

## ASSESSMENT OF CHANCES FOR KEEPING SUGAR BEET PRODUCTION IN LUBELSKIE VOIVODESHIP

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**Abstract.** The paper presents the results of a research on the capacity of sugar beet production in the Lubelskie Region, Poland. Based on data obtained from sugar plants and a number of national organizations (Association of Sugar Producers in Poland, Association of Sugar Production Technicians), the survey confirmed strong position of Lubelskie Region as a sugar and sugar beet producer in the country. The analysis of sugar beet growing practices applied in selected farmsteads allowed the authors to determine the list of advisable improvements to the methods of cultivation. Production results, achieved on farms, can also be improved through the introduction of new technical and technological solutions in cultivation.

**Key words:** sugar beet, sugar market, Lubelskie Voivodeship

### Introduction

The 2008/2009 sugar-beet harvest in Poland was the period when the EU sugar market control mechanisms started to work in full. Sugar production was reduced by 366.879 metric tons, nineteen operating sugar factories remained out of twenty nine production plants (currently, there are eighteen plants in service). Previously being a significant sugar exporter, we became its importer [Mucha 2009, Smoleński et al. 2009, Świetlicki 2009]. Nevertheless, it should be observed that Poland is still the third largest sugar producer in the EU.

The purpose of this work was to assess changes that occurred in sugar beet production scale in Lubelskie Region, compared to the situation in the country. Obtained data allowed to assess Lubelskie Voivodeship position as the manufacturer of raw product for sugar industry.

Cultivation technology in selected farms was put through analysis in order to determine chances to improve production outcome in the region.

### Research method

Research area covered Lubelskie Voivodeship region. The research was completed in years 2006–2008 (production years: 2006/07 – 2008/09). Data sources included: questionnaires and direct interviews conducted with directors of raw product departments in three sugar factories in Lublin and Cukrownia Ropczyce S.A. sugar production plant, which

cooperates with a group of planters from Lubelskie Voivodeship. The group of planters (218) was selected in 2008 in consultation with employees of raw product departments in the examined sugar factories. From these planters, the researchers acquired information on sugar beet cultivation technology (using the standardised interview method). The selection of test group was deliberate - these had to be farmers planning to continue cultivation in the nearest years, reaching production outcome at medium or higher crop level observed in Lubelskie Region. Spatial layout of farms in the region was also taken into account. In the whole examined group, as much as 92% of farmers were using conventional technology (with winter ploughing), and only a small group of planters (8%) was practising simplifications in farming. Due to still high popularity of conventional technology, it was put through detailed analysis, and planters choosing this cultivation system were treated like target test group.

Moreover, from countrywide organisations (Association of Sugar Producers in Poland – ZPC, Association of Sugar Production Technicians – STC) the researchers acquired data concerning sugar sector in Poland. The researchers took into account sugar beet cultivation area before and after implemented reform of the European Union sugar market. Results obtained for Lubelskie Region were compared to the data for the whole country, which allowed to compare production potential of the region to the situation in the whole country.

## **Analysis of results**

Since implementation of the EU sugar market reform, sugar beet cultivation area in Lubelskie Voivodeship distinctly dropped from 39,000 hectares in 2006 down to 30,000 hectares in 2008 (tab. 1) [BDR GUS – Central Statistical Office Regional Data Bank]. The main reason for changes in crops area size is the reduction of sugar production quotas in concerns.

Table 1 indicates that, in majority, beet plantations are located in the following Voivodeships: Wielkopolskie, Kujawsko-Pomorskie, Lubelskie, Mazowieckie and Dolnośląskie. Wielkopolskie Voivodeship is the largest sugar beet producer in Poland (almost 40,000 ha of cultivated land). Lubelskie Voivodeship is the third largest as regards cultivated land area (16% of total sugar beet cultivation area in Poland), right after Kujawsko-Pomorskie Voivodeship [BDR GUS].

