European Bioeconomy in Figures 2014–2021

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List of figures

TABLE OF CONTENTS

LIST OF FIGURES **3**

1 EXECUTIVE SUMMARY **4**

2 INTRODUCTION **6**

3 SOURCES AND METHODOLOGY **6**

4 RESULTS **9**

4.1 TURNOVER 9
4.2 EMPLOYMENT 12
4.3 BIO-BASED SHARES IN THE MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS 18

5 REFERENCES **29**

List of figures

Figure 1 Turnover and Employment in the Bioeconomy overall (2020; EU-27) *4*
Figure 2 Relation of NACE and CPA classification *7*
Figure 3 Turnover in the bioeconomy in the EU (2014-2021; EU-27) *10*
Figure 4 Turnover in the bioeconomy (2021; EU-27) *10*
Figure 5 Turnover in the bio-based economy (2021; EU-27) *11*
Figure 6 Turnover in the bio-based economy (2014–2021; EU-27) *12*
Figure 7 Employment in the bioeconomy (2021; EU-27) *13*
Figure 8 Employment in the bioeconomy (2014-2021; EU-27) *14*
Figure 9 Employment in the bio-based economy (2021; EU-27) *15*
Figure 10 Employment in the bio-based economy (2014 – 2021; EU-27) *16*
Figure 11 Turnover in thousand € per employment unit (FTE) in the bio-based economy per Member State (2021; EU-27) *17*
Figure 12 Employment per turnover in sectors of the bio-based economy (2014-2021; EU-27) *18*
Figure 13 Bio-based shares in the product value of chemicals and chemical products in each Member State (2014-2021; EU-27) *19*
*Figure 14 Bio-based shares in the product **value** of chemicals and chemical products (2014-2021; EU-27)* *21*
*Figure 15 Bio-based shares in the product **volume** of chemicals and chemical products (EU-27; 2014 – 2021)* *22*
Figure 16 Contribution of NACE classes to the total product value of bio-based chemicals (2014-2021; EU-27) *23*
Figure 17 Contribution of NACE classes to the total product volume of bio-based chemicals (2014 – 2021; EU-27) *26*

List of tables

*Table 1 Bio-based shares in the product **value** of chemicals and chemical products (2014-2021; EU-27)* *20*
*Table 2 Bio-based shares in the product **volume** of chemicals and chemical products products (2014-2021; EU-27)* *20*
Table 3 The 20 partly or fully bio-based chemical products with the highest bio-based production value (2020; EU-27) *24*
Table 4 The 20 partly or fully bio-based chemical products with the highest bio-based production value (2021; EU-27) *25*
Table 5 The 20 partly or fully bio-based chemical products with the highest bio-based production volume (2020; EU-27) *27*
Table 6 The 20 partly or fully bio-based chemical products with the highest bio-based production volume (2021; EU-27) *28*

1 Executive summary

The bioeconomy in the European Union is a strong contributor to the overall economy and accounts for over 16 million employees and more than 2.3 trillion Euro in turnover across all 27 Member States. In terms of turnover almost half of the 2.3 trillion Euro can be attributed to the food and feed industries, which remain a large part of the EU bioeconomy. Adding to this are the agriculture and forestry sectors providing primary biomass to bioeconomic processes. However, the sectors processing these feedstocks and manufacturing intermediate and end-use products, collectively referred to as the bio-based industries, find themselves contributing on a stable level to the overall bioeconomy and account for almost a third of the overall turnover.

The 16 million employed people in the European bioeconomy are divided to these sectors differently. While agriculture and forestry only account for less than a quarter of the overall turnover, more than half of the employment can be accounted to primary biomass production. Adding to this and together accounting for more than three quarters of the overall employment, is the food and feed industry in the European Union. The so-called bio-based industries provide work for more than three million people across the EU Member States.

While employment of the whole bioeconomy continues to decrease over the years, it has remained relatively stable for the bio-based industries. In the case of turnover, a different trend can be observed in the respective scopes: the overall bioeconomy is more or less at a stable level for the last couple of years, while turnover in the bio-based industries fluctuates somewhat from year to year with a small decrease visible in 2021 data.

