

Profitability of sugar beet crop in 2017/2018 campaign on the example of lubelskie province

Zbigniew Krzysiak

*Katedra Inżynierii Mechanicznej i Automatyki, University of Life Sciences in Lublin, Poland
Głęboka 28, Lublin, e-mail: zbigniew.krzysiak@wp.pl*

Received: January 10, 2018; Accepted: February 09, 2018

Abstract. The work presents a complex analysis and cost accounting of beet sugar cultivation in the 2017/2018 campaign for individual farms in the Lubelskie Province. The economic results obtained by the producers were mainly affected by indirect costs accounting for 57,7% of the revenue from the total production. Within this group of costs the sowing as well as harvest and soil liming services were the major part, reaching 18,53%.

Sugar beet production in the analyzed campaign was profitable, with the profitability index 1,28 and unit production cost 13,99 zł/dt. Sugar beet growing is considered one of profit-making activities in agricultural production, yet it is characterized by the high production cost that gobbled up 68,37% of total revenue in the analyzed campaign 2017/18.

Key words: sugar beet, cost, profitability of sugar beet production.

INTRODUCTION

The sugar beet campaign 2017/18 in the European Union member states was the first campaign after the abolition of production quota. The quota system on the sugar market ended in 2017 when the production restrictions were lifted. The limits abolition did not bring any significant changes on the sugar market and, notably, the price of white (refined) sugar decreased. This situation may have resulted from the regulated market system for sugar and overall policy of the EU conducted currently and defining priorities for future in the whole agricultural sector.

The European Commission has issued a statement concerning the future of the common agricultural policy(CAP), focusing on the potential trends of farming and food production development. According to that, in the face of current hardships, the European Union is to go towards helping agricultural sector with farmers income support and profitability of their activities. Besides, CAP should fully implement digital innovations that would make farmers work easier and reduce a negative effect of red tape [4].

In Poland sugar production concerns 18 sugar plants operating under the following four sugar companies: Krajowa Spółka Cukrowa(National Sugar Company), Nordzucker Polska, Pfeifer & Langen Polska and Sudzucker Polska.

The sugar producers have had beet supply contracts with 34 275 growers from whom 15 730341,21 tonnes of beets have been bought. This year, sugar beet plantation area has been higher than a year before by around 30 thousand ha and reached 232 301 thousand ha with average yield – 7,27ha[3].

The sugar beet procurement campaign 2017/18 has been challenging because of bad weather. After the first sowing operations, the April temperature was low and rainfall intense.

Local frosts and snowfall were observed and such weather conditions made the plants' emergence difficult and long-lasting. The plantations in the regions of heavy rainfall were partly flooded and that concerned mainly clay soils and those with defective texture. The difficult emergence period was followed by better weather conditions in May and June that enhanced beet growth and made up for some spring delay. The next months were characterized by lower temperatures compared to the previous year. Generally, precipitation amount in Poland was quite varied between regions, it was either high or low. Locally, there occurred sudden and heavy rainfalls causing flooding of plantations. At the beginning of the harvest time, the periods of intense precipitation and high soil moisture were recorded and, consequently, stopped the digging up of beets and their delivery for some time in several places [3].

The sugar campaign at the Krajowa Spółka Cukrowa S.A. was carried out in its seven branches – sugar factories in Dobrzelin, Kluczewo, Krasnystaw, Kruszwica, Malbork, Nakło and Werbkowice. The average length of sugar campaign was 110 days. The Company purchased over 6 million tonnes of sugar beets from all the seven sugar plants and the total over 900 K tonnes of sugar was produced for the first time in the KSC

S.A. history. The highest average yield was obtained in the Kruszwica Sugar Factory – 73 t/ha and the yield exceeding 70 t/ha was also recorded in the sugar plants in Dobrzelin and Nakło. The average polarization reached ca.16,1% and was lower compared to the year before. In 2017, the sugar beet crop area amounted to 96 000 ha grown by 15 800 contract holders [3,19].

The 2017/2018 sugar campaign, alike the KSC S.A. history, was considered very difficult because of unfavourable weather conditions. The considerable and intense rainfall occurring from September through December impeded beet harvest and delivery to the sugar factories. However, despite adverse weather conditions, thanks to the strong commitment of growers, loading and transportation firms as well as staff members working at beet handling, the right amount of raw material was delivered and ensured the processing within the production plan established before the campaign [3,19].