Sugar production level in each region is closely related to sugar beet cultivation area (Tab. 2). In spite of its 19% reduction, the highest sugar volume is still produced in Wielkopolskie Voivodeship (285,000 tons). Second and third in the ranking are Kujawsko-Pomorskie and Lubelskie Voivodeships, with similar produced material level (over 190,000 tons). 10 out of 19 sugar factories working in season 2008/09 were located in the three above-mentioned Voivodeships. As a result of closing sugar production in Chybie, Racibórz and Łapy sugar factories, sugar production was ceased in Śląskie and Podlaskie Voivodeships.

Presented comparisons indicate that Lubelskie Voivodeship still maintains third, strong position in sugar beet and sugar production in Poland.

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Table 1. Changes in sugar beet cultivation area in Poland in years 2005-2008

Voivodeship	Total area [ha]			Difference: 2005-2008 [%]
	2006	2007	2008	
Lower Silesian (dolnośląskie)	26 789	24 063	19 926	-25.62
Kuyavian-Pomeranian (kujawsko-pomorskie)	41 497	41 387	30 894	-25.55
Lublin (lubelskie)	39 082	35 595	29 966	-23.33
Lubusz (lubuskie)	3 254	3 211	1 396	-57.10
Łódź (łódzkie)	9 284	8 596	6 699	-27.84
Lesser Poland (małopolskie)	1 405	1 198	1 034	-26.41
Masovian (mazowieckie)	23 537	21 889	16 060	-31.77
Opole (opolskie)	19 454	17 826	10 757	-44.71
Subcarpathian (podkarpackie)	4 982	5 561	3 980	-20.11
Podlaskie (podlaskie)	4 933	4 621	41	-99.17
Pomeranian (pomorskie)	10 872	10 514	8 520	-21.63
Silesian (śląskie)	2 143	1 984	1 469	-31.45
Świętokrzyskie (świętokrzyskie)	8 742	7 253	5 713	-34.65
Warmian-Masurian (warmińsko-mazurskie)	4 385	4 042	2 782	-36.56
Greater Poland (wielkopolskie)	50 391	48 615	39 594	-21.43
West Pomeranian (zachodniopomorskie)	11 296	11 075	8 653	-23.40
Poland	262 046	247 432	187 484	-28.45

Note: Statistical data differ from data acquired during the research and allow to determine approximately the differences in individual voivodeships

Source: Own study based on [BDR GUS]

Table 2. Number of sugar factories and sugar production divided into Voivodeships

Voivodeship	Number of sugar factories [pcs.]		Sugar production [ $10^3 \cdot t$ ]		Difference 2006-2008 [%]
	2006/07	2008/09	2006/07	2008/09	
Lower Silesian (dolnośląskie)	3	2	119.10	89.90	-24.52
Kuyavian-Pomeranian (kujawsko-pomorskie)	5	3	261.30	196.9	-24.65
Lublin (lubelskie)	4	3	262.9	192.7	-26.70
Łódź (łódzkie)	2	1	66.4	60	-9.64
Masovian (mazowieckie)	1	1	177.4	163.9	-7.61
Opole (opolskie)	3	2	143.9	120.7	-16.12
Subcarpathian (podkarpackie)	1	1	96.2	81.4	-15.38
Podlaskie (podlaskie)	1	0	56.5	0	-100.00
Pomeranian (pomorskie)	2	1	76.8	60.5	-21.22
Silesian (śląskie)	2	0	45.6	0	-100.00
Greater Poland (wielkopolskie)	5	4	351.7	285	-18.97
West Pomeranian (zachodniopomorskie)	2	1	65.1	52	-20.12

Source: own study based on data from STC

In 2008, sugar beet cultivation area in Lubelskie Region occupied more than 26,000 ha and was shared by approximately 10,000 planters (tab. 3). The average plantation area per one farm was 2.71 ha. In 2009, the researchers observed next increase in an average plantation size to 3.03 ha. Compared to 2006, plantation size has grown by 0.73 ha (32%), however, it is still too small. This high fragmentation of plantations (in 2006, the average plantation in Lubelskie Region was 1.6 ha smaller than the national average) makes it difficult to introduce technical and technological progress in sugar beet production.