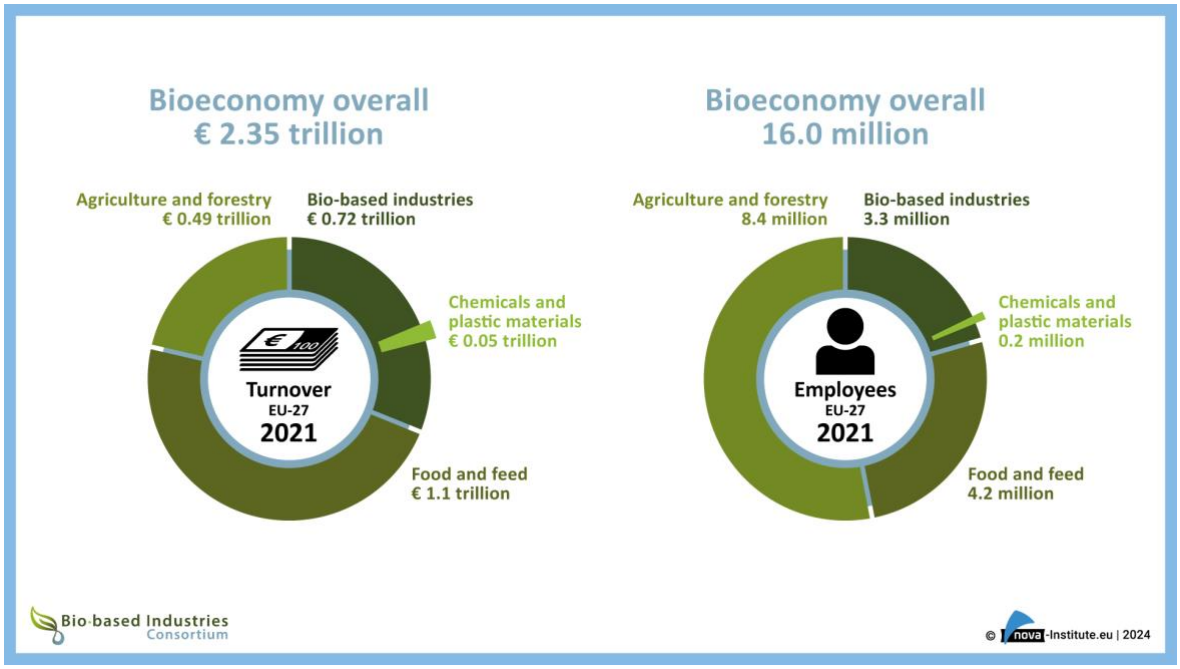

Figure 1: Turnover and Employment in the Bioeconomy overall (2021; EU-27)

Compared to earlier versions of this report the new numbers do not include the United Kingdom anymore, even for years where the UK was still part of the European Union. This has been done to provide comparability across the years.

Analysing the economic data for 2020 and 2021 inevitably includes possible effects of the COVID-19 pandemic that, while not necessarily immediately visible, can be attributed to certain trends in the newest data. One example is the pharmaceutical sector which shows an upwards trend in the latest data in contrary to other sectors, that faced great challenges during the early years of COVID-19.

2 Introduction

The bioeconomy gains increasing importance in the strategic focus of the European Union and has been identified as a key sector to achieve the Union's sustainability and climate targets. Strategically, the bioeconomy is integral to the European Green Deal, which aims to make Europe the first climate-neutral continent by 2050. The EU's dedicated Bioeconomy Strategy focuses on developing a sustainable and circular bioeconomy to address societal challenges and enhance the competitiveness of bio-based industries. Significant funding for bioeconomy-related projects is also allocated through the EU's research and innovation framework program, Horizon Europe.

As a means of understanding the current role of the bioeconomy in Europe and to understand how it is developing over the years, this study gathers data on key (socio-)economic indicators of the bioeconomy in Europe. These indicators include annual production value, production volume and employment data in the different sectors of the bioeconomic industries. In this year's edition of the report, the newest information from Eurostat up until 2021 is being assessed.