The cost calculation of sugar beet production presented is complex, with a special concern to the growers' labour input and farm overhead 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 has been made for the 2017/2018 sugar campaign, the first after the sugar quota elimination. This calculation, just like the other ones presented by the author, provides a detailed analysis of sugar beet production costs and its profitability for individual farms in the Lubelskie Province [7,8,9,10,11,12,13,15,16,17,18]. Currently, about 3963 growers are delivering sugar beets to the KSC S.A. branch – Krasnystaw Sugar Factory.

1. METHODOLOGICAL ASSUMPTIONS FOR CALCULATING SUGAR BEET CULTIVATION COSTS

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

Around 123 farms were examined and, finally, a model farm was chosen for further analysis as the one reflecting the regional specificity.

Most data found in the paper are the present author's observations or have been obtained directly either from sugar beet contract holders or from Krasnystaw Sugar Factory, a branch of KSC S.A. The assumption 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[2]

1.1. 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 on the basis of 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 2200 hours annually, the rate assumed for the year 2017 – 16,14 PLN [1,2].

1.2. 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 [5,6] and the data supplied by the Agricultural Advisory Centre in Końskowola. It is a complex calculation including the costs of wear, 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) and thus the cost of hourly work rate of a tractor is 87,09 PLN. The costs of particular agricultural practices include total cost of tractor operation with implements. A number of hours spent performing particular farm operations has been determined based on the literature data available [5,6] and the present author's experience.

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

1.3. 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 – 112,26 PLN/tonne (for 16% standard polarization),
- price of wet beet pulp (1,62 PLN/dt) was that applicable in the Krasnystaw Sugar Factory in 2017/2018 campaign,
- price of plant protection products and fertilizers applicable in the 2017/2018 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 phone, consumption of electricity and water (included into overhead costs).

The calculation assumed that the raw material will be transported from the plantation (from the field to factory) by the sugar producer.

2. COST CALCULATION

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

Table 1. Calculation costs of 1ha sugar beet production in the 2017/2018 season

No	Content	U.m.	Unit price	Quantity	Value [zł]	Share in percent[%]
1.	Production - sugar beet roots	dt	11,23	500	5613,00	
1.1	Refund of lump sum tax VAT	%	7,00	5613,00	392,91	
1.2	By-product – beet pulp	dt	1,62	250,00	405,00	
1.3	Area direct payment	ha	948,34	1,00	948,34	
1.4	Sugar payment per 1 ha from 2015	ha	1563,46	1,00	1563,46	
	Total revenue from production				8922,71	
2.	DIRECT COSTS					
2.1	Seeds:					
2.2	Cultivar – Jampol Rh Cr(KHBc)	jd.	599,40	1,25	749,25	10,71%
2.3	Plant protection products					
2.4	Herbicides:					
2.5	Pyramin Turbo 520 S.C.	l	79,00	5,00	395,00	5,65%
2.6	Betanal maxxPro 209 OD	l	144,00	2,50	360,00	5,15%
2.7	Targa Super 0,5 EC	l	95,00	1,50	142,50	2,04%
2.8	Fungicidal products:					
2.9	Optan 183 SE	l	205,00	0,70	143,50	2,05%
2.10	Duet Ultra 497 S.C.	l	105,00	1,00	105,00	1,50%
2.11	Total plant protection products expenses				1041,00	14,89%
2.12	Fertilizer needs :					
2.13	N-ammonium nitrate	dt	115,00	3,53	405,95	5,80%
2.14	P- 46% granular triple superphosphate	dt	163,00	1,96	319,48	4,57%
2.15	K- 60% potassium salt	dt	150,00	2,83	424,50	6,07%
2.16	Cao- dolomitic lime(every 4th year)	dt	1,73	40,00	17,30	0,25%
2.17	Total fertilizer expenses	-	-	-	1167,23	16,69%
2.18	TOTAL DIRECT COSTS	-	-	-	2957,48	42,29%
3.	DIRECT SURPLUS	-	-	-	5965,23	
4.	INDIRECT COSTS					
4.1	Complex service cost(transportation from field	dt	0,30	500,00	150,00	2,14%
4.2	Production levy	dt	0,00	500,00	0,00	0,00%
4.3	Services:					
4.4	Seed sowing		254,89	1,50	382,34	5,47%
4.5	Beet root harvest(Holmer harvester)		850,00	1,00	850,00	12,15%
4.6	Liming operation(every 4th year)		254,54	1,00	63,64	0,91%
4.7	Total services costs				1295,97	18,53%