In 2008, high root crops were obtained in Lubelskie Voivodeship plantations (almost  $52 \text{ t}\cdot\text{ha}^{-1}$ ) - by 6.2 tons per hectare higher than the value reached in 2006 (tab. 3). In 2008, the average crop in Poland was  $48 \text{ t}\cdot\text{ha}^{-1}$ , and only slightly different from crop obtained in 2006 ( $48.3 \text{ t}\cdot\text{ha}^{-1}$ ) [Mucha 2009]. In Lubelskie Voivodeship, the year 2008 was characterised by very favourable meteorological conditions for sugar beet cropping. Moreover, Lubelskie Region proves to have high production space agricultural valorisation index reaching 74.1 points (the average for Poland is 66.6 points), which is an additional factor that predisposes to achieving high crops [Witek 1994].

Table 3. Characteristics of raw product base for sugar industry in Lubelskie Voivodeship

Specification	2006/07	2008/09
Cultivation area [ha]	36 783	26 259
Number of planters	16 012	9 699
Average plantation area [ha]	2.30	2.71
Average plant stock	85 767	87 467
Weight of harvested roots [t]	1 682 886	1 363 282
Root crop [ $\text{t}\cdot\text{ha}^{-1}$ ]	45.75	51.92
Polarisation [%]	17.43	16.39
Biological sugar crop [ $\text{t}\cdot\text{ha}^{-1}$ ]	7.97	8.51
Technological sugar crop [ $\text{t}\cdot\text{ha}^{-1}$ ]	7.16	7.61

Source: Own study based on data obtained from Lublin, Krasnystaw, Strzyżów, Werbkowice, and Ropczyce Sugar Factories

There are noticeable differences in obtained root crops between each of administrative districts in Lubelskie Voivodeship. In 2008, the highest mean value of root yield, reaching  $55.9 \text{ t}\cdot\text{ha}^{-1}$ , was observed in Puławy District. Mean value of crops exceeding  $54 \text{ t}\cdot\text{ha}^{-1}$  were obtained in Hrubieszów and Tomaszów Districts, and in Krasnystaw and Zamość areas weight of roots gathered from one hectare was close to the average for the whole Voivodeship. In other districts the yield level ranged from 45 to  $50 \text{ t}\cdot\text{ha}^{-1}$  (Lublin Administrative District –  $49.7 \text{ t}\cdot\text{ha}^{-1}$ ).

Among other things, production potential of farms depends on technical equipment and capability to adapt technology that would allow to obtain high quality raw product, and thus high income. Analysis of individual operations carried out in sugar beet plantations allowed to identify many departures from technological regime resulting from free matching of number, methods and dates for carrying out individual operations by planters (tab. 4).

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Table 4. Departures from technological regime in sugar beet cultivation

Specification	Percent of farmers (number of farmers)
No soil analysis carried out	43% (85)
Using lime combined with organic or mineral fertilisation	4% (7)
Too early (for after-crop cultivation) application of mineral or organic fertilisers	16% (32)
No intercrop sowing	87% (173)
After-crop cultivation carried out using a plough	48% (95)
Carrying out pre-winter ploughing using bed plough without additional field levelling before winter	73% (146)
Full doses of phosphatic-potassic fertilisers in spring	63% (125)
Carrying out ploughing in spring	4% (7)
Multiple (more than two) cultivation operations carried out in spring before seed sowing	8% (16)
Application of nitrogen fertilisers in one dose	37% (74)
Lime application in spring	1% (2)
No fertilisation with microelements	5% (10)
Root harvest carried out using single-action towed harvesters, or two-stage harvesting technology with obsolete machinery sets	82% (163)

*Source: own study based on research results*

Large group of farmers still do not carry out soil analyses (43%), in spite of the fact that their results allow to prepare correct fertilisation plan. In 63% of farms, full dose of phosphatic-potassic fertilisers was distributed in the soil in spring. It is recommended to use these fertilisers in autumn due to the need of mixing the supplied components deeper into the soil. Moreover, too high pre-sowing nitrogen and potassium doses may contribute to the reduction of beet seedlings and stock.

