SUGAR BEET (Beta vulgaris L. subsp. vulgaris)
Production in Poland - Present Status and Future Perspectives

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Production and perspective of sugar beet in Poland are discussed. Upto 1960's, there was an increasing trend of sugar production which was later reduced. Different factors responsible for sugar yield production has been discussed. The last two decade has been found more productive in increasing sugar beet yield in Poland upto 70 t/ha with 8.0 t recoverable sugar. However, very fast transformations which occurred in sugar beet industry during the last 10 yrs have markedly accelerated rate of transformation as related to yields of taproots/ha and quality. Different natural and agronomical factors responsible for limiting production is also discussed. Major political changes and ownership reorganisation in Poland after 1989 greatly affects the deep restoration to market economy in sugar industry. Future prospects for better sugar beet production and sugar recovery has also been suggested.

KEYWORDS : Sugar beet, production, present status, Poland

HISTORY
The first sugar factory technologically constructed in Poland to process sugar beet (Beta vulgaris L.) taproots was built in 1862 and settled at Konary (in literature known as Kunern - German name), a village in the Lower Silesia. In the 19th century this region belonged to the Prussian Empire, but at present it is a part of Poland. During the first sugar beet campaign 400 t of sugar beet taproots were processed. Sugar content in taproots was estimated to vary from 5 to 7% and the harvested yield of roots about 5 t/ha (Gutmański, 1991).

ARMERS GOALS OF PRODUCTION
It is well known, that grower profits depend on the harvested yield and its technological quality. Therefore, the main farmers' goal in sugar beet production in Poland deal with maximization of:
- roots' yield per ha,
- biological sugar yield per ha,
- recoverable sugar yield per ha.

The first goal prevails in the regions where sugar stories still pay only for roots tonnage. The second and especially the third one are actually considered in many factories.

SUGAR PRODUCTION TRENDS
Productivity of sugar beets
Yields of sugar beets harvested by farmers in Poland are generally low (Table 1). The quantity of recoverable sugar (also known as white sugar) production in Poland since 1960 shows an increasing trend up to half of 80-ies. Since the second half of 80-ies the trend has been turning down with a very high year to year variability (Fig. 1). One of the most important reasons for this decline is the quotation fixed at production, which is evaluated for about 1.6 mln tons annually (World Crop and Livestock Statistics 1948-1985, FAO Yearbooks 1987-2003; Malec, 2002).

The prognosis of sugar production is usually based on three characteristics, i.e. yield of taproots per ha, sowing area and recoverable sugar content. The first two ones are presented in Figs. 2 and 3, respectively. With respect to yield of taproots, a linear trend was found in the last 15 years and showed a permanent increase. However, for the first time, in spite of a very high year to year variability, annual yields approached 40 t per ha. With respect to sowing area,
Table 1: Sugar beets production characteristics, Poland, 1960-2002

<table>
<thead>
<tr>
<th>Statistical parameters</th>
<th>Yield of recoverable sugar t x 1000</th>
<th>Yield of taproots t/ha</th>
<th>Sowing area ha x 1000</th>
<th>Recoverable sugar %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1747</td>
<td>32.5</td>
<td>427.0</td>
<td>12.8</td>
</tr>
<tr>
<td>Median</td>
<td>1799</td>
<td>32.2</td>
<td>426.5</td>
<td>13.3</td>
</tr>
<tr>
<td>Mode</td>
<td>1785</td>
<td>33.6</td>
<td>440.0</td>
<td>13.3</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>238</td>
<td>4.5</td>
<td>55.1</td>
<td>0.014</td>
</tr>
<tr>
<td>Minimum</td>
<td>1134</td>
<td>22.1</td>
<td>301.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Maximum</td>
<td>2219</td>
<td>45.2</td>
<td>555.0</td>
<td>16.4</td>
</tr>
<tr>
<td>Coefficient of variation %</td>
<td>13.62</td>
<td>13.96</td>
<td>12.9</td>
<td>10.9</td>
</tr>
</tbody>
</table>

![Graph showing trends of recoverable sugar production, Poland (1960-2002)](image1)

![Graph showing long-term trend in sugar beet taproots yields, Poland (1960-2002)](image2)

![Graph showing trends of sugar beet sowing area, Poland (1960-2002)](image3)

![Graph showing trends of recoverable sugar yields, Poland (1960-2002)](image4)

as shown in the Fig. 3, the area under sugar beet cropping increased up to 550 000 ha in 1976 and since 1977 has been decreasing continuously. The trend observed in the yields of recoverable sugar per ha over the period of 43 years is shown in Fig. 4.

Among the three main factors, generally used in estimating sugar yield production, only the yield of taproots per ha appears to significantly affect yield of sugar but explains only 38% of expected sugar yield over the period 1961 – 2002. The quantity of produced sugar can be, therefore calculated on the basis of multiplicative regression, as reported by Equ.

\[ Y = 677.6 + 33.0 Y_B \]
\[ R^2 = 38\% \]

2 and 3. The latter one stresses the importance of quality parameters, which are found to be responsible for over 40% of the quantity of sugar produced in Poland.

Evaluation of factors responsible for sugar production in Poland over the period 1961 – 2002 may be undertaken on the basis of suggestions as below:

1. Yield of sugar beet taproots \((Y_B)\), t/ha
   \[ SY = 677.6 + 33.0 Y_B \]
   \[ R^2 = 38\% \]