



A transforming european
sugar industry:
new and better jobs in a
competitive, innovative
and **sustainable industry**



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Final Report



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competitive, innovative
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Areté The Agri-food
Intelligence
Company

TABLE OF CONTENTS

FOREWORD	7
INTRODUCTION	8
Project objectives	8
Data collection strategy	8
1 THE EU BEET SUGAR SECTOR: KEY FACTS AND FIGURES	10
2 RELATIONSHIPS AMONG SOCIAL PARTNERS	13
3 STATE OF EMPLOYMENT IN THE EU BEET SUGAR INDUSTRY	16
3.1 Socio-demographic situation of workforce.....	16
3.2 Job quality	17
4 JOBS IN THE EU BEET SUGAR SECTOR: BEST PRACTICES TO BOOST EMPLOYMENT AND REGIONAL DEVELOPMENT	21
4.1 Safeguarding and boosting employment	22
4.2 Boosting regional development in EU sugar beet growing areas.....	25
5 EUROPEAN GREEN DEAL: WHAT ROLE FOR FACTORIES AND WORKERS OF THE EU BEET SUGAR SECTOR?	27
5.1 Further increasing the sector's sustainability	27
5.2 Diversification towards production of other beet-derived products.....	31
6 THE JOBS OF THE FUTURE: THE EU BEET SUGAR SECTOR IN TRANSITION AND SKILLS REQUIRED OF WORKERS	36
6.1 Potential for future jobs in the sector in a new, integrated approach to biorefinery.....	36
6.2 Skills required of workers in a new, integrated approach to biorefinery	38

7 INCREASING THE SECTOR'S ATTRACTIVENESS TO YOUNG WORKERS.....	41
7.1 Current attractiveness of the sector as an employer	42
7.2 How to improve the attractiveness of the sector to young workers	44
8 FACILITATING INTRA-EU SKILLS MOBILITY	50
8.1 Barriers to intra-EU skills mobility.....	50
8.2 Promoting improved intra-EU skills mobility	52
9 RECOMMENDATIONS	53
9.1 Safeguarding/boosting employment in the EU beet sugar sector and promoting regional development in sugar beet growing areas.....	53
9.2 Further increasing the EU beet sugar sector's sustainability and promoting diversification into other beet-derived products.....	54
9.3 Securing the skills required of the workers in a sector in transition.....	55
9.4 Increasing the sector's attractiveness to young workers.....	57
9.5 Facilitating intra-EU skills mobil.....	58
10 BIBLIOGRAPHY	59

FOREWORD

Beet sugar factories offer skilled, remunerative industrial employment and are often at the heart of the rural communities in which they operate. Factories generate important economic multipliers: supporting sugar beet farmers; providing food producers with high-quality, sustainable sugar; providing co-products from sugar beet to a wide range of destinations, from electricity generation and biofuels production to use in the chemicals and fermentation industries; and, offering pastoral agriculture nourishing animal feed from beet pulp.

There are no simple and straightforward solutions to challenges ahead, but social partners CEFS and EFFAT are mutually committed to creating the dialogue and collaboration needed to ensure the continued competitiveness and sustainability of our industry and, through this, quality employment vital to the livelihoods of hundreds of thousands of European citizens and some of our most fragile communities.

The EU beet sugar sector has undergone successive restructurings: in 2006-2009 and, most recently, since the end of the quota period in September 2017. This has required close cooperation between workers and industry, facilitated by the sugar industry Social Dialogue on various levels.

Sustainability is at the core of beet sugar production in both factories and field. Sugar production in the EU constitutes a bio-based circular economy where every part of the beet is used, either as a product or as an input in the production process. The EU beet sugar industry is well on track to reduce its greenhouse gas (GHG) emissions by 55% by 2030, in line with the Green Deal objectives. And sugar beet is well regarded as a key component of crop rotation systems and an important nitrogen-fixing plant. All those transformations need strong involvement of social

partners to ensure a just transition for workers and quality job creation.

However, the EU beet sugar sector is a vulnerable sector that needs protection.

A legal framework with incentives to support new diversification and decarbonisation strategies is key. Once shuttered, a sugar factory will almost never re-open its doors. This is because the construction of a sugar factory entails high capital costs, typically of several hundred million Euros. Its closure represents a permanent loss to the local community in the form of hundreds of direct and indirect jobs lost and hundreds of millions of Euros of economic activity. Beet sugar production and sugar beet cultivation are symbiotic: the one cannot exist without the other.

The present report is the final output of a **project funded by the European Commission** and carried out by Areté consulting firm for social partners CEFS and EFFAT. The project aimed at helping the social partners to further develop a **competitive, innovative and sustainable vision of the sugar industry**, moving towards new and better jobs, and leading the transition towards a post-petroleum society while decoupling economic growth from resource depletion and negative environmental and social impacts. The report illustrates the main findings of the project and provides a comprehensive set of detailed recommendations aimed at contributing to the realisation of the project's objectives.



INTRODUCTION

The present report represents the final output of a project carried out for CEFS and EFFAT between February 2020 and January 2022. The study investigates the current status and future challenges of the EU sugar industry, with a specific focus on:

- the current state of employment in the sector (*section 3*),
- the best practices to safeguard/boost employment in the sector (*section 4*),
- the role that the sector can play in the framework of the new European Green Deal (*section 5*),
- an analysis of the sector in transition after the end of sugar quotas, of the potential for future jobs in the sector and of the skills required of workers (*section 6*),
- the sector's attractiveness to young workers (*section 7*), and
- insights into facilitating intra-EU skills mobility within the sector (*section 8*).

Finally, a comprehensive set of **detailed recommendations aimed at contributing to the achievement of the objectives of the project** is provided in *section 9*.

Project objectives

The project aimed at achieving the **overall objective** of helping the social partners - CEFS and EFFAT - to further develop a **competitive, innovative and sustainable vision of the sugar industry** and

new and better jobs leading the transition towards a post-petroleum society while decoupling economic growth from resource depletion and negative environmental and social impacts.

To that purpose, the project aimed at achieving the following **specific objectives**:

1. Mapping the **relationship of social partners** (organisations representing the interests of workers and employers) **in the sugar industry** across the EU from a qualitative perspective, collecting **good practices** and assessing the **state of employment** in the industry.
 - a. Discussing the **future of the sugar industry**, including:
 - b. efforts to **further increase sustainability** and to **promote diversification** towards the production of other beet-derived products;
2. the **potential for future jobs** in the sector and the **skills required of the workers** in a new, **integrated approach to biorefinery**.
3. Exploring how to increase the **sector's attractiveness to young workers** in a modernised labour market.
4. Exploring how to **facilitate intra-EU skills mobility**.

Data collection strategy

The **data collection strategy** for the project was designed around three main pillars:

- A. **Desk research** and analysis of the available literature and other relevant documentation (e.g., codes of good practice, collective agreements, position papers, policy documents, etc.).

- B. **In-depth interviews** with EU-level stakeholders; a total of 21 interviews were carried out for the study, out of which:
 - a. 5 interviews with EU-level associations;
 - b. 7 interviews with trade unions;
 - c. 7 interviews with sugar companies;
 - d. 2 interviews with European institutions.

- C. **Two workshops**, organised in April and October 2021 with the participation of CEFS, EFFAT and their members/affiliates respectively, as well as external independent experts and keynote speakers. The two workshops played a central role in the development of the discussion with sectoral stakeholders around the themes of jobs in the EU beet sugar sector, skills required of workers in the sector, the role of the sector in the framework of the EU Green Deal, the sector's attractiveness to young workers and solutions to facilitate intra-EU skills mobility within the sector.

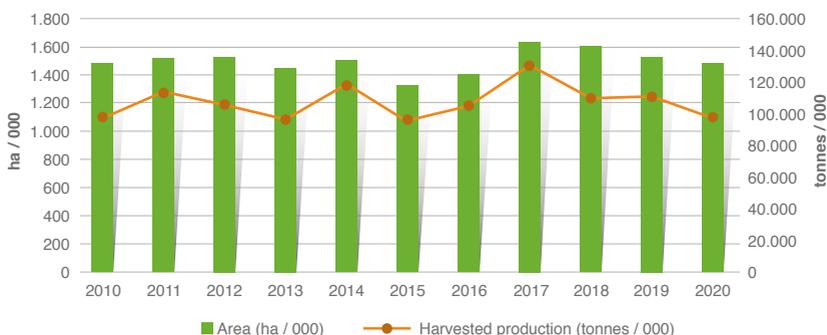
1 THE EU BEET SUGAR SECTOR: KEY FACTS AND FIGURES

The EU beet sugar sector has gone through deep changes over the last years, mainly because of the 2006 reform of the EU sugar regime and the ultimate end of the quota system in 2017. These developments have driven consolidation and restructuring in the sector, resulting in increased competitiveness and factory productivity. Growing third country pene-

tration of the EU sugar market - a result of progressive market opening in trade negotiations - has been a secondary source of pressure on the EU beet sugar industry.

At sugar beet farming level, cultivated areas and harvested production have been fluctuating over the 2010-2020 period (Figure 1.1).

Figure 1.1 – EU27 sugar beet cultivated area and harvested production (2010-20)



Source: DG Agri – Short term outlook, DG Agri – Sugar supply balance, CEFS sugar statistics (for 2011-12 and 2012-13 campaigns)

Some shifts between Member States have occurred since the end of quotas in 2017 in cultivated areas and production

volumes, with increasing concentration in the top 5 producing Member States (Table 1.1).

Table 1.1 – EU27 and top 5 Member States – sugar beet cultivated area and harvested production

Cultivated areas (ha/000)		
	Avg. 2010-2017	Avg. 2018-20
EU 27	1,491	1,548 (+4%)
Top 5 MS*	1,110	1,239 (+12%)
Other MS	381	309 (-19%)
Harvested production (tonnes/000)		
	Avg. 2010-2017	Avg. 2018-20
EU 27	110,105	108,402 (-2%)
Top 5 MS*	86,077	88,624 (+3%)
Other MS	24,029	19,778 (-18%)

Source: DG Agri – Short term outlook

*Czechia, Germany, France, Netherlands, Poland / ** Belgium, Germany, France, Netherlands, Poland

As for the processing stage, the last 11 years have seen fluctuating production of white sugar in the EU, without clear growth/contraction trends (Figure 1.1).

The already-observed concentration of production in the leading Member States

is even more evident for sugar: the top 5 sugar-producing EU27 Member States (Belgium, Germany, France, Netherlands and Poland) have increased their sugar output by around 15%, at the expense of the other Member States (Table 1.2).

Table 1.2 – EU27 and top 5 Member States – beet sugar production

Beet sugar production (tonnes/000)		
	Avg. 2010-2017	Avg. 2017-20
EU 27	15,861	16,792 (+6%)
Top 5 MS*	11,825	13,633 (+15%)
Other MS	4,036	3,159 (-22%)

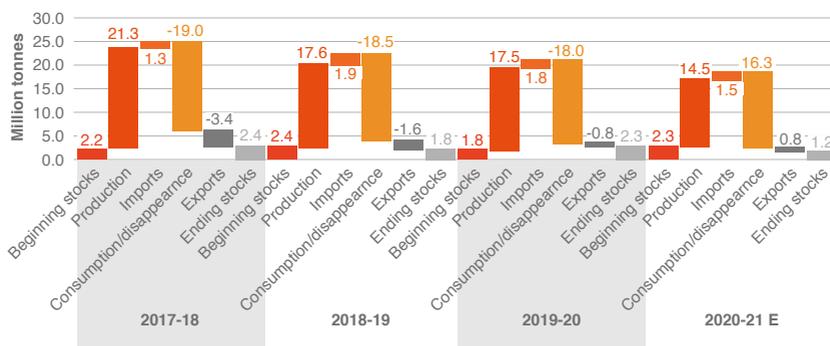
Source: DG Agri – Sugar supply balance, CEFS sugar statistics (for 2011-12 and 2012-13 campaigns)

*Belgium, Germany, France, Netherlands, Poland

The last sugar supply balances at EU28 level show a declining consumption (Figure 1.2). The EU is traditionally a net importer of sugar (imports systematically exceed exports); the only significant exception

was the first marketing year after the end of the quota system (2017/18), when an exceptionally abundant sugar production was obtained.

Figure 1.2 – EU beet sugar supply balance (2017-21*)



Source: DG Agri – Sugar supply balance

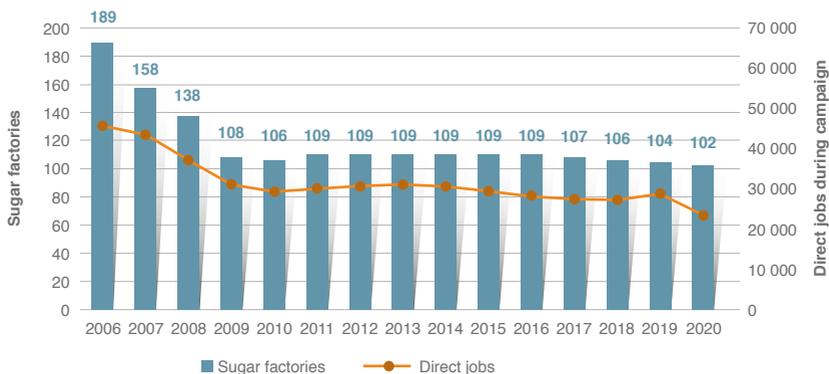
*2020/21 data are estimated; 2017/18 to 2019/20: EU-28; 2020/21: EU-27 (United Kingdom excluded)

*According to the 2019-20 DG Agriculture sugar balance sheet, beet sugar production still takes place in AT, BE, CZ, DE, DK, EL, ES, FI, FR, HR, HU, IT, LT, NL, PL, RO, SE and SK

The number of beet sugar factories operating in the EU sharply decreased from 189 in 2006 to the current 99; mainly due to factory closures, also employment in the sector decreased from around 52,000 direct jobs during the campaign in 2006 to approximately 24,000 in 2020 (Figure 1.3).

Beet sugar production in the EU is currently limited to 18 Member States, due to the restructuring process that started in the early 2000s and continued after the termination of the quota system.¹

Figure 1.3 – EU28 beet sugar factories and direct employment during campaign (2006-20)



Source: CEFS sugar statistics

2 RELATIONSHIPS AMONG SOCIAL PARTNERS

The EU beet sugar sector has experienced a dramatic reduction in the number of operating factories and in its workforce since the 2006 reform, initially due to the restructuring process resulting from the reduction of sugar quotas and then following the end of the quota system itself. However, discussions about possible strategies to cope with competitive pressure without serious negative impacts on employment and working conditions in the EU beet sugar sector have been ongoing for a much longer period. The **EU Sugar Sector Social Dialogue** was established in 1969, right after the entry into force of the Common Market Organisation (CMO) for sugar; it has been of paramount importance for ensuring a socially adequate transition in difficult times, such as those following the 2006 reform of the EU sugar regime and the end of quotas in 2017.

The two EU-level social partners in the beet sugar sector are: on the industry/employers' side, CEFS; and on the workers' side, EFFAT. These two organisations and their national members represent the vast majority of the EU sugar sector stakeholders. CEFS and EFFAT have also been recognised (Eurofound, 2016) as *“the most important European-level social partner organisations in the sector and, also, the only social partners in the European Sectoral Social Dialogue Committee for the sugar sector”*.

CEFS counts 37 individual companies as full members (of which 35 are based in the EU). In addition, 8 national associations are representative members. Finally, Zaharni Zavodi (Bulgaria) and the Syndicat du Sucre de la Réunion (French Over-

seas Territories) are associate members.²

EFFAT has currently 116 national member associations operating in 37 countries³; the majority of them is specifically focused on the interests of workers in the food industry, while the remaining ones have a cross-industry focus. In total, EFFAT represents the interests of over 25 million workers in the food, agriculture and tourism sectors. Out of the 27 Member States in the EU, 25 are represented in the EFFAT membership base with one or more organisations.

Beet sugar is currently produced in 18 Member States.