Almost 50% of planters were carrying out after-crop cultivation using a plough. Using a stubble unit allows to mix crop residues with the soil in a better way and to place weed seeds shallowly. Additionally, when using the stubble unit, this operation becomes less energy-consuming.

Small number of planters (18%) gather roots using modern self-propelled harvesters that ensure higher crop quality, and less losses and fouling. The decisive majority of them harvest roots using single-action towed harvesters (Neptun Z 413, Stoll V 100, Stoll V 50,

Kleine 5002), and some of them use for that purpose obsolete machinery sets for two-stage harvest (Orlik, Birkut).

In the current situation, considering low price for beets delivered to sugar factories, production efficiency may be increased by adhering strictly to the technological regime, which at the end of the day affects the volume of obtained crop, and therefore achieved profits.

Nevertheless, in spite of many mistakes made in cultivation and obsolete technical equipment being used in farms, crops reached in the region in 2008 exceeded the average root crop volume in Poland by  $4 \text{ t}\cdot\text{ha}^{-1}$  [Mucha 2009]. However, the obtained results were lower than crops obtained in leading European countries - average yield level in the EU in production year 2008/09 reached 63.8 ha [data obtained from Polish Association of Sugar Beet Producers (KZPBC), from statistics kept by CIBE].

## Conclusions

1. In spite of sugar production drop by 27% and reduction of beet cultivation area by 23%, Lubelskie Voivodeship is still the third largest producer in Poland - of both sugar ( $192.7 \cdot 10^3 \text{ t}$ ), and sugar beets (cultivation area exceeds  $26 \cdot 10^3 \text{ ha}$ ).
2. Very high fragmentation of plantations in Lubelskie Region (in 2008 average plantation size was 2.71 ha) makes it difficult to introduce technical and technological progress in farms, however, gradual growth of an average cultivation area is observed in the region (in the years 2006-2009 increase in the average plantation size reached 32%). Also, higher and higher root crops are obtained - in 2008 exceeding the national average by  $4 \text{ t}\cdot\text{ha}^{-1}$ .
3. Analysis of technology used in sugar beet cultivation proves that in order to increase their production outcomes, farmers should introduce technical and technological improvements, first of all concerning:
  - carrying out soil analysis,
  - carrying out after-crop cultivation using stubble units,
  - using fertilisation according to the guidelines (application of phosphatic-potassic fertilisers in autumn, application of nitrogen in split doses, fertilisation with micro-elements),
  - reducing the number of spring cultivation runs across fields,
  - root harvest carried out using modern self-propelled harvesters.

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## **OCENA SZANS UTRZYMANIA PRODUKCJI BURAKÓW CUKROWYCH W WOJEWÓDZTWIE LUBELSKIM**

**Streszczenie.** W artykule przedstawiono wyniki badań nad możliwościami produkcji buraków cukrowych w województwie lubelskim. Opierając się na danych uzyskanych z cukrowni oraz ogólnokrajowych organizacji (Związek Producentów Cukru w Polsce, Stowarzyszenie Techników Cukrowników) potwierdzono silną pozycję Lubelszczyzny jako producenta buraków i cukru w skali kraju. Analiza technologii produkcji buraków cukrowych w wybranych gospodarstwach pozwoliła na wskazanie koniecznych usprawnień technologicznych. Wyniki produkcyjne osiągnięte w gospodarstwach mogą dodatkowo zostać poprawione poprzez wprowadzenie nowych rozwiązań echniczno – technologicznych w uprawie.

**Słowa kluczowe:** buraki cukrowe, rynek cukru, województwo lubelskie

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