

PROFITABILITY OF SUGAR BEET CROP IN 2018/2019 CAMPAIGN ON THE EXAMPLE OF LUBELSKIE PROVINCE

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ABSTRACT

The work presents a complex analysis and cost accounting of beet sugar cultivation in 2018/2019 campaign for individual farms of Lublin region. The economic results obtained by producers are mainly affected by indirect costs accounting for 60.11% of the revenue from the total production. Within this group of costs, the major components are sowing service, harvest and soil liming operations reaching 39.38%. Sugar beet production in the analyzed campaign was profitable, with the profitability index of 1.24 and unit production cost 14.33 PLN·dt⁻¹ is considered one of the profit-making activities in agricultural production, yet it is characterized by a high production cost that gobbled up to 80.39% of the total revenue in the analyzed 2018/19 campaign. The main factor influencing the income from sugar beet cultivation was the price for the raw material, which in the considered business year in relation to the previous season increased by only 0.77 PLN·t⁻¹.

Introduction

The sugar campaign of 2018/2019 in all member states of the European Union was the second campaign after the abolition of the production quota system. Freeing up of sugar market in 2017 did not raise any revolutionary changes for growers and producers of sugar. White sugar price has stabilised at a constant level, slightly reduced in relation to the price from two years ago. It has been expected that the sugar production will fall sharply since 2018, before a gradual increase in the production starting in 2020. A new report identifies the EU price of white sugar at a level or below the threshold of the reference of 404.4 euro·t⁻¹ for almost all of the forecast period. It has been expected that the global price for white sugar will be within 360 Euro·t⁻¹, at EU prices of more about 40 Euro·t⁻¹ (Gawryszczak, 2019a). It has been expected that sugar production in the European Union remains largely sufficient to supply the internal demand. Sugar production in Poland was currently conducted in 18 sugar plants belonging to four concerns as follows: Krajowa Spółka Cukrowa S.A. (National Sugar Company INC.), Nordzucker Polska S.A., Pfeifer & Langen Polska S.A., and Sudzucker Polska S.A.

During the completed campaign, sugar producers signed contracts for cultivation and delivery of sugar beet with 32 989 farmers from whom they purchased 14 301 812.59 tonnes

of sugar. Despite lower sugar beet purchase, the crop area was higher this year than a year ago by 7 140 ha and amounted to 239 441.53 ha. Special attention should be paid to the increasing average size of sugar beet growing area, which amounted to 7.75 ha this year (Gawryszczak, 2019b).

The sugar beet growing conditions were good. The sowing depended on the region of the country in March or April. A relatively high temperature in April and moisture reserve due to the rainfall that occurred at the turn of March and April contributed to the smooth and rapid emergence. Quite intense rainfalls occurring in the second half of April in the northern part of the country locally caused soil crusting slowing or impeding the emergence of sugar. In the following months, good plant vegetation conditions enabled obtaining the average final planting density. April, and May were very warm, clearly above multiannual averages. In the initial period of vegetation, the precipitation varied locally.

At the beginning of July, significant rainfall occurred in all regions. Later the situation changed in the east of the country, precipitation was sufficient, while in the west it was dry, sunny, and hot. Beet growth in the initial phase was intensive due to favourable weather conditions. Starting from the summer months, the growth of root mass was inhibited by soil drought. However, from August or September producers recorded a significant increase in the content of natural sugar in beets. Harvesting of roots started in August or September, depending on the region and producer, under conditions of significant soil drying, which made combine harvester working difficult. Such conditions lasted until the turn of October and November (Gawryszczak, 2019).

National Sugar Company S.A. (Krajowa Spółka Cukrowa S.A., KSC S.A.) is the largest in Poland and the eighth largest producer of sugar in Europe. The concern included seven sugar plants located in the territory of five provinces and a fruit and vegetable processing plant called "Polskie Przetwory" established in Włocławek. In KSC S.A. the campaign was conducted in seven branches: Dobrzelin Sugar Factory, Kluczewo Sugar Factory, Krasnystaw Sugar Factory, Kruszwica Sugar Factory, Malbork Sugar Factory, Nakło Sugar Factory and Werbkowice Sugar Factory. The average duration of the campaign was 110 days (<https://firma.polski-cukier.pl>).