CEFS and EFFAT have been social partners within the Sugar Sector Social Dialogue since its establishment; with the formal recognition from the EU Commission in 1999, also the **Sectoral Social Dialogue Committee (SSDC) for the sugar industry** was created.

In 2003 CEFS and EFFAT started working together on the topic of Corporate Social Responsibility, developing a **Code of Conduct** that entered into force at the beginning of 2004. The Code sets eight compulsory minimum social standards and basic rights.

The vast majority of CEFS and EFFAT members are involved in collective bargaining at national level, be this multiemployer bargaining (MEB⁴) or single-employer bargaining (SEB⁵). As reported by Eurofound (2016), the **collective bargaining coverage in the EU sugar sector is remarkably high, i.e., close to 100% in most Member Sta-**

²CEFS website – accessed on Nov 9th, 2021: <https://cefs.org/about-cefs/#members>

³EFFAT website – accessed on Nov 9th, 2021: <https://effat.org/members/>

⁴MEB stands for a bargaining conducted by an employer organisation on behalf of multiple companies on the employers' side.

⁵SEB stands for a bargaining where an individual company is part of the agreement. This includes the cases where two or more companies jointly negotiate an agreement, or an employer organisation negotiates on behalf of only one company.

tes. Collective bargaining is, on the one hand, a common practice in the industry and a **relatively good indicator of the existing and constantly renewed dialogue among social partners**; on the other hand, it should be noted that in some Member States with very high rates of collective bargaining, SEB is usually the common (or only) practice. Another useful indicator of the **quality of social dialogue** in the sector is the **extent to which trade unions and employer organisations are consulted in sector-related matters by public authorities**. The 2016 Eurofound study shows that in 15 Member States in 2016 at least one trade union with interests in the sugar sector was involved in these processes by public authorities, either on a regular or on an *ad hoc* basis. For what concerns employer organisations, they were consulted in 11 Member States. In terms of prevalence, the study reveals that 49% of trade unions were consulted by public authorities, versus 72% of employer organisations. Consultation of trade unions by public authorities takes place mainly on an *ad hoc* basis, while consultation on a regular basis prevails for employer organisations. It can hence be concluded that the **participation of employer organisations in public policy consultations was stronger than that of trade unions**, at least till 2016. For what concerns **consultations within sector specific public policies**, five Member States (Bulgaria, Denmark, Finland, France and Italy) have bodies where social partners are involved in the decision-making process. These bodies deal with a plurality of topics, including **education and (vocational) training, working environment, occupational health and safety, and healthcare as well as forecasts of employment and skills**. In Bulgaria and Finland (3 bodies

in total), the character of these bodies is **tripartite**, i.e., the Government plays an active role side by side with trade unions and employer organisations, on the other hand, in Denmark, France and Italy (12 bodies in total) their nature is **bipartite**.

These efforts bring every year new elements to build a comprehensive and inclusive discussion about the central themes for the industry: employment, working conditions and human rights, training and development of skills. The most tangible example of the final goal of such process is certainly the development, in 2003, of the **Code of Conduct**, stating **eight minimum standards of Corporate Social Responsibility (CSR) that the social partners and their members continuously advocate**.

Equally noteworthy are also the **twelve joint positions on social and economic matters** issued by CEFS and EFFAT in the last 22 years, on topics spanning from apprenticeship in the sugar sector to work safety and competitiveness.

Table 2.1 reports selected examples of good practices aimed at the improvement of relationships among social partners implemented in recent years by sector stakeholders at EU or multi-country level.

Table 2.1 – Selected good practices in the field of relationships among social partners

Geographical scope	Promoter(s)	Initiative (date/period)
EU	CEFS-EFFAT	<p><u>Development and regular monitoring of the implementation of the Code of Conduct on CSR (since 2004)</u></p> <p>The Code lists eight compulsory minimum social standards and basic rights spanning from working conditions and fair pay to transparency on restructuring processes within the industry.</p>
EU	CEFS-EFFAT	<p><u>Continuous seeking for up-to-date knowledge, best practices and solutions (since 2004)</u></p> <p>CEFS and EFFAT have sought to get up-to-date knowledge not only of their sector of interest, but also of good practices, effective solutions and success stories from other sectors on cross-sectoral issues concerning social dialogue. The two organisations have also solicited opinions from both sector stakeholders and independent third parties on a number of hot topics related to the food industry and the sugar sector in particular. This attitude is demonstrated by a significant number of studies and projects promoted by both organisations on subjects like digitalisation, new career paths and bioeconomy.</p>
EU	CEFS-CI-BE-EFFAT	<p><u>Establishment of the EU Beet Sugar Sustainability Partnership (2013)</u></p> <p>The three organisations established a partnership dedicated to the promotion of sustainability throughout the sugar supply chain, highlighting and facilitating further the dissemination of best practices from an agricultural, industrial, social and environmental standpoint.</p>
EU	CEFS-EFFAT	<p><u>Initiative on sustainability of private company pension funds (2015)</u></p> <p>The social partners discussed the issue of pension funds within sugar companies, promoting constructive dialogue around a hot topic in the relationships between workers and employers and in the overall financial sustainability of companies.</p>
Multiple MS	Tereos	<p><u>European Works Council agreement at Tereos (since 2017)</u></p> <p>In May 2017, Tereos Group Management and the Special Negotiating Body signed an agreement on the new European Works Council; a place of information and consultation for matters of transnational nature.</p>
Multiple MS	Agrana and Südzucker	<p><u>Employers' and worker's representatives' meetings</u></p> <p>The European umbrella workers' organisation of the two companies meets every year to discuss with the employers, among others, the development of the sector, the impact of the end of the quotas on jobs, the training and education of workers, subcontracted and temporary labour and the growing scarcity of skilled labour.</p>

3 STATE OF EMPLOYMENT IN THE EU BEET SUGAR INDUSTRY

Topic	Key findings
Current status of workforce in the EU beet sugar sector	Ageing workforce , predominantly represented by male workers.
	Average higher qualification of beet sugar workers vis-à-vis EU food industry as a whole.
	Increasing difficulties in attracting young workers because of atypical working hours, less flexibility in work planning and more difficult work-life balance.
Job quality in the EU beet sugar industry	Wrong perceptions among young workers: food industry offers cold, heavy, dirty and hard work with a worse career path than in other industries.
	Very good career paths actually available in the sugar industry: high diffusion of permanent employment contracts and demand for skilled workers.
Good practices in the beet sugar industry	A number of initiatives have been carried out in the last years by the vast majority of EU sugar producers, often in cooperation with trade unions , to improve working conditions and job quality, reduce risks, promote well-being and stimulate skills transfer and development.

3.1 Socio-demographic situation of workforce

The most recent complete picture of the socio-demographic characteristics of the workforce employed in the EU beet sugar industry is presented in a 2015 CEFS and EFFAT study. Some sugar producers and industry associations consulted for the study provided more up-to-date (but often confidential) statistics; updated relevant data were also sourced from the annual reports of some producers. The most recent evidence basically confirmed the key findings of the CEFS/EFFAT study, but also revealed some improvements, especially in terms of gender composition.

According to the CEFS and EFFAT study, the EU sugar sector is experiencing a **progressive ageing of its workforce**, with an average age of sugar workers of 46 years and over-55s accounting for 25% of the total workforce - well above the EU average in the food sector (17%)⁶. By contrast, workers aged 24 or less accounted for just 5% of total workforce in the sugar sector in 2015.

In terms of gender composition, **male workers accounted for around 80% of the total workforce in 2014**, with women particularly underrepresented in the 15-24 years class⁷. By way of comparison, the EU food sector as a whole shows a much higher incidence of women, at 43%

⁶Eurostat – Labour Force Survey, 2019. More recent statistics provided by some consulted producers/employers' associations, or publicly available in their annual reports, basically confirm the significant relative weight of the over-50 or over-55 age groups (falling in the 25-30% range). In some cases, the weight of the older age groups has significantly increased compared to 2015, thus confirming the trend towards a progressive ageing of the workforce in the industry.

⁷More recent statistics provided by some consulted producers/employers' associations, or publicly available in their annual reports, reveal a slow but rather steady improvement of the gender balance in the industry. Female employees account for 21-22% of the workforce in most of the companies/national sectors for which more up-to-date figures are available. For some producers, the share of female employees is above 25%; by contrast, only around 10% of the workforce of other producers is made of women. The share of female employees is significantly higher in "white collar" jobs (often beyond 35%) than in "blue collar" jobs (generally less than 20%).

of the total workforce. The study provides as a possible explanation of this situation the fact that a very large proportion (80%) of sugar sold in the EU is delivered in bulk: this implies that conditioning and packaging – activities in which women are generally better represented – remain relatively less important in the EU sugar industry.

The comparison between the EU sugar sector and the EU food industry as a whole becomes more balanced when considering **workers' qualifications**: 28% of sugar workers had lower levels of education in 2015, slightly below the EU food industry average (30%), while workers with higher levels of education accounted for 17% of total workforce in the sugar sector⁸, a higher share than in the EU food industry as a whole (14%).

3.2 Job quality

It is generally recognised that in the last years the **EU food industry has experienced increasing difficulties in attracting young workers** compared to other manufacturing sectors (EFFAT and FoodDrinkEurope, 2019). It might be difficult to identify a single reason behind this issue, which seems to derive from a combination of factors that are typical of the food manufacturing sector (Eurofound, 2014):

- Working atypical hours (nights or weekends) is more prevalent in the food industry.
- Working hours are more regular (i.e., same number of hours and same number of days) in the food industry (compared to general manufacturing): this suggests less flexibility in work

planning. It should however be underlined that the sugar sector is a notable exception, due to its shift-based work routines during the sugar beet processing campaign.

- The work-life balance is worse in the food industry compared to general manufacturing, possibly (again) due to atypical working hours.

In addition to the above features, some general – and sometimes false – perceptions affect the food industry, especially among young workers. In particular, there is a rather widespread perception that food industry offers cold, heavy, dirty and hard work within a rigid structure, meaning that the food industry as a career path is quite often seen in an unfavourable light given the (perceived) better working conditions in other sectors.

Within this framework, the sugar sector has additional characteristics which should be taken into account when discussing its overall job quality. First of all, it is a **seasonal industry**, with campaigns lasting on average around 119 days in the EU in 2019/20 (CEFS, 2021) and with a workforce increasing on average by +29% during the processing campaign compared to the rest of the year (CEFS, 2021). Secondly, the sugar industry is **characterised by rather physically intense working conditions and work in shifts in sugar factories** (running 24 hours, 7 days a week during the processing campaign) compared to the rest of the food industry: this may contribute to make sugar factories a less attractive workplace for blue collar workers. These features were widely highlighted in the interviews made for the study as the most significant downsides of working in a beet sugar factory,

especially for blue collar workers. The **location of processing plants in rural areas or small/medium urban centres**, rather than in major cities, was also often cited by interviewees (from both HR departments of sugar companies and trade unions) as a feature that limits the appeal of the beet sugar sector as an employer.

Despite the above factors, the study by CEFS and EFFAT (2015) highlights a number of features supporting the consideration that a **job in the sugar industry offers good perspectives in terms of career paths**. On the one hand, **permanent employment contracts** represent the norm in the sector, with around 80% of all workforce being employed on a permanent basis; on the other hand, the **increasing need for technicians and professionals** confirms that required job profiles might attract well-trained and skilled workers. The interviews made for the study, together with more recent publicly available information, confirmed these key determinants of the attractiveness of beet sugar producers as employers, and widely highlighted some additional ones, with particular regard to **wage levels generally above the food industry average**, and **well-detailed collective agreements**. With specific regard to the attractiveness of the sector for young workers, several interviewees (from both HR departments of sugar companies and trade unions) underlined the potential appeal of **being involved in different activities over the year** (i.e., during the processing campaigns and in the off-campaign periods, when factory maintenance work is carried out).

Over the past years, social partners in the EU beet sugar sector have reiterated the **importance that this industry holds from a social standpoint, not only for**

the directly employed, but also for a wider range of stakeholders at different levels. The main reasons behind this consideration can be summarised as follows:

1. Beet sugar factories offer **skilled and remunerative industrial employment**, with an increasing need of qualified categories of both middle-level technicians and blue collars.
2. Beet sugar factories are typically located in rural areas, close to sugar beet farmers, and they often **represent the centre of entire rural communities**.
3. Beet processing offers economic multipliers for a wide range of stakeholders: sugar beet farmers, livestock farmers, secondary processors and the chemical and fermentation industries.

For the above reasons it is important to:

- **further enhance working conditions**;
- proactively **tackle emerging issues**, such as lack of adequately skilled profiles, restructuring processes / lack of competitiveness, need to attract young workers, promote the transfer of knowledge between generations, ensure adequate conditions for all workers, and specifically senior workers;
- **keep the social dialogue between workers and employers at the very centre of the industry agenda**.

In their bi-annual Corporate Social Responsibility Report, CEFS and EFFAT identify a short selection of best practices implemented by the industry on different topics. Most of the time, these ini-

tiatives represent **success stories and examples of how sugar companies go beyond the minimum standards set out in the Code of Conduct.**

A selection of these practices is outlined in Table 3.1, taking into account both the importance of the initiative for the improvement of working conditions and the replicability of the practice for other players.

Table 3.1 – Selected best practices in the field of improving working conditions and job quality in the EU beet sugar sector

Geographical scope	Promoter (start)	Initiative (date/period)
Italy	COPROB (2020)	<p><u>Trainings for organic sugar production</u></p> <p>In 2020 the Italian cooperative sugar producer COPROB launched with the support of the Emilia Romagna Region a 29-hours training for organic sugar beet growers. The objective is to transfer specific knowledge on organic production of sugar beet and is organised in the COPROB headquarter near Bologna. The training is part of the wider initiative of COPROB for the development of a sustainable and 100% Italian organic sugar supply chain.</p>
France	Tereos (2018)	<p><u>Creation of employees' campus</u></p> <p>In 2018, French-based multinational sugar producer Tereos inaugurated its Tereos Campus Europe, a European operational centre of expertise and innovation. Located in the heart of the Group's European farming basins and industrial network, the site accommodates more than 500 employees. The company also opened a Europe Business Services Centre in Lille, staffed by 80 administrative personnel. The aim of this project is to enable different departments and entities at all levels to work together in a more coordinated and concerted way. Among the services offered in the campus for the employees, free shuttle services from the airport or from Paris' central station, development of a car-pooling application, parents' access to a network of 2,000 nurseries, a fitness centre and a company concierge service.</p>
Netherlands	COSUN (2017)	<p><u>Introduction of new shift systems</u></p> <p>Dutch cooperative sugar producer COSUN introduced in recent years a 5-shift system during the beet campaign. The initiative took place due to increasing length of production campaigns, to ensure less intensive work, health and safety of the workers and a better balance in working hours.</p>
Austria	AGRANA (2017)	<p><u>Stress and burnout management</u></p> <p>In 2017, Austrian sugar company AGRANA (part of Südzucker group) sponsored a number of workshops on burnout prevention for its workers and promoted a strategy to reduce stress among its workers. Within this initiative, occupational physicians support was ensured within regular office hours on site, together with massages and food alternatives for lunch. In addition, experts were invited to make presentations on fighting stress.</p> <p>The initiative is part of the wider partnership initiated in 2014 among EFFAT, CEFS and the European Agency for Safety and Health at Work (EU-OSHA) for the "Manage Stress" campaign.</p>