3 Sources and methodology

In order to obtain information on the socio-economic impacts of Europe's bioeconomy, the report uses economic information from official statistics and applies expert-derived "bio-based shares" to them. The principal methodology, developed in collaboration with the European Commission's Joint Research Centre (JRC), is detailed in Ronzon et al. (2020).[1]

The primary data sources for all sectors of the bioeconomy shown in the following figures are official Eurostat databases, specifically PRODCOM (Eurostat 2024) and the Structural Business Statistics (SBS, Eurostat 2024a). PRODCOM provides data on the production quantity and value of approximately 3,900 manufactured goods from all Member States. These goods are classified by an 8-digit code according to the European Classification of Products by Activity (CPA) system, where the first four digits indicate the division, group and class according to the NACE classification of economic activities (NACE stands for Nomenclature statistique des activités économiques dans la Communauté européenne).

See below in Figure 2 how the NACE and CPA classification systems are connected and build on each other.

[1] Slight differences in details mean that data published by the JRC may not exactly match ours. Attempts to harmonise approaches have not been entirely successful due to differing objectives and assumptions, but these differences do not significantly impact the overall conclusions.

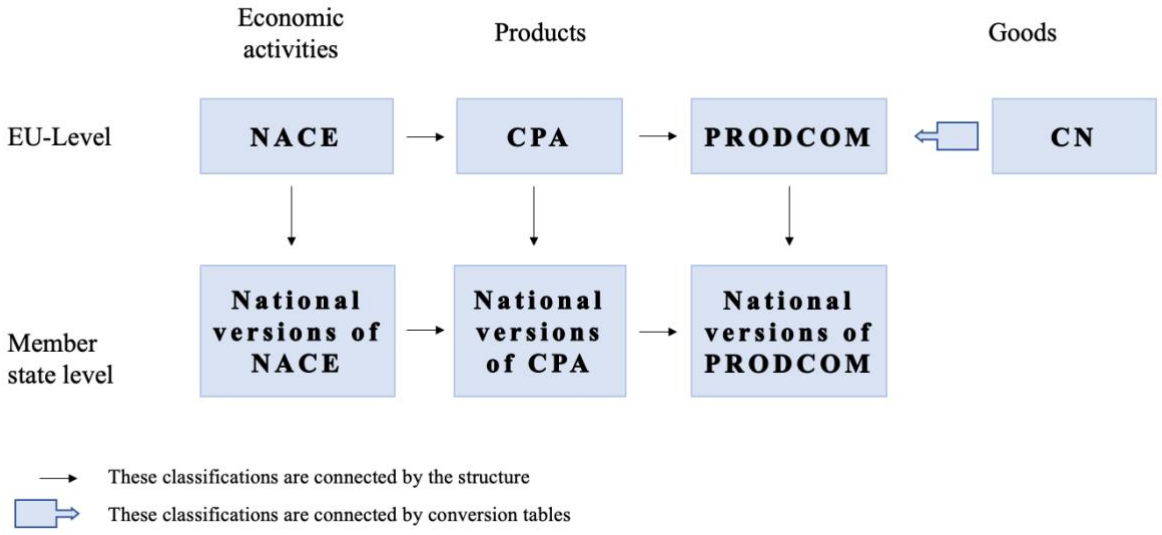

Figure 2: Relation of NACE and CPA classification

The most recent year available for the data analysed in this updated report unfortunately varies across Eurostat data sources. PRODCOM provides data for the years including 2021, while the SBS database has not provided any data on 2021 yet and the 2020 data is the most recent available. Also, due to the United Kingdom leaving the European Union, the EU-specific information in this report has been adjusted accordingly for comparability, removing the UK information going back to the year 2014.

This has been done by one of three ways:

1) For most of the products, there is dedicated data for the EU-27 countries available in PRODCOM, which is the most favourable way to address the adjustment.

2) In the specific cases where EU-27 data is not directly available in PRODCOM, the second most favourable approach is to use EU-28 data and subtract the respective UK data. However, there are also several cases, where either EU-28 or UK data for this approach are not available and gaps have to be filled in a third way.