The campaign started on 12 September 2018 in sugar plants in Dobrzelin and Werbkowice and was concluded on 16 January 2019 in sugar factory in Nakło. The average time of the campaign amounted to 110 days.

Krasnystaw, Kruszwica, Malbork, Nakło and Werbkowice. In all seven sugar factories the company has purchased almost 6 million tonnes of sugar beet and has produced more than 910 thousand tonnes of sugar. This is the best result in the history of the company. In 2018 sugar beet was grown on land over 100 thousand hectares, by 15.5 thousand growers. This campaign in 2018 was one of the most challenging in recent years. Several factors contributed to this, and the atmospheric conditions had a particularly large significant impact. Drought, which occurred in spring and summer caused that in many contracting areas there was a significant reduction in the yield of beets. Billing yield for Krajowa Spółka Cukrowa S.A. is on average $59.9 \text{ t} \cdot \text{ha}^{-1}$ and is regionally varied (from about $53 \text{ t} \cdot \text{ha}^{-1}$ in Kluczewo to approximately $75 \text{ t} \cdot \text{ha}^{-1}$ in Malbork). The average sugar content in the beets for Krajowa Spółka Cukrowa S.A. is 17.4%. and is higher by approximately 1.3 percent in relation to the previous year (Gawryszczak, 2019, <https://firma.polski-cukier.pl>).

The cost calculation of sugar beet production presented is complex, with a special concern to the grower's labour input and farm expense. It often happens that similar calculations exclude other costs of factors of production, e.g. the interest on capital, while the present cost calculation includes that. The calculation was made for the 2018/2019 sugar campaign, the first after the sugar quota elimination. This calculation, just like other presented by the author, provides a detailed analysis of sugar beet production costs and its profitability for individual farms in Lublin region (Gorzelany, 2015, Jansen and Stibbe, 2007, Krzysiak, 2017a, Krzysiak, 2018, Lee et. al., 2015). Currently, about 3,703 growers deliver sugar beets to the KSC S.A. branch – Krasnystaw Sugar Factory.

Methodological assumptions for calculating sugar beet cultivation costs

The analysis of cost estimates was based on chosen individual sugar beet farms owing special machinery and reporting contracting out services occasionally.

Around 123 farms were examined and finally an exemplary farm was selected for further analysis as the one reflecting regional specificity.

Most data found in the paper are the author's present observations or obtained directly from sugar beet contract holders or from Krasnystaw Sugar Factory, a branch of KSC S.A. The premise was to assume real costs, instead of estimated costs wherever possible.

Each category of costs and revenue calculation was defined according to the scheme below:

1. Production value
2. Direct costs
3. Direct surplus
4. Indirect costs
5. Income
6. Total costs
7. Production costs 1 dt

Owner/operator labour costs

The cost of owner/operator labour was estimated according to a wage parity rate per hour. A parity rate was calculated based on the basis of the average annual net earnings in the national economy (after GUS [*Central Statistical Office*]) assuming that nominal working time of a full-time employee in individual farming is 2 200 hours annually, (Augustyńska-Grzymek, 2017; Chudoba, 2004). On the account of this method, the rate was assumed for the year 2018 – 17.32 PLN.

Tractor and farm machinery labour cost

The tractor labour cost was estimated on the basis of calculation of exploitation costs of farm machinery according to the literature (Litwinow, 2002, Lorencowicz, 2004) and the data supplied by the Agricultural Advisory Centre in Końskowola. It is a complex calculation including the costs of depreciation, fuel, oil and lubricants, repairs, housing, insurance, technical inspection, and interest payments. The 48.5 kW tractor operation time was assumed to be 400 h per year (300 mth·year⁻¹) and thus the cost of the hourly work rate of a tractor is 93.85 PLN. The costs of particular agricultural practices include the total cost of a tractor

operation with implements. The number of hours spent performing particular farm operations was determined based on the literature data available (Gawryszczak, 2019b; Litwinow, 2002) and the present author's experience.

It was assumed that a model farm owns the used farm machinery (in 50%) - plough, disc, and spike-tooth harrow, sprayer, agricultural trailer, and new equipment – a farm tractor, soil tillage unit and fertilizer spreader.