Spain	Azucarera (2015)	<p>Health and safety program</p> <p>In 2015, a specific internal communication campaign was started by Spanish sugar company Azucarera with the slogan “Safety is a way of life. It is for you. It is for everyone”, to make workers aware of the importance of safe conduct. Different actions were taken, including informative posters, risk notification questionnaires, information points at the factory entrance providing information on the use of personal protection equipment (PPE), heart disease, noise and key behaviour. In addition, a mobile app has been developed and implemented to manage risk control for exposure to heat, working at height, works with chemical products, confined spaces or any other work liable to generate a critical risk for life. As a result, in 2015/16, Azucarera lowered its accident frequency index by 3.9 points.</p>
France	Cristal Union (2014)	<p>Solutions to reduce workers’ stress problems</p> <p>Starting from 2014, French company Cristal Union promoted workers’ meetings to stimulate discussion, with the help of an external consultant, about stress problems, their causes and possible solutions. As a result of these meetings a number of actions were undertaken by the company to improve working conditions; among others, changing rooms were renewed, new working clothes were agreed and additional air-cooling devices were installed.</p>
Germany	Nordzucker (2014)	<p>Know-how transfer initiative</p> <p>As a result of the industrial restructuring process started with the 2006 reform of the EU sugar regime, German company Nordzucker reduced its total workforce due to some factory closures. At the same time, the company decided to offer all of the affected workers under the age of 55 a job at another plant, which many of them accepted. As a result, however, Nordzucker tended to hire middle-age workers from other plants so that no young personnel were recruited or permanently taken on, with an unbalancing effect on the company age structure. In parallel, a know-how transfer program was established to facilitate knowledge and experience sharing among workers: the new tool aims at being prepared for future retirements, to be as transparent as possible and to be able to plan for the long term. The search for adequate successors for positions where workers are planned to retire is at the very centre of the tool; candidates are thoroughly interviewed and appropriate training is organised in order to generate the best possible transfer of knowledge among the workers.</p>
France - Multi-national	Tereos (2014)	<p>Creation of Tereos Academy</p> <p>With the objective to improve its training activities, in 2014 Tereos inaugurated its internal training centre: the Tereos Academy. Among others, the Academy offers a platform for knowledge sharing between employees, to better understand the group and its expertise and to develop their own skills set.</p>

4 JOBS IN THE EU BEET SUGAR SECTOR: BEST PRACTICES TO BOOST EMPLOYMENT AND REGIONAL DEVELOPMENT

Topic	Key findings	
<p>Current contribution of the sector to employment and regional development</p>	<p>23,700 jobs in sugar factories + 338,500 additional jobs along the supply chain = 366,200 overall jobs generated by the sector</p> <p>Support to the livelihoods of 131,000 sugar beet growers and 166,000 jobs in the agricultural sector</p> <p>Important share of EU beet processing capacity controlled by sugar beet growers</p> <p>Drastic decrease in the sector's workforce due to industrial restructuring (plant closures) since the 2006 reform of EU sugar regime; significant decrease in the number of sugar beet growers</p>	
<p>Safeguarding / boosting employment in the sector</p>	<p>Opportunities and constraints</p>	<p>Opportunities from diversification of beet sugar production plants or expansion to the production of other beet-derived products</p> <p>Policies (European Green Deal, Farm to Fork and Bioeconomy strategies, etc.) can present opportunities (e.g., from authorisation of innovative beet-derived products for new uses) or pose constraints (e.g., lack of a clear policy strategy to support the production of bioplastics and biochemicals on an industrial scale)</p>
	<p>Best practices</p>	<p>Production of ethanol directly from beets; value-adding through side processes of sugar production and use of co-products, residues and waste to obtain added value ingredients, fertilisers, substrates for the chemical or pharmaceutical industry, etc.</p>
<p>Boosting regional development in sugar beet growing areas</p>	<p>Opportunities and constraints</p>	<p>Opportunities from: i) innovation in sugar beet farming techniques; ii) product diversification in the processing stage (need for additional beet supply); iii) implementation of "biobased value-adding processes" to promote sustainable development (economic, social, environmental) in the farming and processing stages and in support activities; iv) support policies (EU structural and investment funds – ESIF)</p>
	<p>Best practices</p>	<p>Diversification into premium products (e.g., organic beet sugar) → higher unit value for sugar beets → incentive to cultivation</p> <p>Development of "biobased industrial clusters" centred on sugar beet farming and processing (innovative concepts: "cascading use of biomass"*, "circular economy"**)</p>

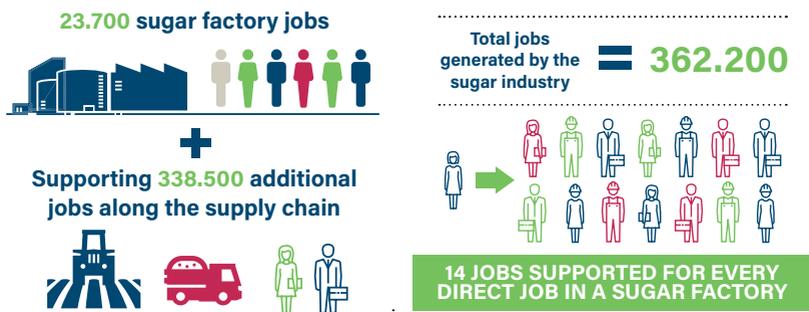
* obtaining the most valuable products in the first stages of biomass processing, and lower-value ones in successive stages
 ** "waste" materials that can be reused and recycled are injected back into the consumption cycle as new (raw) materials

4.1 Safeguarding and boosting employment

The EU beet sugar sector maintains industrial, highly skilled jobs in rural areas and promotes remarkable indirect employment in related activities. According to WifOR (2019), in 2017 the sector directly

created 23,700 jobs in sugar factories, mostly located in rural areas, and supported the livelihoods of 131,000 sugar beet growers, as well as 166,000 jobs in the agricultural sector through indirect effects. Overall, the sector generated 362,200 jobs in 2017 (Figure 4.1).

Figure 4.1 – The EU beet sugar sector’s contribution to employment



Source: CEFS, EU Sugar Industry at a glance, 27/09/2019 (<https://cefs.org/wp-content/uploads/2019/09/EU-Sugar-Industry-at-a-Glance-CEFS-A4-Infographic.pdf>)

Since the 2006 reform of the EU sugar regime, employment in the sector decreased due to **plant closures** in the framework of the related industrial restructuring process (HLG on sugar, 2019; see also section 1). As the European Economic and Social Committee (EESC, 2017) pointed out in its Opinion on [Industrial change in the EU beet sugar industry](#), “only in very exceptional circumstances is it possible to restart sugar production once a sugar production facility has been closed down. This is because the construction of a sugar factory entails high capital costs, typically of several hundred million euros. In most cases, the closure of a single facility means the permanent loss of an essential industrial activity, resulting in the loss of hundreds of direct

and indirect jobs. The search for alternative industrial employment can lead to rural migration and depopulation”. This fact is critical to understand the existing **interdependence between the factory jobs and the continuation of sugar beet farming in the rural areas** where beet sugar factories are located (see section 4.2).

In Europe, **diversification towards the production of other beet-derived products** can be pursued through direct production of ethanol from beets or through **side processes of sugar production**, using a portion of sugar beet juice volume, or using the related co-products (molasses or pulps) as feedstock. Also, there are experiences in the **use of co-products in the area of added value ingredients**

(like prebiotic fibre for human and animal consumption), **fertilizers, substrates for the chemical or pharmaceutical industry**, etc. This is just a short list of the many existing diversification initiatives developed by European sugar producers.

Policy and legislation should align with the current state of the art regarding the **usage of sugar beet and its derivatives as raw materials**. In particular, sustainability criteria in the European Commission's draft proposal for a revised Renewable Energy Directive (RED)¹⁰ are too restrictive to allow full exploitation of the great transformation potential of sugar beet and its derivatives in sugar factories. In this regard, the term "biorefinery" should be understood from a holistic perspective where biomass is not only used to produce energy or oil, but also many other outputs, including those obtained from the above-mentioned co-products. Circular economy cannot exist in the EU beet sugar sector if diverse obstacles to this persist. The revision of the Renewable Energy Directive and Energy Taxation Directive in particular should facilitate the valorisation of all parts of the beet, in particular biomass residues for energetic self-use.

Increase in employment combined with **satisfactory overall** (economic, social, environmental) **sustainability** are usually **key arguments to ask for policy support to the concerned activities**. The relevant policy framework for the operation of the EU beet sugar sector in the near

future actually puts particular emphasis on these aspects. The **new "European Green Deal"** and the related strategies – "**Farm to Fork**" and **Bioeconomy** strategy in particular – are the key policies to consider (see Box 4.1).

Box 4.1 – EU policies of relevance to the beet sugar sector

The European Commission published on 11 December 2019 the Communication on the '**European Green Deal**' (COM (2019) 640), which launched the debate on the **new EU sustainable growth strategy**. Whilst aiming to make the Union 'climate-neutral by 2050', the strategy emphasises that sustainability and economic competitiveness must go hand in hand.¹¹ The European Green Deal includes a **new EU Farm to Fork Strategy** (COM (2020) 381)¹², which aims to more sustainable agri-food systems. To this end, the Farm to Fork strategy includes a range of new policies for more sustainable use of pesticides and fertilisers, increasing the importance of organic farming, mitigate the socioeconomic consequences, improving information to consumers, as well as improving nutrition and reducing obesity.¹³ Last but not least, the **EU Bioeconomy Strategy** (updated in 2018)¹⁴ is another important element shaping the policy environment where the EU beet sugar sector will operate in the future. At least half of the nine objectives of the post 2020 CAP relate directly to the bioeconomy;

¹⁰COM(2021) 557 final, Brussels, 14.7.2021: https://ec.europa.eu/info/sites/default/files/amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf

¹¹Detailed information and documentation on the European Green Deal is available on the European Commission website: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

¹²Detailed information and documentation on the Farm to Fork strategy is available on the European Commission website: https://ec.europa.eu/food/farm2fork_en

¹³The implementation of the strategy's objectives will be pursued through Member States' CAP Strategic Plans.

¹⁴Detailed information and documentation on the EU Bioeconomy Strategy is available on the European Commission website: <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy>

this includes the critical role that agriculture – sugar beet farming included – can play in improving biomass availability in order to produce biobased energy, materials and chemicals.

The expansion of production capacity for **beet-derived products other than sugar** and ethanol has often been constrained by the **limited size of the actual market** for those products. However, a favourable evolution of the relevant drivers (policy-related ones in particular) may promote an expansion in the size of such markets. **Policy changes** and incentives may be decisive in this respect (see Box 4.2).

Box 4.2 – New business opportunities for the beet sugar sector from policy changes: a concrete example

In the case of beet-derived ingredients, **policy changes** concerning their authorisation for additional uses may result in significant expansion of the related markets, and consequently of production capacity. The case of **betaine**¹⁵ is an interesting example. Betaine is a modified amino acid that is gaining recognition as a sports supplement. Two EU Regulations have recently authorised: i) the placing on the market of betaine as a “novel food” (Commission Implementing Regulation (EU) 2019/1294 of 1 August 2019); ii) the use of betaine anhydrous as a feed additive for food-producing animals except rabbits (Commission Implementing Regulation (EU) 2019/9 of 3 January 2019). Recent market research estimated the value

of the global market for betaine at around 2 million USD in 2019, and forecasted a growth to over 2.6 million USD by the end of 2025.¹⁶ US-based Amalgamated Sugar and multinational chemical group DuPont are leading producers of betaine; in the EU, AGRANA has commissioned a betaine crystallisation plant in 2019, in the framework of a joint venture with Amalgamated Sugar (AGRANA, 2019b; see also section 5). The plant is now in operation on the site of AGRANA's Tulln sugar factory (Austria): it started commercial production in August 2020, and has a production capacity of 8,500 tonnes of crystal betaine per year (AGRANA, 2021).

The expansion of production capacity for other beet-derived products may be constrained by the long-established presence on the market of **equivalent products obtained from (normally) cheaper feedstock types**. **Bioplastics** (plastic materials obtained from biomass) and **biochemicals** (chemicals obtained from biomass) are interesting examples in that respect. **Support policies** play an important role also here (see Box 4.3).

Box 4.3 – Expansion of production capacity for beet-derived products: opportunities and constraints

Bioplastics include a wide range of polymers with different properties and uses, which can be produced from a wide range of biomass types, including sugar beets and cereals (currently the most used feedstock type) (F.O. Licht, 2010). The

¹⁵Betaine is a sweet ammonium salt first isolated in sugar beets (hence the name). It helps protecting cells from heat stress and sustains important physiological functions. It is extracted from molasses as a co-product of their desugarisation process (AGRANA, 2019a).

¹⁶https://www.reportlinker.com/p05913561/Betaine-Market-Research-Report-by-Form-by-Type-by-Application-Global-Forecast-to-Cumulative-Impact-of-COVID-19.html?utm_source=GNW

main drivers influencing the evolution of the bioplastics market are: i) **crude oil prices** (plastics are a co-product of the oil refining process); and, ii) **policies aimed at discouraging production and use of non-recyclable plastics and/or at promoting production and use of recyclable ones**.¹⁷ Similar to bioplastics, biochemicals encompass a wide range of products with different properties and uses, obtained by various biomass types, including sugar beets. Similar to bioplastics, the evolution of the market for biochemicals is mainly determined by the price of non-renewable feedstock (crude oil, minerals etc.) and policies. An interesting feature of biochemical production from sugar beets is that a higher share of the additional employment that it creates per tonne of fermentable sugars tends to be concentrated in the processing stage, compared to cereal-based biochemicals, which mostly generate additional jobs in the farming stage (Nova Institute, 2019a).

The development of the market for fine biochemicals that are not in direct competition with petrochemicals (food ingredients, flavours, body care, cosmetics and pharmaceuticals) has been positive in Europe. By contrast, market development for bioplastics and other bio-products that compete with mass-produced petrochemicals has not been equally positive, mainly due to the **lack of a clear policy strategy to support the production of bioplastics and biochemicals on an industrial scale**. EU support policies seem to focus more on biobased research, pilot projects and technology exports¹⁸ (see also section 5).

4.2 Boosting regional development in EU sugar beet growing areas

The number of sugar beet growers in the EU has decreased significantly since the 2006 reform of the EU sugar regime; **sugar beet farming has completely ceased** in some regions and in entire Member States.

Safeguarding, or even **increasing sugar beet processing capacity** (for example by producing other beet-derived products), has **direct positive effects in terms of maintaining/expanding sugar beet farming**, and generally also of the **related support activities** (contract machinery work, supply of inputs for sugar beet cultivation, sugar beet transportation, etc.). An **important share of EU beet processing capacity is controlled by sugar beet growers**: cooperative sugar companies have **strong linkages with the territories where their members carry out their farming activities**, and their strategies are often shaped by the interests of their membership base (i.e., sugar beet growers).

Innovation and product diversification have significant potential for maintaining sugar beet cultivation in the less productive areas, and even for bringing sugar beet farming back to regions where it had ceased (see Box 4.4).

¹⁷In 2018 the global bioplastics production volume reached 7.5 million tonnes, equivalent to 2% of the global production volume of petrochemical polymers. Europe accounted for 18% of the global bioplastics production capacity in 2018, but is projected to reach a 25% share by 2023. The potential for the expansion of bioplastics production at global level is much higher, but is currently hampered by low oil prices and a lack of political support (Nova Institute, 2019e).

¹⁸<http://news.bio-based.eu/michael-carus-ceo-of-nova-institute-in-an-interview-with-bio-based-news-on-the-european-bio-based-economy-and-a-shift-towards-a-renewable-carbon-economy/>

Box 4.4 – Positive effects of innovation and product diversification on sugar beet farming

An interesting concrete example was presented by Italian cooperative sugar producer COPROB during the first online workshop for the project (April 26, 2021). Sensitisation of member sugar beet growers and provision of technical assistance promoted more widespread adoption of **state-of-the-art/innovative sugar beet farming practices**, with positive effects on the crop's productivity and profitability. A partnership with a leading producer of agrochemicals improved sugar beet fertilisation techniques applied by member growers, and found a way to produce a soil improver from a waste of the sugar production process (defecation lime). **Diversification into the organic beet sugar segment** allowed to maintain sugar beet farming in areas affected by lower productivity or located at a long distance from the processing plants: the substantial price premium for organic sugar translates into a higher unit value for sugar beets, which compensates for lower yields and makes long-haul beet transportation economically sustainable.

