PLN)***	***5,839***	***5,657***	***5,694***	***6,007***
Total labour inputs	(hour)	17.1	24.1	18.0	14.5
including: own labour input		13.7	23.1	15.8	9.7
		Economic efficiency ratios			
Total costs per 1 dt of roots	(PLN)	8.34	8.51	8.23	8.35
Total costs per PLN 1 of income less subsidies	(PLN)	2.11	2.67	2.11	2.03
Income less subsidies per 1 dt of roots	(PLN)	3.96	3.18	3.89	4.12
Subsidies per PLN 1 of income less subsidies	(PLN)	1.18	1.44	1.19	1.11
Share of subsidies in income on activities	(%)	54.1	59.1	54.2	52.7
Income less subsidies per 1 hour of own labour	(PLN)	202.98	91.44	170.35	305.34
Subsidies per 1 hour of own labour	(PLN)	239.46	131.93	201.95	340.40

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

[b] Subsidies include single area payment and the so-called sugar payment.

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

Table 2

Production, costs and income obtained from milk production in 2014 (actual data)

Specification		Average for dairy cow farms	Depending on the production scale (number of cows per farm)		
			5-15	20-45	50-100
Number of researched farms		169	49	66	19
Annual average number of dairy cows	(heads)	26.8	9.3	29.0	63.3
Milk yield of cows	(litre)	6016	4513	5995	6441
Annual average milk selling price	(PLN/litre)	1.41	1.23	1.40	1.47
			Per 1 dairy cow		
Total production value	**(PLN)**	**9,371**	**6,500**	**9,279**	**10,329**
including: milk		8,499	5,548	8,400	9,446
weaned calves		544	634	513	509
culled dairy cows		328	318	366	374
Total direct costs	**(PLN)**	**3,311**	**2,705**	**3,385**	**3,260**
including: herd replacement		540	514	601	664
off-farm feed		1,331	566	1,285	1,320
own commodity feed		688	1,041	727	491
own non-commodity feed		354	265	368	371
other		397	319	405	414
Direct margin less subsidies	**(PLN)**	**6,060**	**3,795**	**5,894**	**7,069**
Actual[a] indirect costs[a]	(PLN)	1,544	1,326	1,513	1,647
Gross value added on activity	**(PLN)**	**4,516**	**2,469**	**4,381**	**5,423**
Depreciation	(PLN)	1,053	871	1,052	1,091
including: buildings and structures		285	259	298	217
machinery and equipment		479	330	452	605
means of transport		285	273	298	267
Net value added on activity	**(PLN)**	**3,463**	**1,598**	**3,329**	**4,332**
Cost of external factors	(PLN)	376	217	352	490
Income on activity less subsidies	**(PLN)**	**3,087**	**1,381**	**2,977**	**3,842**
Subsidies[b]	(PLN)	509	558	498	506
Income on activity	**(PLN)**	**3,596**	**1,940**	**3,475**	**4,348**
TOTAL COSTS	***(PLN)***	***6,284***	***5,119***	***6,302***	***6,487***
Total labour inputs	(hour)	101.8	192.9	100.5	69.3
including: own labour input		94.2	190.0	94.7	56.7
Economic efficiency ratios					
Total costs per 1 litre of milk	(PLN)	1.05	1.13	1.05	1.01
Total costs per PLN 1 of income less subsidies	(PLN)	2.04	3.71	2.12	1.69
Cost of purchased feed in total costs of feed	(%)	56.1	30.2	54.0	60.5
Consumption of concentrate feed per 1,000 litre of milk	(dt)	2.89	3.67	2.92	2.42
Income less subsidies per 1 litre of milk	(PLN)	0.51	0.31	0.50	0.60
Subsidies per PLN 1 of income less subsidies	(PLN)	0.16	0.40	0.17	0.13
Share of subsidies in income on activities	(%)	14.2	28.8	14.3	11.6
Income less subsidies per 1 hour of own labour	(PLN)	32.75	7.27	31.43	67.78
Subsidies per 1 hour of own labour	(PLN)	5.40	2.94	5.26	8.92

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

[b] Subsidies cover single area payment to the involved forage area.

Table 3

Production, costs and income obtained from production of live cattle in 2014 (actual data)