3) In these cases, and as the third favourable approach, the data of the EU-27 is calculated as the sum of all individual available Member State data as a tolerable way to fill the gaps.[2]

Please note: For figures with turnover and employment information from the year 2021, the missing SBS data for the year 2021 has also been an issue that had to be addressed with a respective methodological approach. While the required PRODCOM data from 2021 could be used, we had to assume identical numbers for 2020 and 2021 in the SBS data used in the

[2] Note, that this is only tolerable because there are cases, especially with smaller Member States, where information has been reported but is not publicly available in order to prevent direct inferences on individual companies.

figures to fill the data gaps in 2021. Therefore, future changes to the 2021 data are likely once SBS provides newer data than 2020.

For the first time, annual numbers have not been continuously updated for the EU-28 and its Member States. Following the United Kingdom's exit from the European Union (Brexit) and a three-year delay in reporting data in PRODCOM, the UK has not reported any manufacturing and socio-economic data for 2019 and onwards. Therefore, we have decided to change our scope to a pure view on the EU-27, even for years where the UK was still part of the European Union. This allows us to see developments in the EU bioeconomy without having to account for effects of the UK leaving the Union. This report now looks at the numbers from 2014 onwards and to prevent bias, we have excluded the UK from our analysis starting with this edition. All figures account for the EU-27.

Further economic indicators, such as employment and turnover, are found in the SBS and other databases at higher aggregation levels, i.e., the NACE class and division level. The SBS also contain production values at the NACE class level, but these are not identical to the PRODCOM production values summed up to the same NACE class. This discrepancy arises because NACE classifies enterprises by their main activity, even if they produce products belonging to other classes. However, the deviations are generally negligible.

To derive economic indicators for partially bio-based sectors, the methodology first estimates product-level bio-based shares for all products in the PRODCOM list. These shares are determined by two factors for each product code in the respective product groups. The first factor determines how much of the overall production contains **any** bio-based content (e.g. 40% of the overall production has **any** bio-based contents) and the second factor determines the amount of bio-based content in this share determined in the first factor. This translates to an overall bio-based share for a product, which is calculated as follows:

$$\begin{aligned} &Share\ of\ overall\ production, that\ has\ any\ bio\text{–}based\ content \\ &\times\ bio\text{–}based\ content\ of\ said\ share \\ &=\ bio\text{–}based\ share\ of\ this\ product \end{aligned}$$

These shares are continuously improved by nova experts with the help of industry expert feedback and the latest information available from market reports and publications. Industry experts are explicitly encouraged to provide feedback to improve these shares.

These shares are applied to the product-level production value, aggregated to the sector level (NACE classes or higher), and applied to various economic indicators (such as turnover, employment, quantity). For fully bio-based sectors, turnover and employment data were directly obtained from Eurostat datasets. These sectors include primary biomass production (agriculture, forestry, fishery) and the food, beverages, tobacco, paper, and paper products sectors.

Sectors such as textiles and textile products, forest-based industry, chemicals (including enzymes), plastics and pharmaceuticals only partly contain bio-based products. Therefore, bio-based shares for these sectors are estimated and accounted for in the figures. The forest-based industry includes fully bio-based wood products and partly bio-based furniture. Chemicals and plastics, as well as pharmaceuticals, include fully bio-based (e.g. natural dyes, enzymes) and partly bio-based products. In 2020, of the 534 products in NACE division 20 (Manufacture of chemicals and chemical products), 110 were fully or partly bio-

based. Of these 110 bio-based products, 40% are fully bio-based (e.g. vegetable tanning extracts, sorbitol), 24% have a bio-based share of at least 10% (e.g. ethylene glycol), and 36% have lower bio-based shares (e.g. acetic acid).

Biodiesel and bioethanol have dedicated product codes within NACE division 20. Their economic effects are evaluated separately by calculating their shares of the total production values in their respective NACE classes (20.14 and 20.59).

For bioenergy for heat and power (biogas and solid biomass), shares in employment and turnover are estimated, considering the higher labour intensity of renewables due to handling and decentralised plants. While other data sources for bioenergy and biofuels exist (e.g. EurObserv'ER annual reports), they are not compatible with Eurostat as they include both direct and indirect jobs without clear separation.