Regional development is not limited to employment in agriculture. Employment in the **processing stage** and in **support activities** also need to be considered, plus a number of other dimensions concerning the **overall sustainability of regional development from an economic, social and environmental standpoint.**

The concepts of “cascading use of biomass” and “circular economy” have key importance in regional development models centred on the so-called “biobased value-adding processes”.¹⁹ In simple words, **cascading use of biomass** implies obtaining the most valuable products in the first stages of biomass processing, and lower-value products only in successive stages; only the residues from biomass processing into biobased products are finally used to generate energy. In a **circular economy**, materials that can be reused and recycled are injected back into the consumption cycle as new (raw) materials. This converts what is waste for some economic actors into “secondary raw materials” for other economic actors. In the EU there are **notable practical examples** of application of the above concepts in the framework of regional **development experiences based on sugar beet cultivation and processing**. Concrete examples of “biobased industrial clusters” centred around beet sugar factories²⁰ allow to explore the related regional development potential in terms of employment creation at all stages of value chains (including support activities), creation of value for the actors involved, and environmental sustainability through the application of the two aforementioned concepts (Chauvet, undated; Gielen, 2018; Sederel, 2019; see also section 5).

Last but not least, it is important to underline that **support policies** – in particular those financed by **EU structural and investment funds (ESIF)**²¹ – may provide an important contribution to maintaining current development levels and combating the decline in EU sugar beet growing areas.

¹⁹The subject is discussed in detail in, among others: Areté (2019); BE-Rural (2019); Lange and Lindedam (2016); Spatial Foresight, SWECCO, ÓIR, t33, Nordregio, Berman Group, Infyde (2017).

²⁰E.g., at Bazancourt-Pomacle (France) and in the Noord Braabant region of the Netherlands (where Dinteloord sugar factory is located).

²¹ESIF provide financing to: rural, industrial and infrastructural development programmes; initiatives aimed at revitalisation of areas affected by economic decline; and, regional development in general.

5 EUROPEAN GREEN DEAL: WHAT ROLE FOR FACTORIES AND WORKERS OF THE EU BEET SUGAR SECTOR?

Topic	Key findings
<p>Further increasing the sector's sustainability</p>	<p>Key issue: ensuring the economic sustainability of the core business, i.e., processing of sugar beets into sugar</p> <p>Diversification is not the "magic bullet" to improve economic sustainability</p> <p>Increased automation and digitalisation present great potential in terms of efficiency gains and cost savings; they may generate job losses but may also improve job quality for certain job profiles;</p> <p>Combining improved economic sustainability with increased social sustainability in the sector presents significant challenges</p> <p>Already satisfactory environmental sustainability; significant potential for further improvement through implementation of innovative concepts ("cascading use of biomass"; "circular economy";**)</p> <p>Prospective challenge: covering the costs for implementing the EU Green deal</p>
<p>Diversification towards production of other beet-derived products</p>	<p>Wide range of opportunities for producing beet-derived products other than sugar, but many of the related processes have been implemented in laboratory conditions only</p> <p>Critical issue: ensuring the successful transition from pilot plants to full-scale commercial production in industrial sites; specialist consultancy services / specific policy support may be needed to promote that transition</p> <p>There are notable practical examples of full-scale commercial production of biobased products in the EU beet sugar sector, and ongoing initiatives to implement production at least at pilot plant scale</p>

* obtaining the most valuable products in the first stages of biomass processing, and lower-value ones in successive stages

** "waste" materials that can be reused and recycled are injected back into the consumption cycle as new (raw) materials

5.1 Further increasing the sector's sustainability

Diversification strategies implemented by EU beet sugar producers over time have enjoyed mixed success. This suggests that **diversification is not the "magic bullet" to improve economic sustainability**, and that **there is no "golden recipe" to put it into practice**. The success of diversification strategies implemented by certain EU beet sugar producers appears to derive mainly from specific conditions applying

both inside the company (cost structure, organisation, technology adopted, etc.) and in the environment where it operates (actual demand for the final products of diversified activities, presence and effectiveness of EU and/or national policies promoting their production and/or consumption, etc.). In the current market conditions, **ensuring the economic sustainability of the core business**, i.e., processing of sugar beets into sugar, is the key issue. EU beet sugar producers have to offer attractive enough sugar beet prices to growers, and still have

to cope with rather low sugar prices on the EU market, even though there has been a recovery from the minimum reached in January 2019 (312 Euros/tonne) to just above the reference threshold of 404 Euros/tonne as of September 2021²². These conditions have translated into **poor profitability for EU beet sugar producers** over most of the post-quota period.

Increased automation and digitalisation present **great potential in terms of efficiency gains and cost savings**, and may also **improve job quality** for certain job profiles (through reduction of fatigue, accidents, etc.). There are already **noteworthy examples of practical implementation** of automation and digitalisation in sugar beet farming and processing, together with the related logistics and distribution activities (see Box 5.1). Nevertheless, if **further automation/digitalisation** in the sector should be exploited, the possible job losses need anticipation and need to be shaped through the social partners and the policy makers. Another significant hurdle to further automation/digitalisation is related to the skills needed of workers to operate on automated/digitalised equipment and processes: the issue is discussed in section 6.2.

Box 5.1 – Automation and digitalisation in the EU beet sugar sector

Recent contributions in specialist technical literature provide an overview of practical examples of automation and digitalisation

in sugar beet farming and processing. High-capacity self-propelled sugar beet harvesting machines equipped with automated and digital solutions to reduce drivers' fatigue, monitor the machine's performance, and improve the precision of beet scalping and digging are now widely used in several EU beet sugar producing Member States (Ziegler, 2019). As also confirmed by interviews with several EU beet sugar producers and trade unions representing sugar industry workers, and as discussed in the two workshops for the project, highly automated equipment is extensively used in EU beet sugar factories, across all the stages of the production process as well as in storage and handling of sugar and its co-products. Digitalisation of process monitoring and remote controlling of operations is also increasingly implemented in EU beet sugar factories, according to the so called "Industrial Internet of Things" (IIoT)²³ approach: this includes adaptation of interfaces to make them more user-friendly, and to provide the concerned workers with instant access to the most important performance indicators (Schwanke and Lehnberger, 2020).

Significant challenges need to be overcome on the way of combining improved economic sustainability with increased social sustainability in the EU beet sugar sector.²⁴ However, an improved overall economic sustainability of EU beet sugar producers should also create more favourable conditions for safeguarding the current employment levels and/

²²As reported by the European Commission: https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/sugar-dashboard_en.pdf.

²³IIoT can be defined as the use of Internet of Things (IoT) technologies in manufacturing. The IIoT concept is based on the extension of network connectivity (basically, internet) and computing capability to objects, devices, sensors, and items not ordinarily considered to be computers. These "smart objects" require minimal human intervention to generate, exchange, and consume data (Boyes et al, 2018).

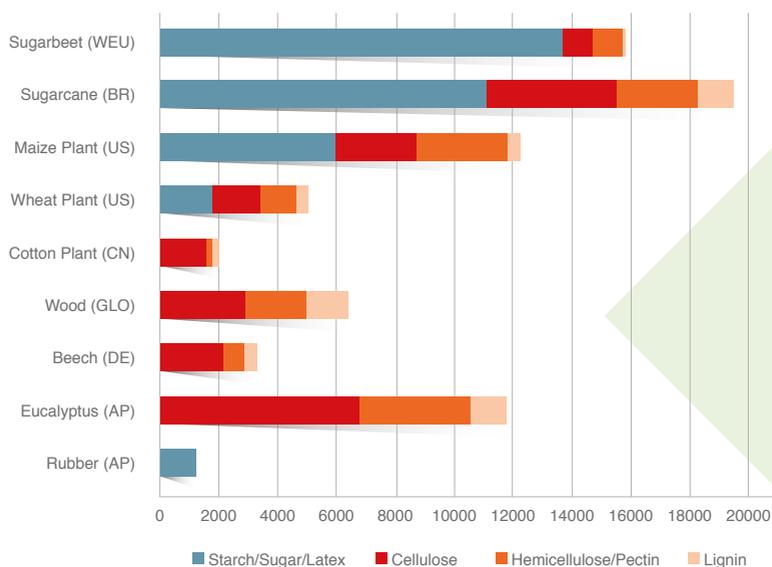
²⁴The issue is discussed in, among others, EESC (2017) and HLG on sugar (2019); the related challenges were repeatedly highlighted by the consulted stakeholders (beet sugar producers and trade unions) and by independent experts, and were extensively discussed in the framework of the two online workshops for the project (April 27, 2021; October 7, 2021).

or for improving the quality of jobs in beet processing activities (Areté, 2019). This suggests that even the strategies based on geographical or technically unrelated diversification can also contribute to positive social developments in the EU beet sugar sector. Nevertheless, ensuring the **economic sustainability of the core business** – i.e., beet sugar production – remains the **critical condition for working towards a socially sustainable EU beet sugar sector**.

Wide portions of the EU beet sugar sector are already characterised by satisfactory **environmental sustainability**, with some

outstanding examples of best practice (see Box 5.2). As demonstrated by a wide literature²⁵, the **high efficiency of sugar beet as feedstock for industrial processes making use of fermentable sugars** (see Figure 5.1) results in a **better environmental performance** compared to processes using other renewable feedstock types (cereals, wood). In brief, sugar beet requires less agricultural land than other crops to produce the same quantity of fermentable sugars. This positive feature adds to obvious advantages vis-à-vis the processes based on non-renewable feedstock types (crude oil, minerals).

Figure 5.1 - Feedstock efficiency – production of fermentable sugars per hectare of different crops (kg)



WEU: Western Europe

Source: Sedereil (2019), *Agro meets Chemistry and Markets*, presentation at the Biethanol Seminar, ACCRES -Lelystad, 4 July 2019.

²⁵Among others: Achinas et al (2019); Corbion (2016); Croxatto Vega et al (2020); Nova Institute (2019 a, 2019c, 2019d); STAR-ProBio (2020).

Box 5.2 – Environmental sustainability in the EU beet sugar sector: examples of best practice

The bio-based industrial cluster centred around COSUN beet sugar factory and biorefinery in Dinteloord²⁶ (Noord Brabant region, The Netherlands) has already implemented a largely circular production process based on waste minimisation. Even the residues from sugar beet farming and processing are used as feedstock for value-adding processes: production of a growing assortment of bio-products (biopolymers, prebiotics, etc.) for a wide range of uses in personal and home care, water treatment and industrial processes; conversion of residues into bioenergy; production of organic fertilisers from residues (Gielen, 2018).

In a presentation given in the first workshop for the project, COSUN illustrated the process that has recently allowed the company to produce paper packaging from sugar beet pulps.

Since the early 2000s, British Sugar uses hot water and carbon dioxide from its Wisington sugar factory in a glasshouse annexed to the facility, where it carries out horticultural production. A non-psychoactive variety of the cannabis plant family, specifically bred for medical purposes, is grown in the glasshouse since 2016: it supplies the key ingredient for a medicine used to treat rare but serious forms of epilepsy in children.²⁷

Nevertheless, in the medium-long term the EU beet sugar sector will have to cover the

costs of the implementation of the EU Green deal: “at least” minus 55% of CO₂ emissions by 2030 and climate neutrality by 2050. A reduction in CO₂ emissions towards greenhouse gas-neutral sugar production can only be achieved if the right **preconditions** are met:

- Access to affordable, clean, renewable energy and investments in infrastructure enabling, e.g., electrification.
- Legal and financial support to compensate additional costs.
- Investment aids that take into account the seasonality and energy intensity of the sector’s activity.
- Dialogue between workers and employers ensuring just transition of the workforce

The EU sugar sector is ready to take this path, which will however require **investments of billions of Euros**, in addition to higher capital expenditure. However, an economic environment such as the one that the EU sugar sector has faced since the end of quotas will not allow the sector to bear these costs on its own. Such an environment also makes the adoption of long-term perspectives more challenging.

As for initiatives aimed at **further improving the social sustainability of the sector**, some noteworthy ones have been described at the end of section 3.2 (Table 3.1)²⁸. Interviews with sugar producers and trade unions, and information from company websites and annual reports, revealed

²⁶For additional information, please check COSUN Beet Company website: <https://www.cosunbiobased.com/>

²⁷For additional information, please check British Sugar website: <https://www.britishsugar.co.uk/about-sugar/co-products; https://www.britishsugar.co.uk/media/news/2016-10-25-wisington-glasshouse-to-grow-plants-for-epilepsy-medicine>

²⁸More specifically: the introduction of new shift systems at COSUN (2017); initiatives to improve stress and burnout management at AGRANA (2017); Azucarera’s health and safety program (2015); solutions to reduce workers’ stress problems at Cristal Union (2014).

several other efforts, including particularly innovative ones, in terms of, e.g.:

- Updated and improved Corporate Social Responsibility (CSR) and ethical codes.
- Initiatives aimed at further improving the safety of workers (through training, upgrade of safety equipment and procedures, etc.), including response strategies and measures to address the risks related to the COVID-19 pandemics.
- Granting of extra recreation time and/or extra flexibility in work routines to workers who are more exposed to the risk of fatigue (shift workers, workers who work on Sundays, workers who perform critical functions during beet processing campaigns, older workers etc.), also considering the trend towards longer beet processing campaigns.
- Efforts to mitigate the negative impacts of factory closures, through the cooperation among employers, trade unions, and local authorities: early retirement schemes, incentives and support to relocation of workers to other active plants of the same company, etc.
- Initiatives aimed at improving the work-life balance of workers, with particular attention to those with (new born) children: e.g., granting of additional recreation time and/or more flexible work routines.

- Initiatives aimed at making the sector more appealing and accessible to female workers, and at ensuring gender equality.
- “Pooling” of skilled seasonal workers among employers of different sectors (including the beet sugar sector) in a certain geographical area. The introduction of “pooling contracts” allows the companies supporting the initiative to create a common pool of temporary workers, to draw from according to necessity. Those workers have a permanent contract, but are employed as seasonal workers - according to needs and time requirements (which are critical during beet processing campaigns) - by the companies supporting the initiative²⁹.

5.2 Diversification towards production of other beet-derived products

There is ample literature³⁰ describing the **wide range of opportunities for producing beet-derived products other than sugar** that can be interesting from a commercial standpoint. However, **many of the related processes have been implemented in laboratory conditions only**; a much smaller number has seen practical implementation in pilot plants, and an even smaller number has been implemented on a (limited, in several cases) commercial scale. Noteworthy examples of full-scale production of such products include: production of animal feed from pulps,

²⁹“Pooling” can also mitigate the negative implications of industrial restructuring in the sugar sector (plant closures), helping to address possible permanent loss of skilled seasonal workers through provision of alternative job opportunities, so that those workers and their know-how can become available again at a later date, in case there are the conditions to start new production activities in the sites of the closed factories.

³⁰Among others: E4tech (2015); F.O. Licht (2010); IEA Bioenergy (2020); Nova Institute (2019a, 2019b and 2019e); Tomaszewska et al (2018).

molasses and beet fibre; generation of biogas from beet leaves and residues of beet processing; production of fertilisers from residues of beet processing and defecation lime; production of fermentation substrates for use in the pharmaceutical and chemical industries.

A critical issue for expanding and diversifying beet sugar production facilities to the production of other beet-derived products of commercial interest is actually ensuring the techno-economic conditions that allow the scaling-up of the related processes: in other terms, the **successful transition from pilot plants to full-scale commercial production** in industrial sites³¹.

Similar to what happened for biofuel and bio-energy production, the availability of **specialist consultancy services**, and in some cases of **specific policy support**, may be needed to promote the transition to full-scale industrial production for bio-products. Besides the advice of consultancy firms and “think tanks” focusing on the development of biobased processes³², the availability of facilities where the “scaling-up” of those processes can be tested in practice before investing in the construction of full-scale production plants³³ is an essential enabling condition. As for policy support, the key issue is that whereas the EU has policy frameworks in place to promote decarbonisation and development of renewable energy, it still lacks a corresponding policy or strategy for the materials sector, especially for the chemical and plastic industries³⁴.