4.8	Cultivation and protection					
4.9	Disking operation	godz.	96,24	2,00	192,48	2,75%
4.10	Harrowing(2 x 0,7h)	godz.	90,75	1,40	127,05	1,82%
4.11	Deep plowing	godz.	95,17	2,50	237,93	3,40%
4.12	PK fertilizers application (2 x 0,7h)	godz.	99,56	1,40	139,38	1,99%
4.13	Pre-sowing tillage(soil tillage unit 2 x 0,7h)	godz.	109,09	1,40	152,73	2,18%
4.14	N top dressing(2 x 0,7h)	godz.	99,56	1,40	139,38	1,99%
4.15	Sprays(5 x 0.5h)	godz.	105,88	2,50	264,70	3,79%
4.17	Collection of beetroots from harvester	godz.	104,94	2,00	209,88	3,00%
4.18	Total cultivation and protection costs				1463,53	20,93%
4.19	Farm overhead expenses					
4.20	Property tax				132,00	1,89%
4.21	Liability insurance				15,00	0,21%
4.22	Building structure depreciation				100,39	1,44%
4.23	Other overheads				104,05	1,49%
4.24	Total overhead costs				351,44	5,03%
4.25	Owner/operator labour cost	godz.	16,14	48,00	774,72	11,08%
4.26	TOTAL INDIRECT COSTS				4035,66	57,71%
5.	AGRICULTURAL INCOME				1929,57	

As the analysis demonstrates, the indirect costs (57,71) had the highest share in sugar beet cultivation (Tab.1) with the highest effect of the costs of sowing and harvesting services as well as liming operation – 18,53% followed by the costs of plant cultivation and protection – 20,93%, overhead expenses – 5,03% and the owner/operator labour – 11,08%.

The direct costs also had a strong influence (42,29%), notably, the costs of fertilizers – 16.69%, seeds – 10,71%, plant protection products – 14.89%.

A characteristic feature of this procurement campaign costs is lifting the production levy.

3. PROFITABILITY OF SUGAR BEET PRODUCTION

Production profitability has been determined on the basis of the production profitability index defined below:

$$W = \frac{P}{K}$$

where:

W – profitability index,

P – value of production (PLN)

K – production cost (PLN)

The index value higher than 1 indicates profitability of production, whereas lower 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	1,28	13,99

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

The profitability index is higher than one so the sugar beet production in the 2017/2018 campaign was profitable, yet at a low profit level.

4. DISCUSSION

The 2017/2018 sugar procurement campaign in the Lublin region represented by the contract holders supplying sugar beets to the KSC S.A branch – Krasnystaw Sugar Factory can be considered successful despite the adverse weather conditions observed immediately after sugar beet seed emergence and at harvest time. As a consequence, a substantial part of growers have not fulfilled their sugar beet contracts, yet there were some with the surplus raw material. The total of 1000902,81 tonnes were procured.

The sugar procurement campaign in the Krasnystaw Sugar Factory lasted from 11.09.2017 to 27.12.2017. The average polarization was 16,37%, owing to challenging weather conditions in spring and heavy rainfall in autumn. The average sugar beet yield reached 58,06 tonnes and average raw material impurity – 9,73. The rather poor farming procedures in sugar beet cultivation resulted in only a small surplus of the raw material. The initial price of the surplus was set at 40 PLN/tonne.

The Krasnystaw Sugar factory produced 165 000 t of sugar from the sugar beets purchased. The plants were cultivated on the production area covering 18 962 ha by 3963 growers.

However, lowering the raw material price by 17,76 PLN as compared to the previous sugar campaign caused a drop in income derived from the sugar beet production (1349,21 PLN/ha) to 1929,57 PLN/ha. However, finally, the financial result generated by sugar beet contract holders was overall profitable.

Good financial performance makes the sugar beet cultivation profitable, also after the new sugar market regime has entered into force. It has still remained one of the most profitable traditional agricultural crops in the Lublin region, even despite variable income in particular years [7,8,9,10, 11,12,13,14,15,16,17,18].

A good economic situation of sugar beet production in the successive years will be conducive to an increase in purchasing power and, in turn, will promote on-farm investment.

The analyzed sugar campaign ended with a slight decline in profitability of sugar beet cultivation when the prices of means of production remained at nearly the same level. In 2018 the economic conditions are very likely to change even more because the price of white sugar has been lowered. Under these circumstances, profitability of sugar beet production is to be considerably affected by the sugar payment amount that provides financial support to sugar beet growers.

In the years 2017-2020, the quantitative limit at the European Union level for sugar beet production related support is 516 422 ha, which is an increase by almost 20 000 ha as compared to the previous period (2015-2016). The annual amount available at the EU level has also increased by 1 million EUR and currently it has reached 177 million EUR (343 EUR/hectare). The total payment amounts in the EU in 2020 will fall by 4% in relation to 2017 [4] and, consequently, the dropping financial support for sugar beet growers will decrease their profit from sugar beet production to the same extent.