The graphs in this study differentiate between the overall bioeconomy (including primary production, food, and feed), the bioeconomy excluding food and feed, and the narrower "bio-based economy" excluding primary biomass production. This categorisation illustrates different effects and characteristics, as the food market follows different dynamics compared to the chemical and material industries.

4 Results

4.1 Turnover

Turnover in the EU bioeconomy (EU-27; 2014–2021)

Figure 3 shows the turnover development of the total bioeconomy (including food and beverages and the primary sectors agriculture and forestry) over the period 2014–2021. The data shows a continuous increase from approximately 1.75 trillion Euro in 2014 to more than 2.35 trillion Euro in 2021, with the food and beverage sector being the largest contributor.

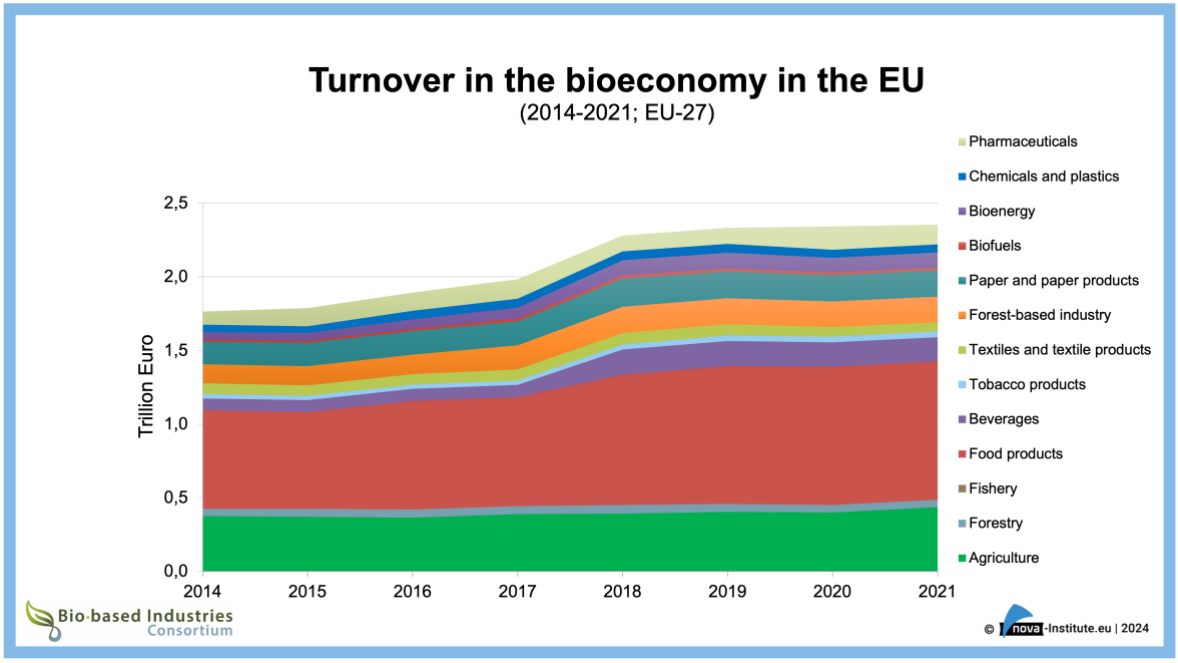

Figure 3: Turnover in the bioeconomy in the EU (2014–2021; EU-27)

About half of the 2.3 trillion Euro in 2021 (see Figure 4) comes from the food and beverage sector (47%), 1.6% from tobacco products and 19% of the turnover is generated by the primary sectors (agriculture and forestry) The rest is attributed to the so-called bio-based industries (which includes chemicals and plastics, pharmaceuticals, paper and paper products, forest-based industries, textiles and textile products, biofuels and bioenergy).