A selection of practical examples of full-sca-

le commercial production of biobased products in the EU beet sugar sector is presented in a series of fiches hereunder. An overview of initiatives to implement the production of beet-derived products other than sugar at least at pilot plant scale is provided in Table 5.1.

AGRANA: crystalline betaine production

In April 2019 AGRANA (part of Südzucker Group) started the construction of a betaine crystallisation plant on the site of its beet sugar factory in Tulln (Austria) under a joint venture with US-based Amalgamated Sugar (AGRANA, 2019b). AGRANA had been processing sugar beet molasses to make liquid betaine at its Tulln site since 2015. The new plant entailed an investment of around 40 million Euros; it has a production capacity of around 8,500 tonnes of natural crystalline betaine per year, and is only the third of its kind worldwide. Betaine is used in food supplements and sport drinks to promote muscle development, in livestock rearing as a component in animal feeds, in cosmetic products and in detergent substances (e.g., shampoos and conditioners).

To know more: <https://www.agrana.com/en/products/betaine/> ; <https://www.betapura.com/en/start/> ; <http://amalgamatedsugar.com/our-sugar/feed-products.html>

Azucarera: non-food products from molasses, beet pulps and residues

Since 2017, Azucarera’s subsidiary Betalia has developed an extensive range of feed

³¹The issue and the possible solutions are discussed in, among others: Bio Base Europe Pilot Plant (2018); COWI, Bio-Based World News and Ecologic Institute (2019).

³²Nova Institute (<http://nova-institute.eu/>) is one of the longest-established and most widely known ones.

³³A noteworthy example of such facilities is Bio Base Europe Pilot Plant (<http://www.bbeu.org/pilotplant/>), located in Desteldonk industrial park, near Gent (Belgium).

³⁴See Nova Institute (2019e) for a discussion on the issue.

products, fertilisers and substrates for fermentation, obtained from the co-products of beet sugar production (molasses, beet pulps and other residues from the process) in Azucarera's Toro sugar factory. *Prebionat*, for instance, is an innovative liquid prebiotic aimed at improving animal health and well-being: it is specifically targeted at improving digestive tract health and boosting immunity in pregnant ewes and new-born lambs, and specifically avoiding the use of antibiotics, thus contributing to address antimicrobial resistance (AMR) linked to excessive/inappropriate use of antimicrobials in animal and human healthcare.

To know more: <https://www.betalia.es/> (in Spanish)

COSUN: sugar-based biopolymers production

Dutch cooperative sugar group COSUN has been active in sugar-based biopolymers production since the early 2010s, first at pilot plant scale, and then at industrial scale. COSUN developed processes for biopolymer production from both sugar beets and chicory roots. Its subsidiary COSUN Beet Company (formerly COSUN Biobased Products) now offers a large assortment of biopolymers for a wide range of applications in home care and personal care products, water treatment, paints and coatings, agrochemicals and fertilisers. In 2019, COSUN launched a "Bioplastics Challenge" for start-ups and scale-ups willing to collaborate with the cooperative to develop innovative processes to convert beet sugar into biopolymers. The selected start-ups and scale-ups entered the pilot phase in February 2020.

To know more: <https://www.cosunbiobased.com/> ; <https://www.cosunbiobased.com/product-portfolio> ; [\[nableindustrychallenge.com/challenge/work-with-suikerunie-to-valorizata-sucrose-from-sugar-beet-into-bio-polymers-ti-produce-sustainable-plastics/\]\(https://nableindustrychallenge.com/challenge/work-with-suikerunie-to-valorizata-sucrose-from-sugar-beet-into-bio-polymers-ti-produce-sustainable-plastics/\)](https://sustai-</p></div><div data-bbox=)

Pfeifer & Langen: beet-based ingredients production

Beet sugar producer Pfeifer & Langen established an innovation centre in the site of its Elsdorf sugar factory (Germany). Among others, research was conducted at Elsdorf to extract innovative natural sugars from beets, and to develop industrial-scale production of the same. In 2016, a pilot plant went in operation at Elsdorf to produce innovative natural sugars for use as ingredients in the food industry. Through its subsidiary Savanna Ingredients GmbH, Pfeifer & Langen now produces and markets two of these innovative natural sugars. Allulose is a natural sugar with almost 100% fewer calories than sucrose (standard beet sugar), that is just 0.2 kcal per gram, and is 70% as sweet; it can be used as a syrup and, in granulated form, as an ingredient in food and drinks. Cellobiose is a natural sugar with 50% fewer calories than sucrose and similar to lactose (which it can substitute): it can be used as a food ingredient.

To know more: <https://www.pfeifer-langen.com/en/company/> ; <https://www.savanna-ingredients.com/en/>

Table 5.1 – Overview of initiatives focusing on production of beet-derived products other than sugar at least at pilot plant scale

Initiative	Brief description	Partners in the beet sugar sector	To know more
AFTER-BIOCHEM	<p>Objective: creating multiple new value chains, from non-food biomass feedstock to multiple end-products, by combining anaerobic batch fermentation and esterification</p> <p>Started in May 2020; biorefinery in France to be commissioned by 2022 and to run at full capacity and integrate esterification by 2024</p> <p><i>Feedstocks:</i> beet pulps, molasses, vinasse</p> <p><i>Products:</i> 7 carboxylic acids (acetic, propionic, valeric, isovaleric, butyric, isobutyric, caproic) for use in the food and feed, fragrances and flavour, personal care, pharmaceuticals, and industrial chemicals sectors</p>	<p>Südzucker https://www.suedzucker.com/</p>	<p>https://cordis.europa.eu/project/id/887432</p> <p>https://www.bji-europe.eu/projects/afterbiochem</p>
CARBAFIN	<p>Objective: creating a new value chain for utilisation of surplus sugar beet biomass in the EU by converting glucose and fructose separately into value-added products at demonstration and then industrial scale</p> <p>Started in January 2018 and will last until December 2021</p> <p><i>Feedstocks:</i> sugar</p> <p><i>Products:</i> functional glucosides for use in food and feed-, cosmetics-, detergents- and polymer sectors</p> <p><i>Main achievements:</i> implementation of processes at demonstration plant scale; identification of constraints to full-scale production (insufficient market demand; lack of "infant industry" policy support)</p>	<p>Pfeifer & Langen https://www.pfeifer-langen.com/en/company/</p>	<p>https://www.carba-fin.eu/</p> <p>https://www.carba-fin.eu/workpackages/</p> <p>https://www.carba-fin.eu/partners/</p>
Green Protein	<p>Objective: producing high-added value, food-grade and fully functional proteins and other ingredients, out of vegetal residues mainly from sugar beets</p> <p>Started in September 2016 and concluded in January 2021; demonstration plant at COSUN's Dinteloord sugar factory (The Netherlands) opened in October 2019</p> <p><i>Feedstocks:</i> beet leaves</p> <p><i>Products:</i> RuBisCo, a high-value vegetable functional protein that can replace chicken egg protein → use in vegetarian and vegan foods</p> <p><i>Main achievements:</i> production at pilot plant scale since 2019; COSUN requested an assessment by EFSA (currently ongoing) for use of RuBisCo as food component</p>	<p>COSUN https://www.cosunbiobased.com/</p>	<p>http://greenprotein-project.eu/</p> <p>https://www.cosunbeetcompany.com/products/food/protein</p>

<p>PLAnet™</p>	<p>Objective: promoting production of Poly-Lactic Acid (PLA) bioplastic from conversion of sugar or sugar-containing biomass (including beets), in industrial plants of up to 100,000 tonnes/year capacity</p> <p><i>Feedstocks:</i> sugar, sugar beets</p> <p><i>Products:</i> Poly-Lactic Acid (PLA) bioplastics</p> <p><i>Main achievements:</i> 2019: construction of a PLA industrial plant with a 30,000 tonnes/year capacity in Escanaffles (Belgium); scaling-up to 100,000 tonnes/year capacity planned for 2022</p>	<p>Futero (Groupe Finasucre) http://www.futero.com/</p>	<p>http://news.bio-based.eu/build-a-plant-for-sustainable-bioplastics/</p> <p>https://empowerpumps.com/sulzer-farming-sugar-based-plastic/</p>
<p>PULP2VALUE</p>	<p>Objective: obtaining high-value products for a wide range of applications (detergents, personal care, oil & gas, paints & coatings and composites) from sugar beet pulps.</p> <p>Start July 2015 / end June 2019; pilot plant operated by COSUN</p> <p><i>Feedstocks:</i> beet pulps</p> <p><i>Products:</i> Betafib, a natural biopolymer (cellulose) for use as structuring agent in home care and personal care formulations</p> <p><i>Main achievements:</i> small-scale commercial production in the pilot plant of Roosendaal (The Netherlands); COSUN is studying the feasibility of building a full-scale plant due to increasing sales of <i>Betafib</i></p>	<p>COSUN https://www.cosunbiobased.com/</p>	<p>http://pulp2value.eu/</p> <p>https://cordis.europa.eu/project/id/669105</p>

6 THE JOBS OF THE FUTURE: THE EU BEET SUGAR SECTOR IN TRANSITION AND SKILLS REQUIRED OF WORKERS

Topic	Key findings
<p>Potential for future jobs in a new integrated approach to biorefinery</p>	<p>With the end of quotas, the sector has experienced a challenging transition from legislation-based supply management to a more market-oriented competitive environment → new opportunities and new challenges (also from external factors)</p> <p>Biorefineries: highly mechanised and automated plants applying advanced technologies → implications in terms of employment creation potential</p> <p>Additional employment created by sugar beet-related biorefineries may often seem modest, but their contribution to improved overall profitability may help to safeguard more substantial employment figures in “traditional” beet sugar factories and beet ethanol distilleries</p>
<p>Skills required of workers in a new integrated approach to biorefinery</p>	<p>In biorefineries/beet ethanol distilleries:</p> <ul style="list-style-type: none"> - the need for “process managers” and highly skilled specialist workers with a formal technical education tends to prevail over the need for less specialised “blue collar” workers with practical skills acquired through experience - required skills are closer to those in the (bio)chemical industry than in the rest of the food industry - specific training activities are necessary to provide workers with the required specialist skills <p>Key challenges, common to sugar production and biorefineries/distilleries:</p> <ul style="list-style-type: none"> - covering critical job positions (blacksmiths, mechanics and electricians in particular) for which there is more and more limited availability of skilled workers - train older, less skilled “blue collar” workers to enable them to keep working on more and more automated and digitalised processes

6.1 Potential for future jobs in the sector in a new, integrated approach to biorefinery

Since the end of the quota regime in 2017, the EU beet sugar sector has experienced a **challenging transition** from legislation-based supply management to a more market-oriented competitive environment. The combined effect of several **external factors** (changes in EU policies that are relevant for the sugar sector, Brexit, the Covid-19 pandemics, etc.) has made

the transition even more challenging. The new **European Green Deal and Farm to Fork Strategy**, in particular, aim at further improving the overall sustainability of the EU production and consumption system. The **EU Bioeconomy Strategy** is another important element shaping the policy environment in which the EU beet sugar sector will operate in the future. This can open new opportunities for biobased value-adding processes in an EU beet sugar sector in transition, but also presents new challenges, including in terms of securing the required skills from workers (see section 6.2).

The evidence presented under sections 4 and 5 suggest that biobased value-adding processes that can be implemented in beet sugar factories tend to be capital- rather than labour-intensive.³⁵ This was confirmed by interviews with several EU beet sugar producers and trade unions representing sugar industry workers. In other words, **biorefineries are highly mechanised and automated plants that apply advanced technologies**, and this has rather clear **implications in terms of employment creation potential, job profiles and required workforce skills**. Publicly available data on employment in sugar beet-related

biorefineries currently in operation in the EU are extremely scarce. Table 6.1 presents the available figures for a selection of notable concrete cases, concerning large-scale biobased industrial clusters (Bazancourt-Pomacle), medium-large (Frellstedt) and small-scale (Dinteloord, Fife) biorefineries. Whereas the biorefinery at Dinteloord is owned and operated by Dutch sugar producer COSUN, not all the facilities at Bazancourt cluster are owned and operated by Cristal Union. Biorefineries at Frellstedt and Fife are owned and operated by companies that are not controlled by sugar producers.

Table 6.1 – Employment figures for notable cases of implementation of sugar beet-based biorefineries

Company / site(s)	Available information on employment	Source
Bazancourt/Pomacle biobased cluster, centred around Cristal Union's sugar factory and ethanol distillery (France)	1,200 direct employees + around 800 employees in related support activities <i>Includes employment in Cristal Union's "traditional" sugar factory and beet ethanol distillery (permanent workforce: 370 units, of which 154 in the distillery³⁶) and in activities not related to beet processing (e.g., starch plant)</i>	Chauvet (undated)
Amino GmbH biorefinery in Frellstedt (Germany)	114 employees	https://amino.de/en/amino/our-team
COSUN biorefinery, Dinteloord (The Netherlands)	15 direct employees + 15 indirect R&D employees at COSUN Beet Company <i>Dinteloord sugar factory is broadly comparable to Bazancourt in terms of production capacity; total employment at COSUN's sugar unit (2 factories in The Netherlands + 1 in Germany) was 880 full-time employees equivalent (FTEs) in 2020³⁷</i>	COWI, Bio-Based World News and Ecologic Institute (2019)
CelluComp Ltd. biorefinery in Fife (Scotland, UK)	17 employees in 2018 (small-scale plant with a 4-500 tonnes/year capacity)	COWI, Bio-Based World News and Ecologic Institute (2019)

³⁵Areté's study on bioeconomy for EFFAT (Areté, 2019) came to the same conclusion.

³⁶Source: <https://www.cristal-union.fr/sites-de-production/site-de-bazancourt-2/> and <https://www.cristal-union.fr/sites-de-production/distillerie-cristanol/>.

³⁷Source: COSUN annual report, 2020: https://www.cosun.com/wp-content/uploads/2021/04/Cosun_JV_2020_UK-web.pdf

If we consider the example of the **additional employment created by sugar beet-related biorefineries, these numbers may seem modest**. However, it should be kept in mind that the positive contribution from their high value-added products to the overall profitability of the concerned beet sugar producers **may help to safeguard more substantial employment figures in “traditional” beet sugar factories and beet ethanol distilleries**. This was confirmed by the consulted sugar producers that implemented such facilities.

6.2 Skills required of workers in a new, integrated approach to biorefinery

Publicly available information on job profiles and the skills required in sugar beet-related biorefineries, as well as in beet ethanol distilleries, is even scarcer than information on employment figures.

Information collected from company websites³⁸ suggests that in biorefineries/distilleries the **need for “process managers”, and more in general for highly skilled specialist workers with a formal technical education**, tends to prevail over the need for less specialised “blue collar” workers that achieved their practical skills mostly through experience.³⁹ This was confirmed by interviews with the EU beet sugar producers that operate biorefineries/distilleries, and by trade unions representing workers in those companies. This implies that the skills more in demand in biorefineries/distilleries are more likely to be found in **younger workers / applicants** than in the older workers. Nevertheless, interviews with the concerned sugar companies and trade unions revealed that part of the workforce employed

in biorefineries/distilleries was originally employed in sugar factories, and received opportune training to operate in the new plants.

Interviews also revealed that the skills needed of workers operating in biorefineries/distilleries tend to be **closer to the skills required of workers in the (bio)chemical industry** than to those required by the food industry. In most cases, workers operating in biorefineries/distilleries are covered by the collective agreements for the chemical industry, rather than those for the food industry/the sugar sector, due to the nature of the production processes. In a few cases, workers in biorefineries/distilleries are still covered by the collective agreements for the food industry/the sugar sector (in one case specific derogations were requested and obtained in that regard, due to the preference of workers for the related arrangements, which they deemed to be more comprehensive than those for the chemical industry).

