

CIRCULAR BIOECONOMY



THE EU SUGAR BEET SECTOR IS A MODEL OF CIRCULAR BIOECONOMY

The European beet sugar sector is 100% circular, making use of every part of the sugar beet. For us, sugar beet is the renewable biomass and the sugar factory is the integrated biorefinery. This closed-loop system of field to factory and vice-versa demonstrates the possibilities of the renewable biobased economy. The production of primary raw materials in the most sustainable, efficient and productive way will continue to be an essential goal for the future as well as the unlocking of non-food potentials of sugar beet, such as biogenic energy.

A SURPRISING AMOUNT OF PRODUCTS CAN BE DERIVED FROM SUGAR BEET: CONCRETE, BIOENERGY, BIOETHANOL, POLYMERS, PAPER, NYLON AND MUCH MORE... DISCOVER THE MAIN ONES:

FOOD

With 15.5 million tonnes of sugar produced from 1.5 million hectares of sugar beet, the EU is the world's largest producer of beet sugar. All factories that process beet in the EU today produce sugar as their primary product. Some EU sugar beet manufacturers also deliver other food products from sugar beet, such as syrups, plant-based protein and betaine.



Sugar

FEED

Sugar beet production in Europe helps offset the EU's heavy reliance on imported protein for animal feed use. Beet pulp can be used as animal feed, both in its fresh form (between 8 and 18% of dry matter), as pressed pulp (between 18 and 35% of dry matter) or as dried pellets (between 88 and 91% of dry matter) (Source: Reg. EC n°68/2013). Every year the extraction of sugar produces around some 22 million tonnes of pulp (25% dry matter).* This pulp is returned to farmers for animal feed, dried and further processed into compound feed, or used for other purposes.

*Source CEFS Sugar Statistics, EU average (2018/19-2022/23)



Animal Feed (Pulp & Molasses)

BIOENERGY

The EU is the World's 5th largest ethanol producer. Many factories produce bioethanol or non-fuel alcohol as a primary product, especially in France. Renewable European ethanol reduces greenhouse-gas emissions from today's vehicles – more than 78% in 2022 compared to fossil petrol – and it works in nearly all petrol cars currently on the road.



Bioethanol for transport

The EU sugar industry's most promising decarbonisation pathway is the usage of renewable energy produced from own biomass residues, in particular beet pulp. Beet pulp can provide enough energy to meet the needs of an energy efficient beet sugar factory. The methanisation or solid combustion of beet pulp, tops, tails and leaves could make a central contribution to the decarbonisation of the industry. Biomethane can also be fed into the national gas transmission network. And biodigestate left over from biomethane production can be used as a fertiliser.



Biomethane

Example: The Agrana subsidiary Magyar Cukor Zrt. operates Hungary's largest biogas plant at its sugar factory at Kaposvár. The plant can provide 83% of the primary energy needs of the sugar factory from the methanisation of beet residues during the sugar production campaign.



Electricity



District Heating





MINIMISING AGRICULTURAL LOSSES

Since sugar beet is a perishable crop, agricultural losses can take place after harvesting. To mitigate this, farmers use specific beet harvesting and storage methods.

During harvesting and loading, sugar beets are pre-cleaned to limit soil removal from the field. This reduces soil degradation and facilitates efficient processing. Beet harvest leftovers, such as beet tails, leaves, and weeds, are usually left on, or returned to, the field.

Efficient processing requires continuous delivery to the factory on a precise schedule. The sector is constantly working to improve efficiency (e.g. transport, logistics, round-the-clock harvesting, etc.). Until mid-November, most beet deliveries to sugar factories are just-in-time, thus minimising storage and associated losses. During the storage period, beet is stored outdoors on suitable sites to minimise deterioration. Many beet clamps are covered to protect them from frost and rain.

BIO-BASED PRODUCTS



Soil & Compost



Bioethanol

Bioethanol made from beet sugar fermentation is used for alcoholic drinks, perfume (LVMH is collaborating with the French cooperative Cristal Union and its 9000 growers for 3 major perfume brands going organic), disinfectant hand gel, pharmacy or industrial (solvent) uses.



Lime Fertiliser

The processing of beet into sugar also results in the production of Sugar Factory Lime from the juice purification process. It is used as a soil conditioner and organic fertiliser to improve soil structure and reduce acidity.



Vinasse

The liquid residue from ethanol production can be used as a fertiliser or further processed to extract valuable nutrients like potassium.



BIOPLASTIC

The residue from sugar beets can be used to make robust, flexible and water-tight bioplastic, which can then be used to make bottles and other products to replace oil-based PET bottles.



Biomaterials

Glycol from granulated sugar can replace petrol in the composition of polyester fabric or be used for building insulation or car dashboards.



Biochemicals

The **AFTERBIOCHEM** project aims to build the first all-in-one biorefinery in Saint-Avold, France, for transforming the sugar industry's sidestreams, mainly pulp and non-food waste, into bio-based molecules of industrial interest. These sidestreams from sugar beet can be used to produce flavourings, fragrances, hygiene products, pharmaceuticals, antimicrobials and polymers.



Many others

The **PULP2VALUE** consortium has built demonstration plants and developed positive business cases for sugar beet's high-value co-products such as microcellulose fibres, arabinose and galacturonic acid. These microcellulose fibres are used as new structurants for particles in solution in detergents, adhesives, paints and coatings, and drilling muds. Arabinose is used to develop foods with a low glycemic. Galacturonic acid is used in personal care products and as an environmentally friendly corrosion inhibitor.