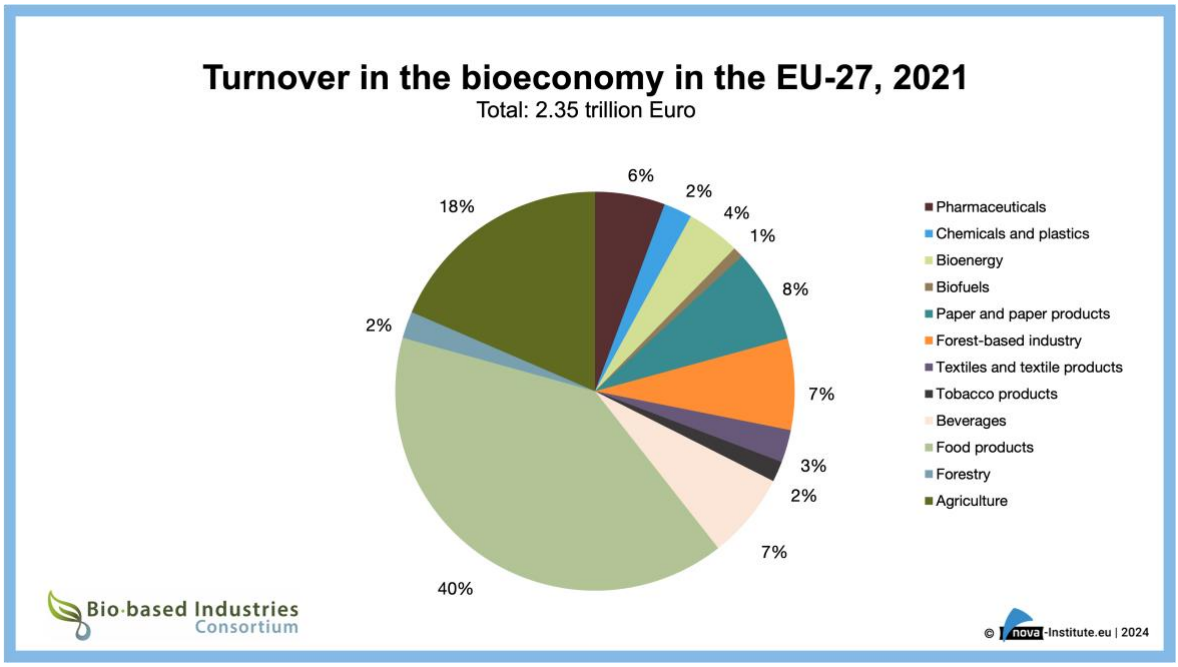

Figure 4: Turnover in the bioeconomy (2021; EU-27)

Turnover in the EU bio-based sector (EU-27; 2014–2021)

The turnover of only the EU industrial sectors referred to as the "bio-based economy" is shown in Figure 5. The analysis shows that biofuels and bioenergy together account for about 17% of turnover, which corresponds to a total of about 122 billion Euro.

The paper and paper products sector (25%) and the forest-based industry (wood products and furniture) (24%) account for the largest shares of turnover. Together they amount to about 352 billion Euro. Bio-based chemicals and plastics account for 55 billion Euro (7%). The total turnover of the bio-based industries reached around 725 billion Euro in 2021, up from around 560 billion in 2014 (Figure 6).