It should be noted that the continuous nature of production processes in the **beet sugar/ethanol sector, together with a rather high degree of mechanisation and automation in sugar factories/beet ethanol distilleries, makes the beet sugar sector more similar to the (bio)chemical industry** than to the rest of the food industry; this implies that the workforce in the beet sugar sector tends to be less at a disadvantage in achieving the skills needed to operate in biorefineries than the workforce in food industry sectors characterised by non-continuous production processes, batch production and/or a greater need for manual, “craftsman-like” skills.

Interviews with EU beet sugar producers

³⁸And in particular from the sections of those websites dedicated to workforce recruiting.

³⁹Areté’s study on bioeconomy (Areté, 2019) came to similar conclusions, both in general and with specific reference to biorefineries in the sugar sector.

that implemented **biorefineries/distilleries** revealed that **specific training activities are needed** to provide workers with the **specialist skills needed** to work in those plants. According to those operators, sugar production, beet ethanol production and biorefining are characterised by a common layer of competences required of workers – mostly related to more and more automated and digitalised production processes – and a set of process-specific skills. The level of skills needed to work in biorefineries/distilleries tends to be higher than in sugar production; distilleries also have specificities that are related to more serious hazards than in sugar factories (beet ethanol production is an industrial activity falling under the scope of the Seveso-III Directive).⁴⁰ According to an interviewed sugar producer, workers in biorefineries/distilleries should ideally meet the following requirements:

1. practical, hands-on attitude;
2. affinity with biobased products;
3. experience with similar (chemical) processes;
4. bachelor degree for process engineers or technical school degree for process operators;
5. high safety awareness (VCA certification).⁴¹

To ensure the availability of the required skills to work in biorefineries/distilleries, the consulted producers combine recruitment of personnel with specialist education and process-specific training, provided partly

in-house, partly by external suppliers.

The case of a company now mainly focused on biobased value-adding processes, which used to have tight linkages with the sugar sector, is presented in Box 6.1.

Box 6.1 – Workforce in Amino GmbH biorefinery

*Amino GmbH operates a large-scale biorefinery in Frelstedt (Germany). Its origins date back to *Norddeutsche Zucker-Raffinerie GmbH*, formerly a Nordzucker Group subsidiary. The company website⁴² discloses interesting socio-demographic information on the workforce, as well as information on job quality. Most of Amino's 114 employees work full-time; less than one-tenth is doing part-time jobs. The majority of employees are between 30 and 50 years old. The proportion of women in Amino's workforce has constantly risen, starting from just under 29 % in 2013 to over 36 % in 2015. The company has a policy of involving apprentices in its daily business as much as possible, and supporting them in their work. Preferably, each apprentice is supervised by one trainer per occupational field. A significant drawback from a social dialogue standpoint is the fact that workforce at Amino is not bound by a collective bargaining agreement: job conditions and contractual matters with its employees are dealt with individually.*

Interviews with sugar producers and trade unions, and discussions in the two workshops for the project, revealed that one of

⁴⁰Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:s3A32012L0018>)

⁴¹<https://vcadirect.com/vca-course/all-about-vca/>

⁴²<https://amino.de/en/amino/our-team>

the most serious challenges, common to sugar production and biorefineries/distilleries, is **covering job positions of critical importance** (blacksmiths, mechanics and electricians in particular), for which there is **more and more limited availability of skilled workers**. In the case of sugar factories, there is the additional challenge that skilled workers for those positions often prefer to work for companies whose work routines are not shift-based; the fact that during the beet processing campaign workers in those positions are often under heavy pressure does not help either. By contrast, it emerged that it is relatively easier for companies to find skilled engineers or process managers, since sugar factories, biorefineries and distilleries are generally considered as stimulating operational environments. The most significant difficulty in attracting skilled professionals for those positions is the fact that most sugar factories are located in rural areas or small/medium urban centres, whereas such professionals may prefer to work in major urban centres.

Another challenge highlighted by the consulted producers and trade unions is **putting older, less skilled “blue collar” workers** in the position to keep **working on more and more automated and digitalised processes**. This requires substantial efforts by both trade unions and employers, not only in terms of providing older workers with the basic skills and specific training needed to work on equipment and automated processes controlled through digital interfaces, but also in terms of sensitisation and motivation. It is essential that everybody is taken along in this transition. A **robust social dimension is needed**, putting the future of jobs and the sustainability of the sector at its centre. **Social partners need to anti-**

pate change jointly through collective bargaining.

7 INCREASING THE SECTOR'S ATTRACTIVENESS TO YOUNG WORKERS

As highlighted in section 3, the **ageing workforce** is a major challenge to address for the European beet sugar sector; the issue is further aggravated by the **specialist skills** that are needed for several job positions in sugar factories, especially in the production department. Specialist skills are needed even more in the production of beet-derived products other than sugar, and in biobased value-adding processes. Last but not least, increasing **automation, robotisation and digitalisation** in the European beet sugar

factories require more and more sophisticated IT skills from workers (section 6). The **inclusion of young workers** in the sector is of paramount importance to address the above challenges. The following sections analyse the main obstacles to a wider inclusion of young workers in the sector, and provide examples of good practices aimed at **increasing the sector's attractiveness as employer** among younger prospects, to promote generational change.

Topic	Key findings
<p>The European beet sugar sector as an attractive employer for young people</p>	<p>Main issues with the image of the sector as employer among young people:</p> <ul style="list-style-type: none"> • Limited awareness of the sector. • Limited knowledge about the sector as an employer. • Knowledge about the sector is partly incorrect/outdated.
<p>Conveying to young workers a truthful image of the European beet sugar sector</p>	<p>European beet sugar producers seem to focus on the most appropriate typologies of communication efforts for reaching out to young talents (<i>company profiles on social medias/dedicated platforms; "work with us", corporate social responsibility and environmental sustainability sections on company websites</i>)</p>
<p>Establishing fruitful linkages with the educational system</p>	<p>Several European beet sugar producers have established successful forms of cooperation with the educational system (technical schools; universities).</p>
<p>Reaping the concrete benefits of improved attractiveness to young workers</p>	<p>Most European beet sugar producers have implemented effective approaches to reap the concrete benefits of improved attractiveness to young workers, and increased availability of young prospects with the right skills (<i>effective in-house training programmes, apprenticeship schemes and tutoring/mentoring by older skilled workers</i>)</p>

7.1 Current attractiveness of the sector as an employer

The “Socio-demographic analysis of the European Sugar Sector” (CEFS and EFFAT, 2015) identified a number of **key socio-demographic features** of the sector that are tightly linked with the need for generational change:

- I. ageing and predominantly male workforce;
- II. high proportion of white collars and technical job profiles;
- III. significant demand for workers with higher qualifications;
- IV. permanent employment as the standard situation.

To **tackle the related challenges**, the study proposed, among others, to:

- a. address **succession planning** and transmission of know-how;
- b. promote **access of young workers** to the sector;
- c. recruit job profiles in high demand in the sector.

The **image of the European beet sugar sector as employer** in the eyes of the young generations is a key element to consider to tackle the problem of generational diversification in the sector. Desk research and (especially) interviews with stakeholders revealed a number of **key issues** concerning that image (Table 7.1).

Table 7.1 – The image of the European beet sugar sector as employer among young people: key issues

Key issues	Relevant aspects to consider
<i>Limited awareness of the sector</i>	In general, students and young job seekers have limited awareness of the European beet sugar sector, especially outside the rural areas where sugar factories are located. Young people in urban areas often do not know that sugar is produced from beets in their country.
<i>Limited knowledge about the sector as an employer</i>	Students and young job seekers that are aware of the sector often know very little about its operations, and hence about the job opportunities that it can offer, the job profiles most in need, the type of activities that those profiles imply, and the skills needed to perform those activities.
<i>Knowledge about the sector is partly incorrect/outdated</i>	Students and young job seekers that are aware of the sector as an employer often have a partly incorrect or outdated knowledge about its operations, the nature of jobs and of the related tasks, working conditions and job quality, as well as wider societal and environmental implications of beet sugar production in Europe.

Sources: interviews with stakeholders

Partly incorrect and/or outdated knowledge about the sector among young people looking for job opportunities is a particularly serious problem, since it has **negative implications for the image of the sector as employer**. The problem deserves a more detailed analysis, whose main findings are outlined in Table 7.2.

Desk research and interviews with stakeholders revealed that a substantial part

of the knowledge about the sector among young people is outright incorrect, or not in line with the current operational reality of the sector. The findings of the analysis suggest that the first, essential step to increase the attractiveness of the European beet sugar sector as an employer in the eyes of young job-seekers is conveying to them a **correct and up-to-date image of the sector** itself.

Table 7.2 – The image of the European beet sugar sector: (mostly) true or (partially) false?

Key concepts	True or false?	Additional considerations
Sugar factories as a workplace		
Sugar factories are located in remote rural areas , often with rather poor quality of life	MOSTLY TRUE	Few sugar factories in Europe are close to the main urban centres; the small rural towns and villages where most sugar factories are located offer limited housing opportunities, basic services only, and very limited (if any) amenities. However, several sugar factories are not so far from mid-sized or large cities, albeit they are usually not reached by public transportation.
Sugar factories are unhealthy and dangerous workplaces	PARTIALLY FALSE	Even though the operational conditions in sugar production present significant safety and health risks (e.g., from use of heat and steam, heavy equipment with moving parts, intense truck traffic within the factories, etc.), sugar producers are extremely attentive to risk prevention and consider safety on the workplace and the health of their workers a priority. To this end, they constantly upgrade their safety procedures, provide specific training to workers, increase automation and robotisation of the most dangerous operations, etc.
Working conditions and job quality in the sugar sector		
The sector offers limited and non-appealing job opportunities (low-tech “blue-collar” jobs)	FALSE	Due to ageing workforce and the need of specialist skills, the sector offers interesting job opportunities for a wide range of profiles. A little known but remarkable sectoral specificity is the fact that several workers basically have two different jobs: one in production during the beet processing campaign, and one in plant maintenance over the rest of the year. Due to increasing automation, robotisation and digitalisation in the sector, there is a growing demand for workers with more or less advanced IT skills, which are more likely to be found among younger prospects. Diversification into innovative biobased processes by some producers also implies increasing demand for highly specialised technicians. Last but not least, average wage levels in the sugar sector are usually among the highest in the food and beverage industry.

<p>Working conditions in the sector are tough (mainly due to shift-based work routines)</p>	<p>MOSTLY TRUE</p>	<p>Shift-based work routines during the beet processing campaign are an inherent feature of the sector. Furthermore, the average length of processing campaigns has increased in several European countries, due to industrial restructuring (much fewer plants process about the same volume of beets). Workers involved in shift-based routines can feel under pressure, and their work-life balance in that period may suffer. However, some sugar producers have successfully implemented work routines based on 4 or even 5 shifts (rather than 3), to reduce workers' fatigue and to improve their work-life balance.</p>
<p>The sector offers limited job opportunities to women</p>	<p>PARTIALLY FALSE</p>	<p>Even though the "blue-collar" workforce in sugar factories is still mostly male, female workers are increasingly employed in production (also thanks to increased automation, robotisation and digitalisation). Women already account for a significant share of personnel employed in administration, marketing, support services, etc.</p>
<p>Beet sugar production in Europe: wider societal and environmental implications</p>		
<p>The sugar sector has a declining economic and social importance</p>	<p>FALSE</p>	<p>It is true that many beet sugar factories have ceased to operate in Europe since 2006: plant closures often make the news, and contribute to convey an image of industrial decline. However, the general public is mostly unaware of the fact that: i) the number of direct jobs in the sector during the processing campaign has declined slightly less than the number of factories (-42% vs. -45%); ii) the sugar production potential of the sector has remained largely the same; iii) as a consequence, the sector still supports a significant number of jobs in rural areas (23,700 direct jobs in sugar factories and a higher number (338,500) of indirect and induced jobs in the related upstream and downstream supply chains, including 166,000 in agriculture</p>
<p>Beet sugar production in Europe has negative environmental impacts</p>	<p>FALSE</p>	<p>The European beet sugar sector boasts outstanding environmental sustainability. The high sugar yield per hectare allows for a very efficient use of agricultural land. As a rotational crop, sugar beet plays an important role in maintaining soil fertility. Sugar factories have to comply with demanding EU and/or national environmental standards. Whereas sugar factories use coal as an energy source in some countries, cleaner natural gas is widely used in other countries. EU sugar producers strive for minimal waste creation through the use of co-products and residues as feedstock for value-adding processes.</p>

Sources: interviews with stakeholders; CEFS-EFFAT CSR reports; company annual/CSR reports; company websites; WifOR (2019); CEFS sugar statistics

7.2 How to improve the attractiveness of the sector to young workers

Desk research and interviews with sta-

keholders revealed that European beet sugar producers have made an **important effort in terms of communication** to convey a truthful, accurate and up-to-date image of the sector's operational reality.

The consulted sectoral stakeholders believe that the sector has the **right assets to “tick many of the essential boxes”** in the wish list of young job-seekers. However, they also deem that some of the sector’s inherent characteristics – mainly the location of factories in rural areas and shift-based work routines during the processing campaign – will keep on preventing recruitment of young talents living in the main urban areas and/or attaching particular importance to a daytime-only job and a guaranteed, year-round, favourable work-life balance.

Table 7.3 provides an overview of the main communication efforts to convey a truthful

image of the European beet sugar sector as an attractive employer, of their diffusion among sectoral stakeholders, and of their likely relevance for young job-seekers. **Relevance has key importance:** not all types of communication combine effectiveness and high visibility among young people. Most young job-seekers use internet to search for attractive employers and interesting job opportunities, but communication through general interest social media (like Facebook or Twitter) or dedicated platforms (e.g., LinkedIn) may be more likely to hit the right target audience than a “work with us” section on a company website or a Corporate Social Responsibility report.

Table 7.3 – Conveying a truthful image of the sector as an attractive employer: main communication efforts

Type of effort	Diffusion*	Likely relevance for young job-seekers
“Work with us” section on company website (information on job quality & opportunities; online application form)	WIDE (>90%)	MODERATE/HIGH
Company profile on social medias (e.g., Facebook, Twitter) and/or dedicated platforms (e.g., LinkedIn)	WIDE (>90%)	HIGH
Participation to dedicated events (e.g., Job Fairs)	MODERATE (>35%)	HIGH
Dedicated section on social responsibility and/or environmental sustainability on company websites	HIGH (>80%)	MODERATE/HIGH
Regular publication of a stand-alone Corporate Social Responsibility / environmental report	LOW (<35%)	MODERATE
Corporate Social Responsibility / environmental section in a company’s annual reports	MODERATE (<50%)	MODERATE/LOW

*prevalence (% share of total) in a sample of 21 sugar companies operating in Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, the United Kingdom

Sources: interviews with stakeholders; CEFS-EFFAT CSR reports; company annual/CSR reports; company websites

The diffusion of communication efforts that are likely to be relevant for young job-seekers (“work with us” and CSR/ sustainability sections on company websites; company presence on social medias and dedicated platforms) was found to be wide within a sample of European beet sugar producers; less relevant efforts (e.g., stand-alone CSR or environmental sustainability reports) have more limited diffusion. Participation of sugar producers in job fairs has moderate diffusion. All in all, European beet sugar producers seem to **focus on the most appropriate typologies of communication efforts for reaching out to young talents.**

Some consulted sectoral stakeholders observed that also communication efforts targeted at the wider public and/or at younger students (primary schools) provide useful, albeit less direct, contributions to building a more attractive image of the European beet sugar sector as employer. Improved general awareness about the sector and more people getting a truthful image of the same make it more likely that a higher number of youngsters will see the sector as a fascinating one to work in, and plan their education accordingly.

Desk research and interviews with stakeholders highlighted the critical importance of **well-functioning linkages between the educational system and sugar producers** for:

1. improving the **attractiveness of sugar producers as employers** among young talents and job-seekers;
2. securing future **availability of young workers with the right basic and specialist skills** to work in the beet sugar sector.

