ISSUE BRIEF:
RESOURCE EFFICIENCY-CIRCULAR ECONOMY

HOW THE BEET SUGAR SECTOR USES RESOURCES RESPONSIBLY

ABOUT THE ISSUE

The EU beet sugar sector has a long tradition of valorising all products arising from the processing of sugar beet, while keeping the use of inputs to an optimum. The Beet Sugar sector thus already applies the principles of the circular economy and waste reduction, anticipating and leading the way towards higher resource efficiency and waste elimination.

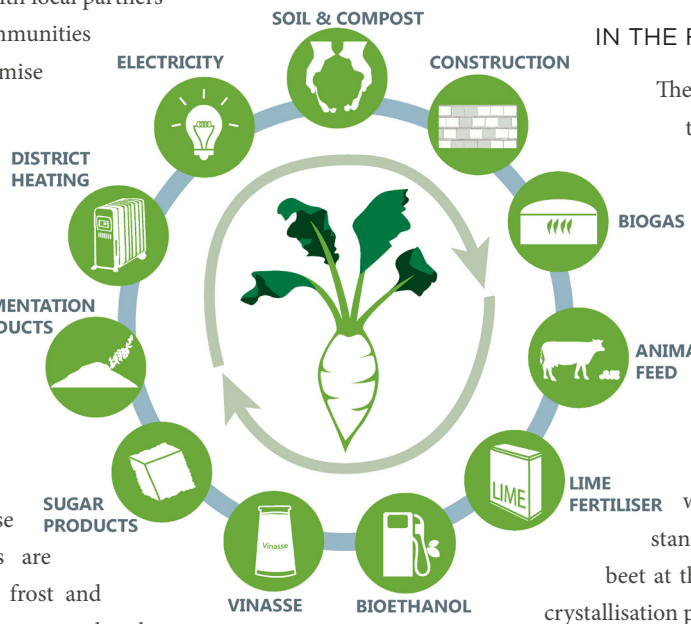
ON THE FARM

Appropriate beet harvesting and storage methods help minimise crop losses. To limit soil removal from the field and to facilitate efficient processing, sugar beet are pre-cleaned during harvest and loading. This allows processing to promptly commence in the factory while also helping to conserve the organic matter and structure of the soil in the field. Beet harvest leftovers such as beet tails, leaves and weeds are usually left in or returned to the field.

Sugar beet are perishable and start deteriorating from the moment they are harvested. Efficient beet processing requires continuous beet delivery to the factory. Harvesting sugar beet and their delivery thus takes place according to a precise schedule. The EU beet sugar sector therefore constantly works with local partners such as local authorities, rural communities and transport companies to optimise transport and logistics.

Beet harvesting can be round-the-clock work while harvesting conditions are good. Until mid-November most beet deliveries to sugar factories are just-in-time, thus keeping storage and the associated losses to a minimum.

During the storage period, beet are stored outdoors on suitable storage sites to minimise deterioration. Many beet clamps are covered to protect the beet from frost and rain. Considerable research is underway to reduce beet deterioration and thus sugar losses during storage.



Beet pulp is principally used as animal feed, be it in its fresh form (between 8 and 18% of dry matter), as pressed pulp (between 18 and 35% dry matter) or as dried pellets (between 88 and 91% of dry matter) (Source: EC 68/2013). Beet pulp is also used as feedstock to produce renewable energy (e.g. biogas in Italy, Hungary and North-East Germany). A niche application for beet pulp is gluten-free dietary fibre (Fibrex), while a Horizon 2020 PULP2VALUE project is currently trying to develop beet pulp into value added products such as microcellulose fibres, arabinose and galacturonic acid.

For more information, see: www.pulp2value.eu

IN THE FACTORY

The method of physically handling the beet can contribute to reducing sugar losses. Beets are stored in the factory for the shortest time possible to minimise deterioration. Sugar beet can be transported either via conveyor belts or water channels into the beet washing unit. The selection of the method is strongly influenced by local weather conditions and circumstances. From the arrival of the sugar beet at the factory's reception point to the crystallisation process, the practises in place make full use of the raw material. This is done through the production of high-value added products.

CASE STUDY 1: USING SUGAR BEET PULP FOR ANIMAL FEED AND OTHER APPLICATIONS

Every year, the extraction of sugar from sugar beet results in some 6-7 million tons (dry matter) (Source CEFS Sugar Statistics, EU28 average) of so-called **beet pulp** in the EU.

MAKING THE MOST OUT OF SUGAR BEET: IMPROVING COMPETITIVENESS

Apart from common household white sugar, the EU beet sugar industry is active in the development of a wide range of products, all of which originate from sugar beet.