Specification		Average for farms producing live cattle	Depending on net production scale (dt per farm)		
			5-15	20-45	50-240
Number of researched farms		86	20	24	20
Net live cattle production (increase)[a]	(dt/farm)	44.93	10.47	30.86	93.88
Gross live cattle production[b]	(dt/farm)	82.68	20.33	61.91	168.60
Annual average selling price of live cattle	(PLN/kg)	6.20	6.34	6.11	6.26
		Per 100 kg of gross live cattle			
Total production value	**(PLN)**	**620**	**634**	**611**	**626**
including: live cattle		620	634	611	626
Total direct costs	**(PLN)**	**470**	**514**	**485**	**468**
including: herd replacement		313	349	342	304
off-farm feed		38	35	34	37
own commodity feed		89	101	77	95
own non-commodity feed		23	18	26	26
other		7	11	6	6
Direct margin less subsidies	**(PLN)**	**150**	**120**	**126**	**158**
Actual[c] indirect costs	(PLN)	117	172	165	107
Gross value added on activity	**(PLN)**	**33**	**-52**	**-39**	**52**
Depreciation	(PLN)	103	124	112	104
including: buildings and structures		30	54	38	23
machinery and equipment		43	39	40	50
means of transport		29	31	33	30
Net value added on activity	**(PLN)**	**-70**	**-176**	**-151**	**-52**
Cost of external factors	(PLN)	28	26	31	29
Income on activity less subsidies	**(PLN)**	**-98**	**-202**	**-182**	**-81**
Subsidies[d]	(PLN)	34	31	40	32
Income on activity	**(PLN)**	**-64**	**-171**	**-142**	**-49**
TOTAL COSTS	***(PLN)***	***718***	***836***	***794***	***707***
Total labour inputs	(hour)	10.6	21.2	12.9	9.6
including: own labour input		10.1	20.9	12.4	9.1
		Economic efficiency ratios			
Direct costs per PLN 1 of gross margin less subsidies	(PLN)	3.12	4.29	3.85	2.96
Cost of total feed in direct costs	(%)	31.9	30.0	28.2	33.8
Cost of purchased feed in total costs of feed	(%)	25.3	22.7	24.8	23.4
Direct costs in total costs	(%)	65.5	61.5	61.1	66.2
Gross production volume per 1 hour of total labour input	(kg)	9.5	4.7	7.8	10.4
Production value per 1 hour of labour in total	(PLN)	58.73	29.94	47.53	65.36
Gross margin less subsidies per 1 hour of labour in total	(PLN)	14.25	5.67	9.81	16.51
Subsidies per 1 hour of own labour input	(PLN)	3.33	1.48	3.24	3.51

[a] Annual weight increase obtained per herd of cattle for fattening aged above 1 year.
[b] Increase + weight of purchased livestock.
[c] Actual indirect costs excluding the costs of external factors.
[d] Subsidies cover single area payment to the involved forage area.

Table 4

Selected descriptive statistics of the profitability index in the selected sections of production scale of agricultural products[a] researched in 2014

Specification		Sugar beets			Milk			Live cattle		
		1-4	6-12	15-45	5-15	20-45	50-100	5-15	20-45	50-240
Average	(%)	137.4	147.3	149.3	127.0	147.2	159.2	75.8	77.0	88.6
Percentile 5%	(%)	85.8	97.4	106.9	72.9	112.9	118.7	59.4	42.7	71.5
Median	(%)	144.8	150.2	156.7	132.2	144.2	166.5	82.1	87.1	89.4
Percentile 95%	(%)	184.5	211.6	197.4	190.1	224.2	291.6	132.3	147.0	108.3
Quartile deviation	(pp)	24.7	25.3	23.5	28.7	20.0	24.9	20.6	15.3	11.7
Position coefficient of variation	(%)	17.0	16.9	15.0	21.7	13.9	15.0	25.1	17.6	13.0
Percentage of farms with profitability index below 100	(%)	7	9	4	18	5	0	70	71	75

[a] Criterion of production scale selection as in Tables 1-3.

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KOSZTY JEDNOSTKOWE I DOCHODY WYBRANYCH PRODUKTÓW W 2014 ROKU – WYNIKI BADAŃ W SYSTEMIE AGROKOSZTY

Abstrakt

Głównym celem artykułu jest analiza wyników produkcyjnych i ekonomicznych buraków cukrowych oraz mleka krowiego i żywca wołowego w 2014 roku w gospodarstwach o różnej skali produkcji tych produktów. Badania przeprowadzono w gospodarstwach towarowych, które mają większe możliwości rozwoju. Na wyniki badanych produktów wpływ miał potencjał produkcyjny gospodarstw, czyli zasoby ziemi, pracy i kapitału, ich jakość oraz sposób wykorzystania, ale były także uzależnione od zewnętrznych warunków funkcjonowania, np. pogodowych, rynkowych. Oddziaływania te skutkowały różnym stopniem zmian w zakresie wolumenu produkcji, kosztów jednostkowych oraz cen realizacji poszczególnych produktów.

Konsekwencją zróżnicowania w wydzielonych przedziałach skali produkcji, wyników produkcyjnych i cenowych oraz poniesionych kosztów było zróżnicowanie opłacalności produkcji, rozumianej jako różnica między wartością produkcji a kosztami jej odpowiadającymi oraz jako iloraz wartości produkcji i kosztów ujęty procentowo. Badania wykazały, że korzyści wynikające ze wzrostu skali produkcji są wyraźnie widoczne. Większy rozmiar produkcji pozwala na generowanie wyższych dochodów, a ponadto ze względu na wyższy poziom specjalizacji i mechanizacji prowadzonych prac wiąże się ze znacznie niższymi nakładami pracy. Skutkiem jest wyższa dochodowość pracy. W efekcie można oczekiwać pokrycia alternatywnego kosztu ziemi i kapitału.

Słowa kluczowe: koszty jednostkowe, buraki cukrowe, mleko krowie, żywiec wołowy, skala produkcji, opłacalność produkcji.

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