Two conditions emerged as essential to establish fruitful linkages between educational institutions and sugar producers for the above purposes:

- c. the linkages must be established with the **right profiles of educational institutions**;
- d. the linkages must be **beneficial to both parties.**

Leaving aside the obvious cases of the (fewer and fewer) educational institutions offering specialist programmes in **sugar technology, technical schools and universities** whose programmes cover a combination of essential basic skills (IT skills in particular) and specialist skills characterising the job profiles most in need in the sugar sector (e.g. electricians, blacksmiths, mechanics, technical process managers, food technologists, quality managers, etc.) emerged as the **most suitable candidates** for cooperation. It also emerged that **educational institutions must see concrete benefits from the cooperation with sugar producers** (e.g. in terms of access to facilities for hands-on training that they could not afford, or to specialist know-how that would be difficult for them to develop in-house and/or costly to secure by hiring knowledgeable teachers) **to get engaged** in the relationship, to provide the **basic and specialist skills needed** to work in the sector, and to act as a **promotional vehicle for the sector among young talents.**

Interviews with sectoral stakeholders also revealed that educational institutions with the right profile **in the areas where sugar factories are located** (or in nearby areas) should be a **priority target** for producers. Young talents living closer to sugar factories are more likely to consider them

as an attractive workplace. Besides that, proposing to students **hands-on experiences in operational environments**, as well as offering **concrete perspectives of future employment** in the sector, are other important conditions to establish an effective cooperation with educational institutions, with a view to securing the availability of young talents with the right skills for the sector.

Several **success stories** in terms of cooperation between educational institutions and sugar producers emerged from the study: Box 7.1 provides a brief outline of the key findings.

Box 7.1 – Key factors for effective cooperation between sugar producers and educational institutions

Several consulted sugar producers have established successful forms of cooperation with the educational system (technical schools; universities). It emerged that

the **key factors for an effective cooperation** are:

Informing the educational institutions about the **essential basic and specialist skills needed** to work in the sector.

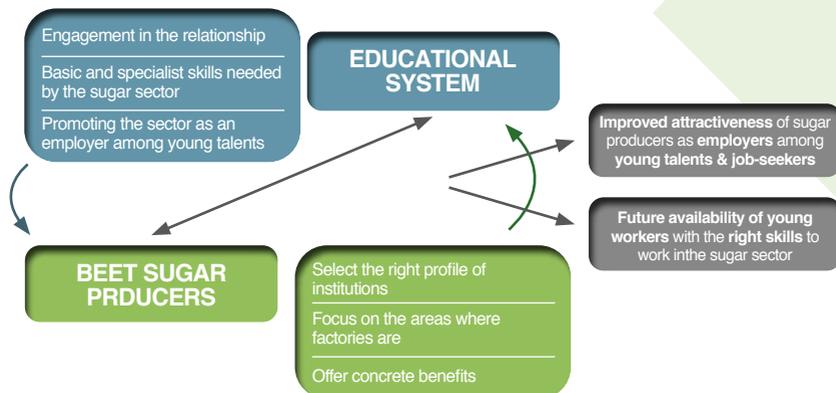
Using **factory visits** for students as a way to raise curiosity and interest about working in the sector.

Promoting the engagement of teachers and students by giving them **access to specialistic know-how and training equipment in sugar factories**, which would otherwise be unavailable to them.

Focusing on **dual learning**: theory classes in the schools but also at sugar factories, and hands-on practical training at sugar factories.

The road to establishing fruitful linkages between the educational institutions and beet sugar producers is outlined in Figure 7.1.

Figure 7.1 – The road to a fruitful cooperation between sugar producers and educational institutions



Conveying to young job-seekers a truthful image of the sector and establishing fruitful linkages with the educational system are essential conditions to improve the attractiveness of the European beet sugar sector as employer in the eyes of young talents. However, an improved attractiveness to young workers, and increased availability of young prospects with the right skills to work in sugar factories, are enabling conditions that cannot solve, by themselves, the problem of ageing workforce in the industry. **Effective in-house training programmes, apprenticeship and tutoring/mentoring by older skilled workers** are the essential next steps to reap the concrete benefits of recruiting young new talents, with a view to **addressing the problem of ageing workforce, promoting generational change and creating value** for the sugar industry. The key findings emerged from the analysis on apprenticeships and tutoring/mentoring programs are outlined in Box 7.2.

Box 7.2 – Apprenticeships and tutoring/mentoring

Apprenticeship programmes play a key role in the transition between young talent recruiting and value creation. These programmes offer to young workers a **concrete chance of finding a permanent job** in the sugar sector, and are very important for **closing the skills gap for specific job profiles**. They also **improve the effectiveness of in-house training**, thanks to the engagement and motivation that they promote in participants, and to the practical experience in actual operational contexts that they provide.

Apprenticeship programmes are often **combined with tutoring and mentoring**

by older skilled workers. The related schemes usually foresee that each apprentice (or small groups of apprentices) carries out his/her tasks under the supervision and with the assistance of a skilled worker with higher seniority, to promote more effective knowledge transfer. In some companies, **tutoring/mentoring** is also combined with **early retirement schemes**. Older workers acting as tutors/mentors enjoy preferential access conditions to early retirement, and apprentices that successfully complete their programme have a concrete chance of finding a permanent job in the company to replace the retired mentor/tutor. According to companies, this approach enhances the engagement and motivation of both tutors/mentors and apprentices, who both see concrete benefits from their relationship.

Some countries (e.g., the United Kingdom) have **publicly funded schemes** in place **to promote apprenticeship** programmes. Several consulted companies **invest significant financial resources** in their apprenticeship programmes. In certain companies, apprentices account for a significant share of total workforce (e.g., around 10% at Südzucker AG). Overall, the German sugar sector can be regarded as an example of good practice in terms of diffusion of apprenticeships: the share of apprentices in the sector is around 9%, compared to 4% in the food industry as a whole. A number of companies implement their apprenticeship programmes in **cooperation with technical schools and universities**. The **duration** of apprenticeship programmes generally ranges from two to four years, and varies according to companies and to the specific job profiles concerned. Some consulted trade unions observed that shortening to some extent

the duration of the longest apprenticeship programmes may further increase the interest of young workers for them.

Apprenticeship programmes in most of the consulted companies were found to be a **very effective** way of addressing skills gaps and the need for generational change. A high share (e.g., 80-100% at British Sugar) of apprentices find a permanent job in the companies after apprenticeship, and often make remarkable progression within the companies afterwards. In some countries (e.g., the United Kingdom), the apprentice retention rate of the beet sugar sector is significantly higher than the national average. This is an additional proof that sugar companies are good employers, and that young talents enjoy working in the sector once they become aware of it, and are given a concrete chance to find a permanent job there.

8 FACILITATING INTRA-EU SKILLS MOBILITY

Topic	Key findings
<i>Intra-EU skills mobility</i> in the European beet sugar sector	Very limited mobility of workers from one country to another (in particular for skilled “blue collar” specialist workers in the production departments of sugar factories).
Barriers to intra-EU skills mobility in the European beet sugar sector	Two very serious and hard-to-remove obstacles: language barriers and bureaucracy (lack of harmonised EU-level legislation and non-homogeneous national legislation in many areas: taxation, social security, work permits, etc.)
<i>Promoting improved intra-EU skills mobility in the European beet sugar sector</i>	Some European sugar producers operating in multiple countries have (or used to have) programmes aimed at promoting and facilitating intra-group mobility of their employees from one country to another; some producers were however forced to quit those programmes (mainly due to bureaucratic complexity).

8.1 Barriers to intra-EU skills mobility

The theme of labour mobility, with particular regard to the movement of skilled workers, has been increasingly explored by institutions, academics and private organisations in the last years. For instance, the European Commission publishes an annual report on intra-EU Labour Mobility⁴³, and OECD has recently explored possible options for creating an “EU Talent Pool” by attracting and recruiting skilled workers also from outside Europe.⁴³ The following sections provide an overview of the **current state of intra-EU skills mobility** (both in general and with specific regard to the European beet sugar sector), explore the **main barriers** that impede mobility, and analyse the **most significant** initiatives undertaken by European sugar producers to facilitate skills mobility within the sector.

Free movement of workers is a fundamental principle of the EU, enshrined in Article 45 of the Treaty on the Functioning of the European Union (TFEU). Free movement means that EU citizens can move freely between Member States of the EU and have the right to live in other countries if they fulfil certain conditions. Secondary legislation⁴⁵ also provides additional elements concerning the free movement of workers and their families.

Overall, work is the main factor of migration, much more important than education and family. In fact, the share of the working-age population is considerably larger amongst intra-EU movers (73%) than in the overall EU population (58%). Unemployment in the Member State of origin is one factor driving the migration of working-age people, but wage differences also seem to be a key driver.⁴⁶

⁴³European Commission (2020).

⁴⁴OECD (2019).

⁴⁵More specifically: Regulation (EU) No 492/2011 of the European Parliament and of the Council of 5 April 2011 on freedom of movement for workers within the Union; Directive 2004/38/EC of the European Parliament and of the Council of 29 April 2004 on the right of citizens of the Union and their family members to move and reside freely within the territory of the Member States; Council Directive 2004/38/EC on the right of citizens of the Union and their family members to move and reside freely within the territory of the Member States.

⁴⁶Committee of Regions (2016).

The **gender distribution** of movers is quite balanced: 51% of EU-28 movers are women and 49% men, with variations between Member States. In terms of education, 33% of intra-EU27 movers have high **education** levels, 41% medium and 25% low. As illustrated in Table 8.1 below, these figures are different from those of

national workers: the prevalence of the high education group was slightly higher among national workers than among intra-EU movers, while the latter are over-represented in the group with a low education level, and under-represented in the medium education level group.

Table 8.1 - Distribution across education levels of national workers and intra-EU movers

Groups	High education	Medium education	Low education
EU-27 movers	33%	41%	25%
National workers	35%	49%	16%

Source: European Commission, 2020 Annual Report on Intra-EU Labour Mobility

The share of highly educated among intra-EU movers increased by 6% between 2011 and 2019 at EU level. Workers with high education levels are more and more moving to other countries to seek better job opportunities and higher wages.

There is a continuous upskilling of intra-EU movers. Over time, the share of intra-EU movers employed in highly skilled occupations has increased. Nevertheless, intra-EU movers still tend to get jobs in the lowest occupational skill level, i.e., elementary occupations, compared to national workers. The share of intra-EU movers working as professionals and in other highly skilled occupations (legislators, senior officials, managers) was similar to that of national workers.

Finally, the total number of EU and EFTA **cross-border workers**, namely workers residing in one country and working in another one, amounted to 1.89 million people in 2019. The cross-border movement of workers is mainly caused by substantial differences in average wages between

neighbouring countries. For instance, among EU and EFTA countries, Germany is the largest country of destination of cross-border workers, mainly from Poland (30% of cross border workers working in Germany), where wages are lower.

Interviews with sectoral stakeholders revealed **very limited mobility from one country to another in the European beet sugar sector**. Mobility is **particularly limited for skilled “blue collar” specialist workers in the production departments** of sugar factories. In all the countries covered by the study, national workers account for the vast majority or near-totality of the workforce in the production departments of sugar factories. The presence of migrant/foreign workers is **more significant for certain non-specialist job profiles** (where mastering the local language has less critical importance) **or for high-level managerial positions** (knowledge of multiple languages is more widespread among high-level professionals). The presence of commuting foreign workers was found to be general-

ly limited also in sugar factories located close to national borders, even where the same language is spoken on both sides of the border (like in the case of the Belgian-French border).

Mobility from one country to another is more significant within multinational groups operating beet sugar factories in multiple countries, especially for highly specialised workers and for managers, but remains limited even within those groups.

Two main barriers to intra-EU skills mobility in the beet sugar sector have been identified in the analysis: language barriers and bureaucracy.

1. **Language barriers** emerged as a particularly serious obstacle. Most job profiles in sugar production, handling, logistics require frequent exchanges with co-workers (often to solve complex operational issues), suppliers and customers, understanding of a wide array of written documents, and extensive paperwork to complete. Foreign workers need to be proficient in the relevant national languages to carry out their tasks: the use of a “bridge” international language (like English) would be clearly unfeasible.
2. **Bureaucracy** was found to be an equally serious obstacle. The absence of a harmonised EU-level legislation, combined with non-homogeneous national legislation in many areas (taxation, social security, work permits, etc.), make the temporary or permanent transfer of workers from one country to another extremely complex. The same difficulties arise for cross-border workers, especially in the absence of agreements between the two countries aimed at facilitating cross-border mobility.

8.2 Promoting improved intra-EU skills mobility

The study found that **some sugar producers operating in multiple countries** have (or used to have) programmes aimed at **promoting and facilitating intra-group mobility** of their employees from one country to another. These programmes are usually not limited to high-level professionals, but also cover specialist workers involved in production, handling and support functions, as well as technical managers. These programmes usually have training purposes, but can also contribute to address specific skill gaps in a certain country where the group operates by promoting temporary or permanent transfer of skilled workers from another country, where the availability of the needed skills is less scarce. To that end, some programmes also provide language courses to address the issue of language barriers.

However, the study also found that **some multinational groups were forced to quit those programmes** mainly because of one of the key barriers to intra-EU mobility of skilled workers: bureaucracy. The need for costly specialistic expertise (e.g., in tax or job legislation) to address the complexity of the related administrative requirements, together with the risk of unpleasant consequences for both workers and the company in case of non-compliance with the relevant national legislation, regrettably forced those producers to quit certain intra-group mobility programmes, in spite of their usefulness.

9 RECOMMENDATIONS

This section illustrates the recommendations that the project team elaborated for the topics of interest.

The **entities for which each recommendation is relevant** are specified by a **reference in (bold blue types)** in the text; the reference **(all)** means that the recommendation is relevant for CEFS and EFFAT as organisations, for their member organisations, trade unions and for individual beet sugar producers.

Decisions on business strategies and on their implementation are clearly a task for individual business operators; no recommendations in that regard were hence elaborated. Recommendations under the present section exclusively focus on initiatives that can **support the achievement of the relevant objectives**, through direct actions of social partners, their member organisations and individual sugar producers, or by promoting/requesting the intervention of other stakeholders.

9.1 Safeguarding/boosting employment in the EU beet sugar sector and promoting regional development in sugar beet growing areas

1. **Keep on monitoring the evolution of the relevant EU policies⁴⁷ (CEFS & EFFAT)** and of the related national policies (**member organisations; individual producers**), with particular attention to the (**funding/enabling**)

opportunities that they can offer to the beet sugar sector; **keep on safeguarding the interests of the sector and of its workers** in the framework of the related stakeholder consultation activities.

2. **Participate proactively in the relevant good practice exchange platforms** set at EU (**CEFS & EFFAT**) and national level (**member organisations; individual producers**), to further improve sectoral know-how and to highlight the main sectoral needs. Platforms of interest include: the European Network for Rural Development (ENRD)⁴⁸; the Global Bioenergy Partnership (GBEP)⁴⁹; ICA Community of Practice for Bioeconomy Education in Europe (ICA CoP Bio-Edu)⁵⁰; the best practice exchange platform of the ENABLING project (funded by Horizon 2020).⁵¹

3. **Highlight to the relevant stakeholders** - EU institutions → (**CEFS & EFFAT**); national and regional/local institutions + local communities of the areas where sugar beet farming and processing are carried out → (**member organisations; individual producers**); the wider public → (**all**) - the **important contribution of sugar beet farming and processing activities to the economic, social and environmental sustainability** of rural areas and small/mid-sized urban centres in the sugar producing Member

⁴⁷These include: the European Green Deal and the related strategies (Farm2Fork, Bioeconomy); the Common Agricultural Policy (CAP) for the 2023-27 period (in particular the related implementing provisions at EU and national level); the Fit for 55 package (revision of the Renewable Energy Directive, Energy Taxation Directive, Emissions Trading System Directive, Energy Efficiency Directive) and other related policies (e.g., the Climate, Energy and Environmental Aid Guidelines - CEEAG); the NextGenerationEU recovery and stimulus package.

