ISSUE BRIEF: SOIL HEALTH AND BIODIVERSITY IN THE EUROPEAN SUGAR BEET SECTOR

On 20 May 2020, the European Commission published its Farm to Fork Strategy and Biodiversity Strategy, focusing on environmental measures by farmers, business and consumers for a fair, healthy and environmentally friendly food system. Working across 18 Member States with over 114 thousand sugar beet growers, the European sugar beet sector is building on a long tradition of own research to contribute to improving soil health and biodiversity at farm level.

SOIL HEALTH MANAGEMENT ON THE FARM

Soil is an irreplaceable resource, vital to the production of food, fuel and fibre. Topsoil, the upper 5 to 20 cm soil layer, has the highest concentration of organic matter and microorganisms. Plants generally concentrate their roots in, and obtain most of their vital nutrients from, this thin layer of the Earth's crust. That fertile soil can take thousands of years to develop and only a few seasons to be destroyed. Therefore, farmers take particular care to maintain as well as improve soil fertility and structure. Soil is also a key element in the current challenges faced by growers, of which in particular the storage of carbon and the increase of organic matter in the soil. This requires farmers to further develop and adopt appropriate good practices.

SUGAR BEET ON THE FARM FOR SOIL HEALTH

Sugar beet is always grown in crop rotation with for example winter wheat, barley, potatoes, etc., thus mitigating the depletion of crop-specific nutrients and the accumulation of crop-specific pests and diseases. One cornerstone to reduce the need for external inputs is the selection of tested varieties with resistance to various pests and diseases, such as Rhizomania, Nematodes, Cercospora leaf spot or Rhizoctonia. Farmers have every reason to keep the soil in good condition, as it is vital to ensure crops can continue to be grown in the future. Therefore, sugar beet growers avoid excessive tilling to prevent loss of topsoil. If crop rotation and soil type permit, the use of mulch and direct sowing are widely adopted, especially in areas vulnerable to wind and water erosion (Fig. 1).

FIGURE 1: EVOLUTION OF MULCH SEEDING OF SUGAR BEET IN GERMANY, 1994–2019

Source: Institute of Sugar Beet Research, IfZ

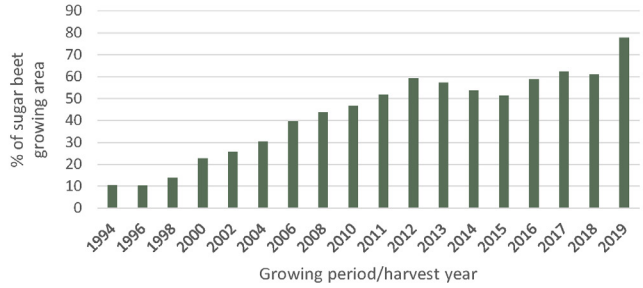
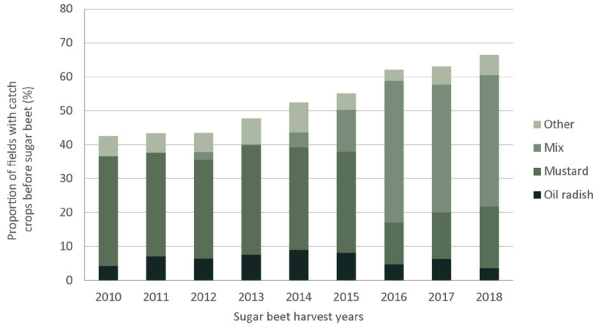


FIGURE 2: GROWING COVER CROPS BEFORE SUGAR BEET IN GERMANY, 2010–2018

Source: Institute of Sugar Beet Research, IfZ



Another aspect of improving soil health is the use of cover crops and valorisation of residual organic matter from the beet leaves (Fig. 2). These practices can help promote soil biodiversity and fertility and reduce the use of mineral fertilizers. Planted before or after sugar beet, cover crops remain in place during winter – this helps to stabilize the soil structure, add organic matter and enhance the environment for beneficial microorganisms.

PROTECTING SOIL STRUCTURE

The machinery used in the field can also have an impact on the soil. The sector advocates the use of appropriate machinery for different degrees of soil moisture and the use of low-pressure tires on field vehicles that will result in reduced compaction. In order to leave as much soil and organic matter on the field, sugar beets are pre-cleaned before transport to the factory and beet cleanliness is an economic incentive for growers.

LINKING SOIL HEALTH AND BIODIVERSITY MEASURES - INTEGRATED PEST MANAGEMENT (IPM) IN SUGAR BEET

Integrated Pest Management (IPM) is a cornerstone element in European sugar beet growing. Every beet growing Member State has a national IPM plan containing measures and recommendations regarding sustainable sugar beet growing, developed by the sugar beet sector in collaboration with research institutes, using crop rotation, variety selection, treated seed, seed priming, integrated weed management (IWM) and integrated pest & disease control in order to minimize the use of crop protection products.

Over the last years, monitoring of beneficial and pest insects and sharing information via digital tools has strengthened the decision-making process for farmers to only use insecticides when absolutely needed. Monitoring beneficial insects and creating habitats for them has become the starting point for research projects like NIKIZ (Sustainable Insect and Disease management in future beet growing) in Germany.

BIODIVERSITY MEASURES IN SUGAR BEET FIELDS

Linking IPM practices is often combined with additional efforts to promote biodiversity at field and farm level. The practice of sowing flower mixes to create flowering strips at field edges is being adopted increasingly by growers. This not only considerably enhances the landscape, but also creates habitats for insects, birds, and small animals.