The other assumptions

Characteristics of data for calculating costs of sugar beet cultivation:

- sugar beet farming area – 2-10 ha,
- medium intensive cultivation on soils of good wheat complex and very good rye complex, pH – 6-6.5,
- sugar beet tops left in the field serve as fertilizers,
- the farm owns most of farm machinery for agricultural production,
- sugar beet selling price for sugar producer – 113.03 PLN·t⁻¹ (for 16% standard polarization),
- price of wet beet pulp (1.728 PLN·dt⁻¹) was that applicable in Krasnystaw Sugar Factory in 2018/2019 campaign,
- price of plant protection products and fertilizers applicable in the 2018/2019 campaign,
- sugar beet cultivation in the farm without manure use,
- the farm contracts services – liming, sugar beet sowing and harvest.

The calculation also estimates the quantity and value of by-products obtained in sugar beet growing (pulp) as well as some other factors involved in the production process. These are partial costs like, using a car, mobile, consumption of electricity and water (included in overhead costs).

The calculation accepted that raw material would be transported from the plantation by a sugar producer (from a field to factory).

Cost calculation

The analysis of sugar beet production considering all the assumptions aforementioned is presented in Table 1.

Table 1.

Calculation costs of 1ha sugar beet production in 2018/2019 season

No	Content	U.m.	Unit price	Quantity	Value (PLN)	Share in percent (%)
1.	Production - sugar beet roots	(dt)	11.30	500	5651.50	
1.1	Refund of lump sum tax VAT	(%)	7.00	5651.50	395.61	
1.2	By-product – beet pulp	(dt)	1.73	250.00	432.50	
1.3	Area direct payment	(ha)	936.38	1.00	936.38	
1.4	Sugar payment per 1 ha from 2015	(ha)	1495.63	1.00	1495.63	
	Total revenue from production				8911.62	
2.	DIRECT COSTS					
2.1	Seeds:					

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No	Content	U.m.	Unit price	Quantity	Value (PLN)	Share in percent (%)
2.2	Cultivar of seeds – Jampol Rh Cr (KHBc)	(l unit)	572.40	1.25	715.50	9.99
2.3	Plant protection products					
2.4	Herbicides:					
2.5	Pyramin Turbo 520 S.C.	(l)	79.00	5.00	395.00	5.51
2.6	Betanal maxxPro 209 OD	(l)	142.00	2.50	355.00	4.96
2.7	Targa Super 0.5 EC	(l)	95.00	1.50	142.50	1.99
2.8	Fungicidal products:					
2.9	Optan 183 SE	(l)	246.00	0.70	172.20	2.40
2.10	Duet Ultra 497 S.C.	(l)	110.00	1.00	110.00	1.54
2.11	Total plant protection products expenses				1064.70	14.86
2.12	Fertilizer needs:					
2.13	N-ammonium nitrate	(dt)	115.00	3.53	405.95	5.67
2.14	P- 46 % granular triple superphosphate	(dt)	139.00	1.96	272.44	3.80
2.15	K- 60 % potassium salt	(dt)	135.00	2.83	382.05	5.33
2.16	Ca- dolomitic lime (every 4th year)	(dt)	1.73	40.00	17.30	0.24
2.17	Total fertilizers costs	(-)	-	-	1077.74	15.04
2.18	TOTAL DIRECT COSTS	(-)	-	-	2857.94	39.89
3.	DIRECT SURPLUS	(-)	-	-	6053.68	
4.	INDIRECT COSTS					
4.1	Complex service cost (transportation from field)	(dt)	0.30	500.00	150.00	2.09
4.2	Production levy	(dt)	0.00	500.00	0.00	0.00
4.3	Services:					
4.4	Seed sowing		296.49	1.50	444.74	6.21
4.5	Beetroot harvest (Holmer harvester)		850.00	1.00	850.00	11.86
4.6	Liming operation (every 4th year)		303.57	1.00	75.89	1.06
4.7	Total services costs				1370.63	19.13
4.8	Cultivation and protection					
4.9	Disking operation	(h)	103.23	2.00	206.46	2.88
4.10	Harrowing (2 x 0.7h)	(h)	97.82	1.40	136.95	1.91
4.11.	Deep plowing	(h)	102.63	2.50	256.58	3.58
4.12	PK fertilizers application (2 x 0.7h)	(h)	106.75	1.40	149.45	2.09
4.13	Pre-sowing tillage (soil tillage unit 2 x 0.7h)	(h)	117.96	1.40	165.14	2.31
4.14	N top dressing (2 x 0.7h)	(h)	106.75	1.40	149.45	2.09
4.15	Sprays (5 x 0.5h)	(h)	110.65	2.50	276.63	3.86
4.17	Collection of beetroots from harvester	(h)	112.55	2.00	225.10	3.14
4.18	Total cultivation and protection costs				1565.75	21.86
4.19	Farm overhead expenses					
4.20	Property tax				135.00	1.88
4.21	Liability insurance				15.00	0.21
4.22	Building structure depreciation				100.39	1.40
4.23	Other overheads				138.15	1.93
4.24	Total overhead costs				388.54	5.42
4.25	Owner labour cost	(h)	17.32	48.00	831.36	11.60
4.26	TOTAL INDIRECT COSTS				4306.28	60.11