⁴⁸https://enrd.ec.europa.eu/networking/stakeholder-involvement_en

⁴⁹<http://www.globalbioenergy.org/>

⁵⁰<https://www.ica-europe.info/ica-board-committees/ica-community-of-practice-for-bioeconomy-education-in-europe>

⁵¹<https://www.enabling-project.com/platforms>

States. In concrete, this can be done through, e.g., communication campaigns (to inform the wider public) and/or more focused efforts (e.g., events like conferences, round tables, seminars, targeted at local institutions/communities, or at a specific audience, such as academics, environmental NGOs, etc.).

4. Insist on asking the relevant EU (**CEFS & EFFAT**), national and regional/local institutions (**member organisations; individual producers**) to take action to **maintain the key conditions that ensure the economic viability** of sugar beet farming and processing in the EU: protection of the EU sugar market from price volatility and from unfair competition by non-EU producers; availability of affordable energy sources; provision of income support to beet growers.
5. Encourage the relevant EU (**CEFS & EFFAT**), national and regional/local institutions (**member organisations; individual producers**) to **remove the regulatory constraints** to, as well as to **actively promote** through general and sector-specific legislation and financial support, the **development of innovative value-adding processes** using sugar beet, sugar and the related co-products as feedstock.⁵²
6. Encourage the relevant EU (**CEFS &**

EFFAT), national and regional/local institutions (**member organisations; individual producers**) to take action to **maintain/upgrade the infrastructure** needed to keep sugar beet farming and processing (into sugar and into products other than sugar) in rural areas, in particular by **establishing/enhancing the needed financial and material enabling conditions**.

9.2 Further increasing the EU beet sugar sector's sustainability and promoting diversification into other beet-derived products

1. Ensure that **European sugar beet processing plants maintain the possibility to valorise all products arising from the sugar manufacturing process**, thereby continuing to minimise waste and delivering on environmental sustainability objectives. To this end, **CEFS, its member organisations and individual producers** should: i) take action to remove regulatory constraints (see section 9.1); and, ii) **contribute proactively to the identification of research streams of interest to the sector**.⁵³
2. **Monitor the progress of scientific and applied research in the field of bioeconomy**⁵⁴ (**CEFS member orga-**

⁵²Some key areas where social partners and individual producers could focus their efforts include: i) ensuring that energetic self-use of residues from biomass processing is not subject to additional requirements under the new Renewable Energy Directive and Energy Taxation Directive; ii) ensuring that other processes, e.g., Combined Heat & Power generation and quicklime production, are treated fairly by new legislation (the Energy Taxation Directive in particular); iii) inclusion of sugar in the scope of the Delegated Regulations of the Sustainable Finance Taxonomy; iv) access to funding for the development of "green" production processes (InvestEU Programme, Taxonomy Regulation for classifying "green investments", promotion of sustainable finance); v) access to funding for the development of innovative value-adding processes through the NextGenerationEU recovery and resilience facility (and the related national plans), in particular in the "Clean Technologies and Renewables" flagship area.

⁵³These include: i) improving energy efficiency of sugar beet processing plants, also with a view to emission abatement; ii) improving energy efficiency in the transportation of sugar beets and final products of beet processing; iii) sugar chemistry, to identify convenient paths for obtaining new compounds with interesting properties for the development of innovative biobased products.

⁵⁴Useful resources to monitor the relevant research streams include: the Science Hub of the Joint Research Centre: <https://ec.europa.eu/jrc/en/research-topics> ; the CORDIS database: <https://cordis.europa.eu/projects/en> ; the European Bioeconomy Network: <https://eubionet.eu/projects-list/>

nisations and individual producers), with a view to identifying and assessing the results that offer the most promising opportunities in terms of development on a commercial scale.

3. **Get engaged in the research and development activities** funded at EU⁵⁵ and national level (**CEFS member organisations and individual producers**) to promote the development of **innovative value-adding processes** using sugar beet, sugar and the related co-products as feedstock.
4. Prompt the relevant EU⁵⁶ (**CEFS**), national and regional/local institutions (**CEFS member organisations, individual producers**) to **remove the regulatory constraints** (e.g., legislation currently not allowing certain specific uses in the food/feed industry) to **full-scale commercial production and marketing of innovative biobased products** using sugar beet, sugar and the related co-products as raw materials, since this would further improve the sector's resilience and sustainability.

9.3 Securing the skills required of the workers in a sector in transition

1. **Monitor the prospective overall trends in the demand of general and specific skills⁵⁷ most in need in the sector (all)**, since those trends will influence the future availability of those skills. The already limited availability of specific skills/job profiles of critical importance in sugar beet processing (e.g., blacksmiths, mechanics, electricians, etc.) may shrink further if the overall demand for those skills will decline.
2. **Identify in advance prospective skills and training needs for the sector⁵⁸ (CEFS; CEFS member organisations; individual producers)**, in order to **plan a response strategy**, also relying on the available EU-level instruments to support the "just transition" towards a more environmentally sustainable production and consumption system, also mitigating the potentially negative social side effects.⁵⁹ Skills that are likely to be in higher demand

⁵⁵The main EU sources of funding for the relevant R&D activities include: the Horizon 2020 and Horizon Europe programmes (<https://ec.europa.eu/programmes/horizon2020/en/home>); the Agricultural European Innovation Partnership (EIP-AGRI); (<https://ec.europa.eu/eip/agriculture/en>); the "InnovFin – EU Finance for Innovators" initiative, providing loans and guarantees to innovative businesses for research and innovation activities (<https://www.eib.org/en/products/mandates-partnerships/innovfin/index.htm>); LIFE Programme, the EU's funding instrument for the environment and climate action (https://cinea.ec.europa.eu/life_en).

⁵⁶With particular regard to the authorisation of beet-derived products as "novel foods" and feed additives, the competent authority is DG SANTE of the European Commission. The European Food Safety Authority (EFSA) has instead a strictly science-based advisory function (provision of non-binding advice to risk managers, i.e., the European Commission, the European Parliament and EU Member States).

⁵⁷Authoritative EU and international institutions regularly monitor the overall and sector/profile-specific trends in skills demand, and also make forward-looking research on the topic. These institutions include: European Centre for the Development of Vocational Training (CEDEFOP); <https://www.cedefop.europa.eu/en>; World Economic Forum (WEF); <https://www.weforum.org/>.

⁵⁸Close cooperation between the General Management and the Human Resources functions in each company emerged as a critical condition to pursue this objective.

⁵⁹Solutions to promote the development of the "green skills" that will be in higher demand in the transition envisaged by the European Green Deal include: i) the Just Transition Mechanism to promote re-skilling and active inclusion of workers and jobseekers, and help create new local jobs in the targeted regions; ii) the Pact for Skills, aimed at – among others – "monitoring skills supply/demand and anticipating skills needs"; iii) the European Skills Agenda, a five-year plan aimed at – among others – "strengthening sustainable competitiveness, as set out in the European Green Deal" through the development of improved/new skills.

in the sector include (see section 6.2):
i) capacity to work on highly automated and digitalised processes and equipment; ii) capacity to work on biobased processes.

3. Monitor the offer of specialist technical education of interest to the sector, also with a view to **establishing forms of cooperation with the concerned institutions** (technical schools, universities)⁶⁰ (**CEFS; CEFS member organisations; individual producers**). The two main approaches to addressing limitations in the educational offer in the areas surrounding sugar factories are:

- a. cooperation with local educational institutions to better tailor their educational offer to the needs of the local plant(s);
- b. cooperation with educational institutions with the “right” offer, but located far from the plant(s), to devise solutions aimed at allowing prospects from the area surrounding the plant(s) to attend courses there (e.g., by offering them accommodation and/or grants).

4. Discuss possible approaches to further improve awareness among wor-

kers about the critical importance of constantly updating and improving their skills⁶¹ (CEFS member organisations; trade unions; individual producers). A robust social dimension will be needed to manage the transition of the sector, putting the future of jobs and the sustainability of the sector at its centre. In particular, social partners will need to **anticipate change jointly through collective bargaining.**

5. Offer training programs that can address **heterogeneous levels of endowment with the “basic skills of the future”**, in particular those related to **digitalisation and automation of production and handling processes (individual producers)**. The acquisition/improvement of **IT skills** - in particular those needed to work on processes/equipment controlled through **digital interfaces** - is of paramount importance for the jobs of the future.⁶²

6. Ensure satisfactory job conditions that can motivate workers to support recruiting activities (individual producers): a satisfied worker who talks positively about the sector as an employer already provides a significant help in that regard.⁶³ **This is also relevant for increasing the sector’s attractiveness to young workers.**

⁶⁰The essential conditions to establish a fruitful cooperation between sugar producers and educational institutions (see section 7.2 for an illustration of good practices in that regard) are the following: i) identifying the right profiles of educational institutions; ii) the cooperation must be beneficial to both parties.

⁶¹The discussion should take place at all the relevant levels (i.e., beet sugar sector as a whole, individual companies, individual factories) to ensure the effectiveness of any approaches devised for the purpose, since there are aspects that should be tailored to the specific demographic situation (structure of workforce by age group), endowment in terms of skills (by age group and/or by job position), as well as type and level of skills required by the specific situation of each plant (in terms of production processes, degree of automation/digitalisation of processes and equipment, etc.).

⁶²Effective training programs need to combine company-wide elements with plant-specific ones. This is particularly important to ensure a sufficient basic level of IT skills across the entire workforce, and even more so to ensure adequate IT skills for job positions where the capacity to control processes/equipment through digital interfaces has critical importance. An example of good practice in providing effective training in difficult conditions (industrial restructuring, plant closures, relocation of workers), based on cooperation with other companies presenting similar needs in terms of skills, as well as with public institutions, was presented in the second workshop for the project (it concerned a food industry sector other than the beet sugar one).

⁶³This is a particularly challenging goal to meet in the difficult conditions that the sector experienced in the post-quota period. In any case, all the levels – sector as a whole, individual companies, individual plants – are relevant for social partners to discuss how to maintain, and possibly improve, the quality of jobs in the sector.

7. Prompt the relevant EU (**CEFS & EF-FAT**), national and regional/local institutions (**member organisations; individual producers**) to **secure adequate funding for maintaining and developing an adequate educational offer also for specialist skills/job profiles** whose overall demand is limited/will be decreasing, but that are of critical importance for the viability of specific sectors.⁶⁴ ***This is also relevant for increasing the sector's attractiveness to young workers.***
8. **Encourage educational institutions** in the areas where beet sugar factories are located, as well as in the nearby areas, **to offer courses that are (better) tailored to the needs of the sugar sector**, including through forms of cooperation with sugar producers⁶⁵ (**CEFS and EFFAT member organisations; individual producers**). ***This is also relevant for increasing the sector's attractiveness to young workers.***

9.4 Increasing the sector's attractiveness to young workers

1. **Implement/enhance opportune communication strategies and practices** aimed at conveying to young people a **correct and up-to-date image of the sector**⁶⁶ (**CEFS; its member organisations; individual producers**). Besides establishing strong linkages with the educational system (see recommendation 3 below), and communication on social media, participation of sugar producers to events targeted at young job-seekers ("job fairs") emerged as a particularly effective practice for the purpose.
2. **Encourage educational institutions** to convey a **correct and updated image of the sector as an employer** to their students⁶⁷ (**CEFS member organisations; individual producers**).
3. **Establish fruitful linkages with the educational system, or further strengthen the existing links**⁶⁸, starting from primary schools (to improve the awareness about the sector and to convey a positive image of the same)

⁶⁴This recommendation is closely related to recommendation 3 about the offer of specialist technical education. To encourage educational institutions in this regard, sugar producers should offer concrete benefits to them, e.g., in the form of access to facilities for hands-on training that they could not afford, or to specialist know-how that would be difficult for them to develop in-house and/or costly to secure by hiring knowledgeable teachers.

⁶⁵There are several incorrect/outdated perceptions about the sector among young people: it is of paramount importance to inform them that the sector has the right assets (e.g., non-routine jobs; advanced technology; environmental sustainability, etc.) to "tick many of the essential boxes" in the wish list of young job-seekers.

⁶⁶The many strong points of the sector – including in terms of social and environmental sustainability – should be highlighted to educational institutions through targeted communication efforts, also with a view to establishing a fruitful cooperation with them (see recommendation 3). Communication should be targeted not only at technical schools and universities, but also at institutions providing primary education: increased awareness about the beet sugar industry among children is likely to translate into a higher number of youngsters who may be interested in finding a job in the sector.

⁶⁸The key conditions for establishing a fruitful cooperation are the following: i) there must be mutual benefits for both parties (sugar producers and educational institutions); ii) the educational institutions need to be informed about the essential basic and specialist skills needed in processing plants; iii) it is important to raise curiosity among students through, e.g., factory visits; iv) cooperation must focus on dual learning. Another important incentive is offering students concrete perspectives of future employment in the sector (see recommendation 4).

up to technical schools and universities (to attract young talents) **(CEFS member organisations; individual producers)**. Dual learning (theory classes in the schools but also at sugar factories, and hands-on practical training at sugar factories) emerged as a particularly important element for a fruitful cooperation with educational institutions.

4. **Develop effective in-house training programmes, apprenticeship and tutoring/mentoring by older skilled workers**, taking inspiration from the available good practices in the sector⁶⁹ **(EFFAT member organisations; individual producers)**. Cooperation between sugar producers and trade unions is critical to ensure the effectiveness of these initiatives.

9.5 Facilitating intra-EU skills mobility

1. **CEFS and EFFAT, their member organisations, and individual producers** should **monitor the evolution of intra-EU skills mobility** and of the **existing barriers to it** (language; bureaucracy)⁷⁰, with particular regard to

the additional challenges posed by the Covid-19 pandemics and the related response measures.

2. **CEFS and EFFAT, their member organisations, and individual producers** should **promote/facilitate the exchange of good practices implemented in the sector** in terms of **programmes aimed at promoting and facilitating intra-group mobility within multinational groups**, including the understanding of the reasons that forced some of those groups to quit those programmes.⁷¹
3. Encourage the relevant EU **(CEFS & EFFAT)**, national and regional/local institutions **(member organisations; individual producers)** to **address the main barriers to intra-EU skills mobility**, i.e., language and bureaucracy, through **support to education and training of foreign workers** and through **regulatory simplification**.⁷²

⁶⁹The identified good practices include: i) Establishing "preferential channels" to apprenticeships for proficient students of technical schools with which a fruitful cooperation has been established (see recommendation 3). ii) Combination of tutoring/mentoring with early retirement schemes. Older workers acting as tutors/mentors enjoy preferential access conditions to early retirement, and apprentices who successfully complete their programme are offered a concrete chance of getting a permanent job to replace the retired mentor/tutor. The approach enhances the engagement and motivation of both tutors/mentors and apprentices, who both see concrete benefits from their relationship.

⁷⁰The European Commission monitors developments in this area, and publishes an Annual Report on Intra-EU Labour Mobility. Even in the absence of data specific to the beet sugar sector, the Commission's report provides interesting evidence on the main trends and the current situation. Section 8.1 of the present report illustrates the (limited) sector-specific evidence available on intra-EU skills mobility.

⁷¹Social partners could jointly develop programmes for such purposes, and discuss the related issues in the framework of, e.g., the European Works Council (EWC). Section 8.2 of the present report provides some information on ongoing and terminated programmes in the sector.

⁷²EU institutions have taken action to address the issue mainly: i) through EURES, the European Job Mobility Portal, a cooperation network of employment services, designed to facilitate the free movement of workers across Europe; ii) by regulating "posted workers" (i.e., workers who are sent by their employers to carry out a service in another EU Member State on a temporary basis, in the context of a contract of services, an intra-group posting or a hiring out through a temporary agency). Sensitisation efforts of social partners should be targeted in particular at the European Labour Authority (ELA), which ensures that EU rules on labour mobility and social security coordination are enforced in a fair and effective way, in order to make it easier for citizens and businesses to reap the benefits of the internal market.

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