COST-BENEFIT ANALYSIS USING SUGAR BEETS AS BIOMASS IN KURZEME REGION

Mārtiņš Jirgens
Content

• Analysis of planning documents and current legislation;

• Feasibility calculation on use of sugar beets in Kurzeme Planning Region;

• Cost-benefit analysis for using sugar beets as biomass.
Analysis of planning documents and legislation

• Latvia’s general target: for the share of energy from renewable sources in the gross final consumption of energy is 40% in 2020 (in 2010 reached - 32.5%, in 2011–33.4%);

• The share of energy from renewable sources used in transport in 2020 is at least 10% of the final consumption of energy in transport (in 2010 reached - 3.3%, in 2011–3.3%).
Sugar beet production in Latvia

• In 2006, the Sugar Reform was launched in the EU. Within the reform, Latvia refused from sugar production quotas and, in the result, sugar production plants were closed by paying compensations to sugar beet breeders, sugar production plants, and local governments;

• During 2002–2006 until the reform was launched, average 14 thousand hectares were cultivated with sugar beets. Sugar beet productivity was 36–39 tonnes/ha, with sugar content of 16–17% at the moment of harvesting;

• At the moment discussion regarding canceling sugar quotas in 2015 takes place in EU.
Diverse use of sugar beets

• In addition to sugar production, sugar beets and side products of their treatment can be used as raw material for bioethanol and biogas production, as well as additional fodder to animals;

• After Sugar reform in several EU countries sugar beet processing plants were transformed into bioethanol production plants, in the result of which sharp increase in the amount of the produced bioethanol is observed over the last years. 30% of the bioethanol produced in Europe is acquired by processing sugar beets;

• Practise Austria, France, Germany, Hungary, the Netherlands, Poland, and Sweden show that sugar beet is suitable for biogas production thanks to their fast fermentation and high yield.
Cost-benefit analysis 1/8

Sugar beet production and sale:

• Cost-benefit analysis calculations prepared within project boundaries indicate that investments in sugar beet cultivation in Kurzeme region (its southern part) theoretically are with higher profit than average profit in agriculture sector, however must be considered that it has several crucial requirements, like, for instance, processing facilities in feasible distance, sugar quota cancelation, etc.

More detailed information is available in research document on the website of Kurzeme planning region.
Cost-benefit analysis 2/8 (bioethanol)

- Sugar beet ethanol is one of the most sustainable available energy sources in EU (emits at least 60% less SEG fossil fuel);

<table>
<thead>
<tr>
<th>Ethanol yield</th>
<th>76 kgEtOH/t sugar beets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity demand</td>
<td>0,13 kW h/kgEtOH</td>
</tr>
<tr>
<td>Heat demand</td>
<td>7,3 MJ/kgEtOH</td>
</tr>
<tr>
<td>Transport field — conversion plant</td>
<td>40 km</td>
</tr>
</tbody>
</table>

- Sugar beet ethanol has characteristic highest bioethanol yield in - 6 250 l/ha; maize 3 740 l/ha, wheat 2 760 l/ha, rye 2 030 l/ha, triticale 2 230 l/ha un straw 2 310 l/ha;
Cost-benefit analysis 3/8 (bioethanol)

• It is foreseen that in nearest years demand for bioethanol will increase;
• Experts forecast that biogas in Europe could replace 25–35% of fossil fuel used in motor vehicles in 2030;
• Biofuel is only competitive in case if state supports biofuel manufacturers with applicable support system and excise duty discounts.
Cost-benefit analysis 4/8 (bioethanol)

• In accordance to theoretical calculations performed by experts, production cost of one liter of bioethanol in Kurzeme planning region is 0,37 LVL (one ton of bioethanol - 469,90 LVL), (without investments for new production facility), however must be considered that information is obtained from data and available production costs provided by other countries’ sugar beet cultivators and producers.
Several years ago sugar beets were started to grow for use in biogas production in experimental level in Germany; At the moment used amount is gradually increasing and calculations indicate that sugar beets area for biogas production in 2011 in Germany reached 15 000 ha.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Unit</th>
<th>Sugar beets (beets and leafs, at average harvest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas</td>
<td>m³/ha</td>
<td>7 690</td>
</tr>
<tr>
<td>Methane</td>
<td>m³/ha</td>
<td>4 000</td>
</tr>
<tr>
<td>Electricity</td>
<td>kWh/ha</td>
<td>14 000</td>
</tr>
</tbody>
</table>
According to data of the Ministry of Economics, at the end of 2012 there were 27 biogas production plant operating in Latvia, and it is expected that their number will grow. Number of the submitted decisions exceeds one hundred;

Currently, also the green mass imported from Lithuania is used for producing biogas in Latvia; this green mass contain also sugar beet or sugar beet pulp.
Cost-benefit analysis 7/8

Scenarios:
1. bioethanol + biogas
2. bioethanol + supplementary food for animals;
3. sugar + bioethanol + biogas.

Preconditions:
• support of the government for bioethanol production;
• biogas is produced throughout whole year by making a mixture of sugar beet and other ingredients;
• during the sugar beet processing season, sugar beet pulp after production of bioethanol is used, but after this season sugar beet silage is used;
• cancellation of the EU sugar quotas (scenario No. 3).
Cost-benefit analysis 8/8

- In sugar beet cultivation and distribution must be considered impact of the sector to the environment;
- Complicated storage and transportation; short processing season;
- Efficiency and profitability of using this resource is affected by the following factors: purchase of new equipment for sugar beet farmers, government support scheme for production of bioethanol, and capacity of bioethanol production plants, development of sugar production sector, and, possibly, construction of a sugar production plant.
Thank you!