No	Content	U.m.	Unit price	Quantity	Value (PLN)	Share in percent (%)
5.	AGRICULTURAL INCOME				1747.40	
6.	TOTAL COSTS				7164.22	

The profitability of sugar beet production

Production profitability was determined based on the production profitability index defined below.

$$W = \frac{P}{K} \quad (1)$$

where:

- W – profitability index,
- P – the value of production PLN
- K – production cost PLN

The index value greater than 1, indicates the profitability of production, whereas less than one – unprofitability. An index calculated in this way can also determine the profit percentage generated from the production.

Table 2.

Values of production profitability index and unit production cost

Type of production	Profitability index (W)	Unit production cost 1 dt in PLN
Sugar beet	1.24	14.33

The values calculated include the values of by-product beet pulp and area payment (SAPS) + greening + redistribution) and sugar payment.

The profitability index is greater than one so the sugar beet production in the 2018/2019 campaign was profitable, yet at a low profit level.

Discussion

The figure 1 shows indirect costs in sugar beet production.

As the analysis demonstrates, the indirect costs (Lorenkowicz, 2004; Krzysiak, 2010b) had the highest share in sugar beet cultivation (Table 1) with the highest effect of the costs of sowing and harvesting services as well as liming operation – 19.13% followed by the costs of plant cultivation and protection – 21.86%, overhead expenses – 5.42% and owner/operator labour – 11.60%.

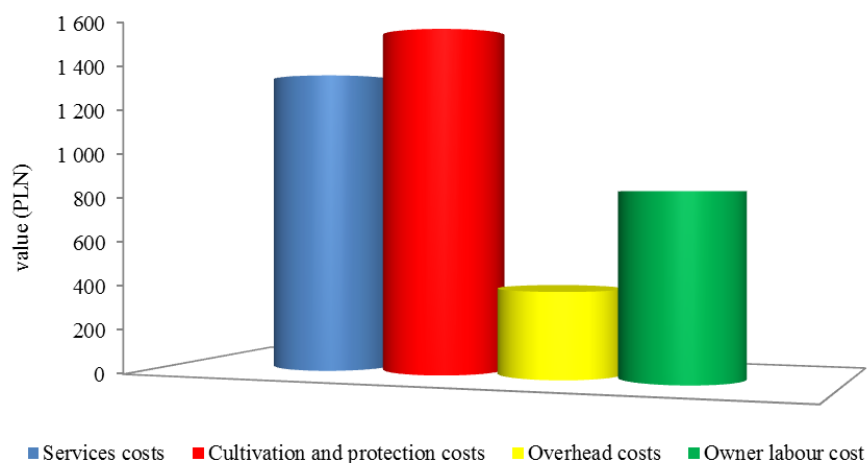


Figure 1. Indirect costs

The figure 2 shows direct costs in sugar beet production.