CASE STUDY 1: SUPPORTING FLOWER STRIPS AND BEEKEEPERS

Cristal Union launched "Bee Happy" with its cooperative members in September 2020, offering them seeds for flower mixes to establish 1,600 hectares of melliferous plants over the next 3 years to provide food for pollinating insects (bumblebees, butterflies, domestic and wild bees). With these renewable 3-year projects, Cristal Union brings together farmers and beekeepers on a long-term basis, while hoping to encourage many beekeeping vocations among its cooperative members.

Südzucker AG has been providing its sugar beet growers in Germany, France, Belgium and Poland with seed mixtures for flowering strips at the edge of the field free of charge. More than 1,800 growers are now involved and using part of their cultivation area to create flower strips.

SUGAR BEET FIELDS AS A FEEDING GROUND FOR BIRDS

During autumn and winter, sugar beet fields provide protection (nesting locations) and feed for many migratory and non-migratory birds (pink-footed goose, skylark, golden plover, pied wagtail, meadow pipit, house martin). After the sugar beet harvest from September to February, many birds are attracted to the remaining beet tops for food. The Royal Society for the Protection of Birds (RSPB) emphasises that UK sugar beet production supports "internationally important populations of pink-footed geese and nationally important populations of stone curlews".

IN THE FACTORY

The process of producing sugar from beet generates a range of other valuable products, some of which are used to enhance soil quality and fertility, returning value to the field season after season. In the factory, limestone is used as natural agent to purify the raw sugar juice in the extraction process. After the process, this sugar factory lime (SFL) has a high calcium carbonate content, making it a good fertilizer and soil-conditioning product. SFL also contains other useful nutrients such as magnesium, phosphates and nitrogen and can improve soil structure and reduce soil acidity when applied in the field.

CASE STUDY 2: COPROB TIMAC AGRO TURN CARBONATION LIME INTO EFFICIENT GRANULAR FERTILIZER

Implementing EU rules and "circular economy", COPROB - Italia Zuccheri has innovated in its methods to use carbonation lime as an agricultural fertilizer. This lime (also known as sugar factory lime) is optained during the

processing of sugar beet; it is already used in agriculture but with difficulties regarding conservation, transport, spreading, etc. The newly obtained technology, elaborated in partnership with TIMAC AGRO, results in a new processing of carbonation lime into a highly efficient standardized granular fertilizer, easily manageable in all phases, from transport via storage up to use in the field. This solution allows to fully exploit sugar beet to the benefit of biodiversity and, in the long-term, in the fight against climate change.

Other organic material arising from the harvesting of sugar beet, such as residue beet tops and tails, can also be used in biogas production, the residues of which, known as biogas digestate, can later be returned to the field.

BIODIVERSITY ON THE FACTORY GROUNDS

Factory areas are often spread over several hectares, due to the settling and clarification ponds for water and beet soil. These ponds provide a habitat notably for birds (little ringed plover, the endangered white-starred bluethroat or the marsh harrier, Egyptian goose, little grebe, mallard, grey heron, oystercatcher, kingfisher and reed warbler, insects such as small the heath butterfly and the speckled wood butterfly and even mammals (muntjac, water vole). Even after production is finished in a factory, the ponds continue to serve as a wildlife and biodiversity sanctuary, creating value to the local flora and fauna.

CASE STUDY 3: EXAMPLES OF BIRD SANCTUARIES

1. **The clarification ponds of the sugar factory in Offstein, Rhineland-Palatinate, Germany have been an officially recognised bird sanctuary since 2005 and are important for the biodiversity of the region. Some 115 bird species nest, breed and rest on the approximately 65-hectare area - the equivalent of about 80 football pitches.**
2. **Within the boundaries of British Sugar's Cantley factory, 45 hectares of Broadland marsh are managed (grazed between April and October, which helps to create a habitat for ground-nesting birds). Furthermore, in cooperation with the RSPB, 2.4 km of foot drains were re-created. These quickly started to fill with drain water and, as they continue to flood during the winter months, make an ideal overwintering ground for migrating wading birds. In spring and early summer, as the marshes dry and water levels recede, muddy margins attract a multitude of fly life that will feed the newly hatched chicks. The aim is to encourage bird species such as lapwing, redshank and other migrant waders to the marsh.**

WHAT'S NEXT

The role of soil conservation as a natural carbon sink – capturing and retaining carbon that would otherwise contribute to climate change – is a key topic in climate science. Good practices that aim to increase soil organic matter in the crop and reduce the amount of soil tare (i.e. soil removed with the beet from the field) are part of interdisciplinary research programmes linking growers, beet research institutes and machinery producers.

New technology innovations such as precision application of plant protection products, field robots and variable rate application of fertilizers, will gradually find more uptake among growers and thus further reduce the use of external inputs, but appropriate frameworks and incentives by EU and national policies need to stimulate this uptake.

MORE INFORMATION

See Good Practices

Part A – Beet Cultivation:
3. Soil Fertility
- 3.1 Maintaining the organic matter
- 3.2 Protecting beneficial organisms
- 3.3 Control of soil-borne pathogens
- 3.4 Preventing erosion & compaction

Part B – Processing:
1. Resource Efficiency
- 1.1 Co-production
- 1.2 Closed-loop (material cycles)