CONCLUSION

1. The cost analysis of sugar beet production has indicated profitability at the average income level of 1929,57 PLN/ha and the profitability index 1,28.
2. It was found out that the income from sugar beet production has been primarily affected by the indirect costs (57,71%), which are higher than the direct costs by 15,42%. The fertilizer costs, which were shown to make up as much as 17,89% of the direct costs, has determined the production costs to the greatest degree.
3. A major factor causing a decreased income generated by sugar beet cultivation has been the lowering of the raw material's price to 112,26 PLN/tonne in the analyzed year compared to the previous season (130 PLN/tonne).
4. Sugar beet growing is characterized by high production costs accounting for 68,37% of revenue from the production.

REFERENCES

1. **Augustyńska-Grzymek I. 2017.** Produkcja, koszty i dochody z wybranych produktów rolniczych w latach 2014-2016. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa.
2. **Chudoba Ł. 2004.** Produkcja buraków cukrowych. Fundusz Współpracy, Warszawa
3. **Gawryszczak M. 2018.** Podsumowanie kampanii cukrowniczej 2017/2018 w Polsce. Burak Cukrowy, Wiosna: 12-14.
4. **Gawryszczak M. 2018.** Przyszłość Wspólnej Polityki Rolnej. Burak Cukrowy, Wiosna: 3, 8.
5. **Litwinow A. 2002.** Skrócone normatywy produkcji rolnej Regionalne Centrum Doradztwa Rozwoju Rolnictwa w Radomiu, Radom.
6. **Lorencowicz E. 2004.** Tabele do ćwiczeń z użytkowania maszyn rolniczych. Wydawnictwo Akademii Rolniczej w Lublinie.
7. **Krzysiak Z. 2006.** Koszty i opłacalność produkcji buraków cukrowych. Inżynieria Rolnicza 5: 355-363.
8. **Krzysiak Z. 2008.** Dochodowość produkcji buraków cukrowych w pierwszym roku trwania reformy rynku cukru UE. Gazeta Cukrownicza 8: 262-265.
9. **Krzysiak Z. 2009.** Dochodowość produkcji buraków cukrowych w drugim roku trwania reformy rynku cukru UE. Gazeta Cukrownicza 7-8: 206-208,
10. **Krzysiak Z. 2010a.** Dochodowość produkcji buraków cukrowych w trzecim roku trwania reformy rynku cukru UE. Gazeta Cukrownicza 2: 49-51.
11. **Krzysiak Z. 2010b.** Dochodowość produkcji buraków cukrowych w czwartym roku trwania reformy rynku

- cukru UE na przykładzie województwa lubelskiego. *Gazeta Cukrownicza* 5: 126-128.
12. **Krzysiak Z. 2011.** Dochodowość produkcji buraków cukrowych po reformie rynku cukru UE na przykładzie województwa lubelskiego. *Gazeta Cukrownicza* 3:71-74.
 13. **Krzysiak Z. 2012.** Dochodowość produkcji buraków cukrowych w drugim roku po reformie rynku cukru UE na przykładzie województwa lubelskiego. *Gazeta Cukrownicza* 3:112-115.
 14. **Krzysiak Z. 2013.** Dochodowość produkcji buraków cukrowych w trzecim roku po reformie rynku cukru UE na przykładzie województwa lubelskiego. *Gazeta Cukrownicza* nr 5-6/2013, s. 185-188.
 15. **Krzysiak Z. 2015.** Dochodowość produkcji buraków cukrowych w czwartym roku po reformie rynku cukru ue z uwzględnieniem kosztów transportu. *Logistyka* 3/2015, s. 2612-2617.
 16. **Krzysiak Z. 2017.** Dochodowość produkcji buraków cukrowych z uwzględnieniem kosztów transportu w piątym roku po reformie rynku cukru ue na przykładzie województwa Lubelskiego. *Studia i Materiały. „Miscellanea Oeconomicae.* 1/2017, tom I. 83-92.
 17. **Krzysiak Z. 2016.** Dochodowość produkcji buraków cukrowych w kampanii 2015/2016 na przykładzie województwa lubelskiego *Motorol*, Vol. 18, nr. 9, 21-26.
 18. **Krzysiak Z. 2017** Dochodowość produkcji buraków cukrowych w kampanii 2016/2017 na przykładzie województwa lubelskiego. *Motorol*, Vol. 19, Nr 4, 49-53.
 19. <https://firma.polski-cukier.pl/269,aktualnosci?tresc=6265> dostęp w dniu 20.02.2018.