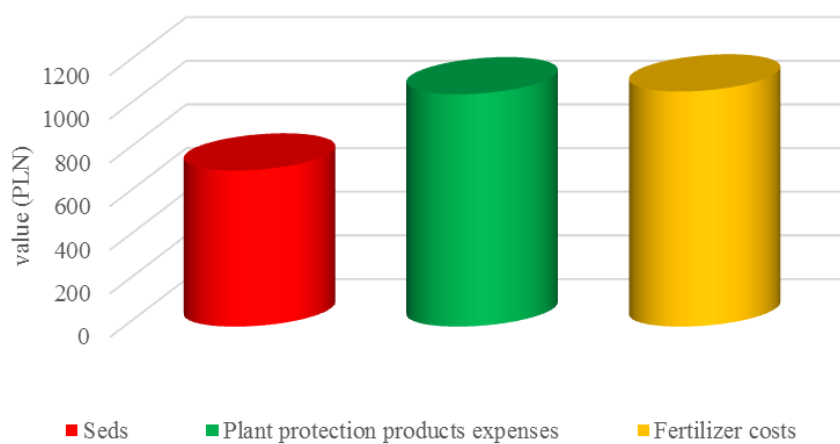


Figure 2. Direct costs

The direct costs also had a strong influence (39.89%), notably, the costs of fertilizers – 15.04%, seeds – 9.99%, plant protection products – 14.86% (Table 1).

The figure 3 shows the breakdown of revenue from sugar beet production.

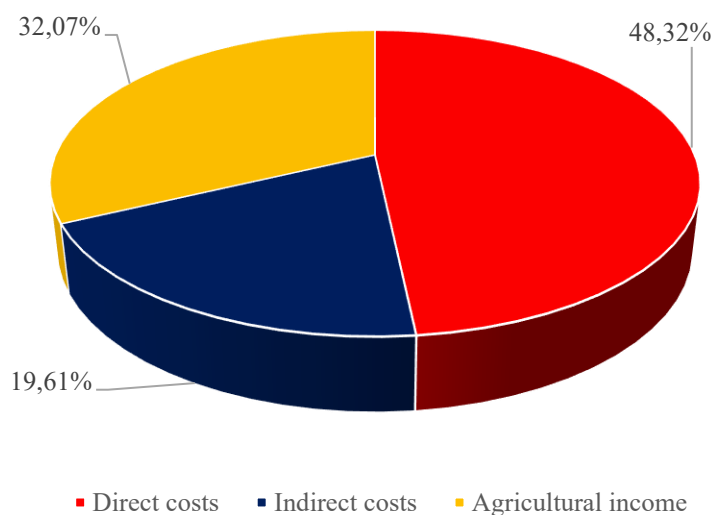


Figure 3. The breakdown revenue from sugar beet production

The analysis of revenue from sugar beet production shows that 80.39% are production costs, and only 19.11% are agricultural income (Table 1, Fig. 3).

The profitability of sugar beet production in the analyzed campaign decreased by PLN 182.17 in relation to the 2017/2018 campaign (Krzysiak, 2008). This is mainly due to an increase in indirect costs by 2.4%. The analysis shows that income reduction was not compensated by an increase of PLN 0.77 for sugar beets or a 2.4% reduction in indirect costs. All this is due to an increase of 2.02% in the total costs compared to the previous campaign (Krzysiak, 2017b). Despite this, the financial result from sugar beet cultivation was beneficial for growers. It should be assumed that for a positive financial result from sugar beet cultivation, a sugar surcharge will be paid to hectares of sugar beet, amounting to PLN 1495.63 and a direct payment per hectare (SAPS) of 450.19 PLN. The existence of these subsidies means that the cultivation of sugar beet is profitable, also in the second year after the abolition of production quotas.

It is still one of the most profitable traditional agricultural crops in the Lublin region, despite the varied income in particular years (Krzysiak, 2006, Krzysiak, 2008, Krzysiak, 2009, Krzysiak, 2010a, Krzysiak, 2010b, Krzysiak, 2011, Krzysiak, 2012, Krzysiak, 2015, Krzysiak, 2017a, Krzysiak, 2016, Krzysiak, 2017b, Krzysiak, 2018).

Summary

In the analyzed Lublin region represented by sugar beet growers supplying to KSC S.A. branch – Krasnystaw Sugar Factory campaign for 2018/2019 ended with a good result. The conditions of plant emergence, immediately after sowing were good, and during their further

growth there were also favourable sugar beet growing conditions. The harvest of sugar beet-roots in the first half of the procurement campaign was very good, only in the second half of the campaign there were temporary difficulties related to weather conditions.