EU BEET SUGAR **SUSTAINABILITY** PARTNERSHIP

These include food ingredients, animal feed, green chemistry products (replacing petroleum-based materials) and renewable ethanol for food and non-food uses. Other products such as lime fertiliser, agricultural soil and stones, serve as inputs to agriculture, as well as to civil engineering, road building and construction sectors. The sector is thus a key contributor to the EU biobased economy as sugar factories are biorefineries operating a closed circle between the field and the factory.

CASE STUDY 2: USING SUGAR BEET MOLASSES FOR ANIMAL FEED AND OTHER APPLICATIONS

The processing of beet into sugar also results in an estimated 3 million tonnes of **molasses** (Source: CEFS Sugar Statistics, EU28 average*), a syrupy product obtained during the manufacture of sugar from sugar beet. The sweet taste and high energy content make molasses a highly appreciated supplement for mixed animal feeds. Molasses is used in both energy feed and mineral feed supplements for virtually all types of livestock. Indeed, between 50 and 60% of dried beet pulp in the EU is molassed (Source: CEFS Sugar Statistics). Other applications for molasses include use as feedstock by fermentation industries to produce high value pharmaceuticals, citric acid, yeast, ethanol and biobased chemicals.

**including figure for France estimated on the basis of beet sugar production*

CASE STUDY 3: SUGAR FACTORY LIME (SFL)

The processing of beet into sugar also results in some 3 million tonnes of **Sugar factory Lime (SFL)** from the juice purification process (Source: The Product Carbon Footprint of EU Beet Sugar, 2012). SFL is used as a soil conditioner/fertiliser to improve soil structure and reduce soil acidity. SFL also contains nutrients such as magnesium, phosphates and nitrogen and is marketed in a range of forms to suit various spreading techniques.

CASE STUDY 4: USING CO_2 AND RESIDUAL HEAT FROM THE WISSINGTON SUGAR FACTORY TO GROW TOMATOES, BRITISH SUGAR

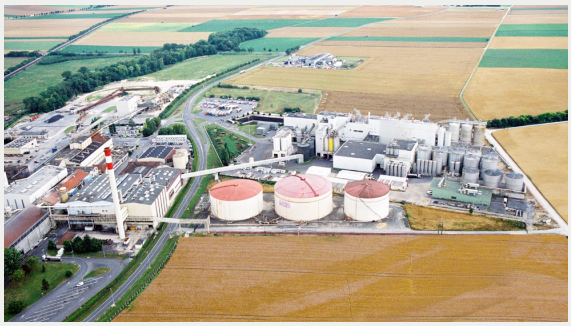
Hot water and carbon dioxide from Wissington sugar factory's Combined Heat and Power (CHP) plant are carried to the on-site 18 hectare tomato glasshouse. Here, some 250,000 tomato plants are grown, producing around 140 million tomatoes every year. The plants are pollinated by over 8,500 bumblebees living in 170 hives and irrigated by over 115 million litres collected annually from the glasshouse roof. For more information, see: www.britishsugar.co.uk/Tomatoes.aspx

WHAT'S NEXT

The bioeconomy comprises the production of renewable biological resources and their conversion into food, feed, biobased products and bioenergy via innovative, efficient technologies. In this regard, it is the biological motor of a future circular economy, which is based on the optimal use of resources. The production of primary raw materials in the most sustainable, efficient and productive way will be an essential goal for the future. In the case of the EU beet sugar sector, sugar beet constitutes the renewable biomass and the sugar factory is the integrated biorefinery. This closed-loop system of field to factory and vice-versa plays a role in the transition from a fossil-based economy to a renewable biobased economy, putting into practice the principles of circular economy in line with the Europe 2020 strategy, "a European Strategy for smart sustainable and inclusive growth". For more information, see: http://bit.ly/2frmDJw

CASE STUDY 5: THE IAR CLUSTER IN BAZANCOURT, CRISTAL UNION

This Industries & Agro-Ressources (IAR) site combines industrial sugar, starch and distillery plants as well as research and innovation. This allows for the production of a wide range of products beside sugar, SFL and animal feed. These include cellulosic ethanol and biopolymers such as hyaluronic acid.



More information can be found here: www.iar-pole.com

MORE INFORMATION

See Good Practices

Part A – Beet Cultivation:

5. Minimisation of Losses/Resource Use Efficiency
   - 5.1 Limit losses during harvest
   - 5.2 Limit losses during storage
   - 5.3 Material cycles

Part B – Processing:

1. Resource Efficiency
   - 1.1 Co-production
   - 1.2 Closed-loop (material cycles)
   - 1.3 Raw material efficiency