This year the campaign in Krasnystaw Sugar Factory – KSC S.A. branch began on 11.09.2018 and lasted until 1.01.2019.

During this campaign 1 060 336 tonnes of sugar beet were purchased. Due to favourable weather conditions in spring and not much rainfall in autumn, the average value of polarization was 17.15%. The average yield from 1 hectare was 59.7 dt, while the average contamination of raw material was 8.81%. Not very good agrotechnical conditions for growing sugar beets contributed to the surplus of raw material in most growers. The surplus price was set at 40 PLN·t⁻¹. In KSC S.A. branch – Krasnystaw Sugar Factory sugar beets were cultivated by 3703 farmers, covering 18771 ha. The development of beet production in both Lublin region and in Poland as a whole is dependent on the common agricultural policy in the European Union.

The conditions for sugar production for all EU countries will be crucial here. In December 2018, the European Commission published a report on forecasts for EU agricultural markets and income in 2018-2030, which assumes, among other things that (Gawryszczak, 2019a):

- the EU sugar production will be structurally higher than during the period of validity of the quota system,
- EU production of isoglucose will increase to meet the growing demand that will undermine the consumption of sugar (although to a lesser extent than expected last year),
- EU sugar prices will remain at around EUR 400 / tonne throughout the period,
- EU sugar imports will fall, and the European Union will remain a constant net exporter,
- the area of sugar beet crops in the European Union will decrease,
- sugar beet harvests will be profitable, albeit from a lower initial value, caused by a ban on the use of neonicotinoids.

The discussed campaign ended with a slight decrease in the profitability of sugar beet cultivation. This happened at almost unchanged prices for the means of production. In 2018, economic conditions may change even more as the price of white sugar has decreased.

Conclusion

1. The cost analysis of sugar beet production indicated profitability at the average income level of 1747.40 PLN·ha⁻¹ and the profitability index 1.24.
2. It was found that the income from sugar beet production is primarily affected by indirect costs (60.11%) which are higher than direct costs by 21.22%. The fertilizer costs which were shown to make up as much as 15.04% of the direct costs determine the production costs to the greatest degree.
3. The main factor influencing the income from sugar beet cultivation was the price for the raw material, which in the considered business year in relation to the previous season increased only by 0.77 PLN·t⁻¹).
4. Sugar beet growing is characterized by high production costs accounting for 80.39% of the revenue from the production.
5. The main factor affecting the income from sugar beet cultivation was the price for the raw material, which in the considered marketing year compared to the previous season increased by only 0.87.

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OPLACALNOŚĆ UPRAWY BURAKA CUKROWEGO W KAMPANII 2018/2019 NA PRZYKŁADZIE WOJEWÓDZTWA LUBELSKIEGO

Streszczenie. W pracy przedstawiono kompleksową analizę i kalkulację kosztów uprawy buraków cukrowych w kampanii 2018/2019, dla gospodarstw indywidualnych regionu lubelskiego. Na wynik finansowy uzyskiwany przez plantatorów w głównym stopniu mają wpływ koszty pośrednie pochłaniające 60,11 przychodu z produkcji. Wśród tej grupy kosztów największy udział mają koszty usług zasiewu, zbioru buraków cukrowych i wapnowania gleby wynoszące 1,13%. Natomiast koszty bezpośrednie w tej kampanii stanowiły 39,89% osiągniętego przychodu. W rozważanej kampanii produkcja buraków cukrowych była opłacalna, ponieważ wartość wskaźnika opłacalności produkcji wyniosła 1.24, a wartość kosztu jednostkowej produkcji wyniosła 14,33 PLN·dt⁻¹. Uprawa buraków cukrowych jest jedną z dochodowych działalności w produkcji rolnej, ale charakteryzuje się wysokimi kosztami produkcji pochłaniającym 80,39% przychodu z produkcji w analizowanej kampanii 2018/2019. Głównym czynnikiem wpływającym na dochód z uprawy buraków cukrowych była cena za surowiec, która w rozważanym roku gospodarczym w stosunku do sezonu ubiegłego wzrosła tylko o 0.77 PLN·t⁻¹.

Słowa kluczowe: burak cukrowy, koszty, opłacalność, dochodowość produkcji