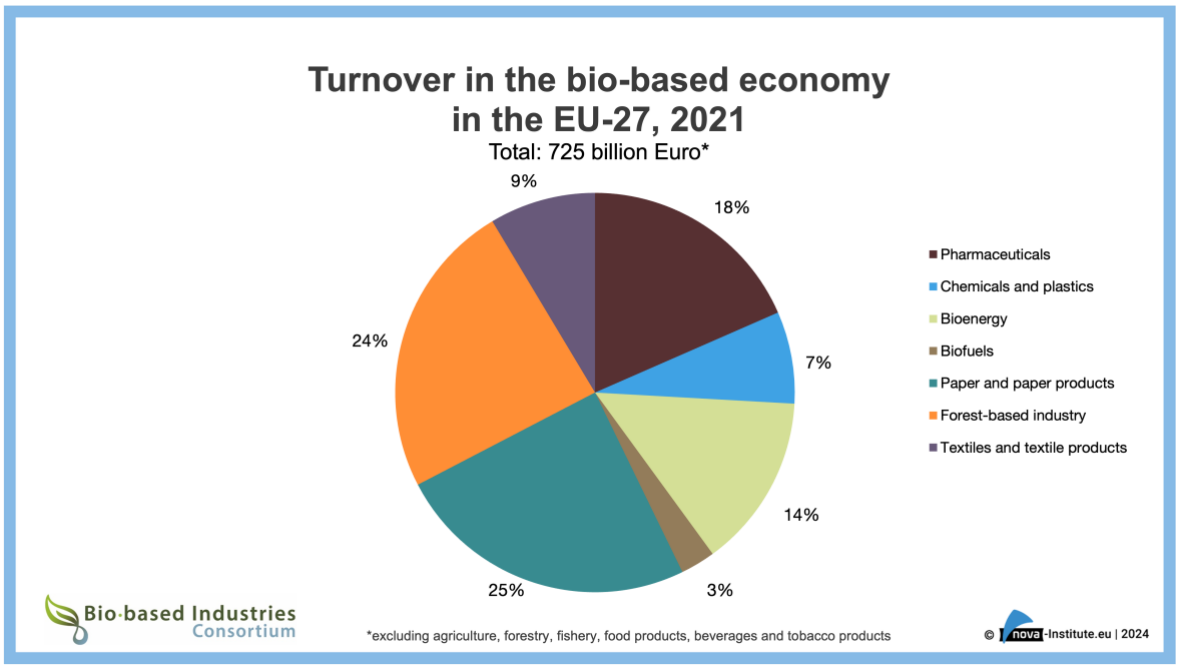

Figure 5: Turnover in the bio-based economy (2021; EU-27)

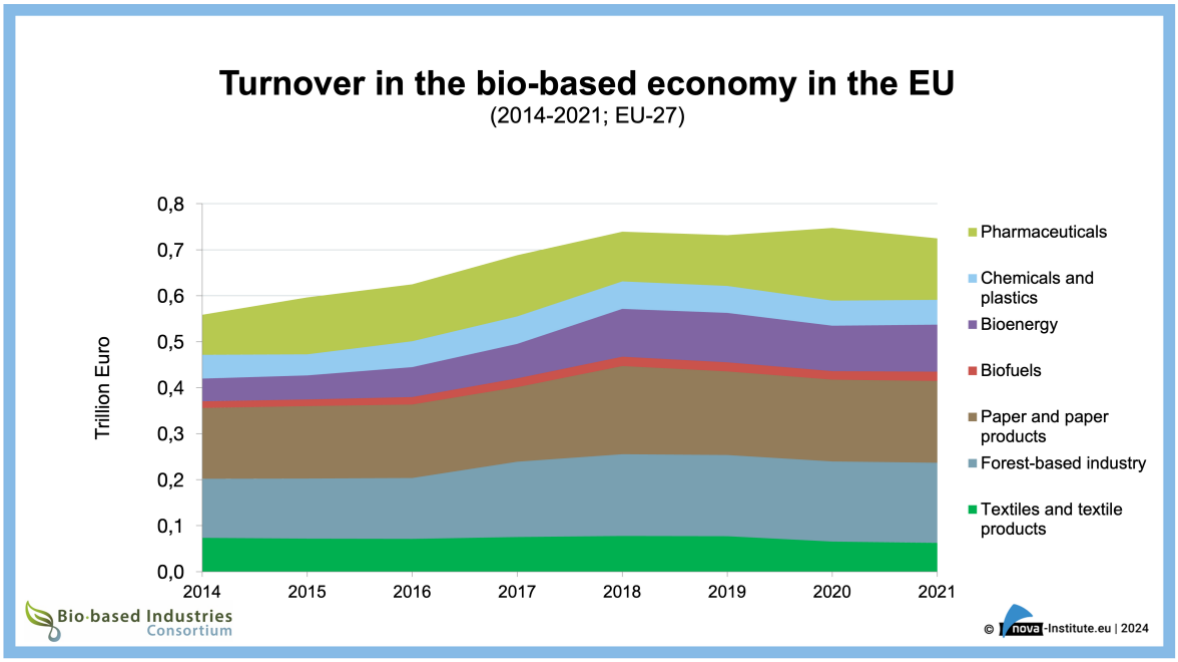

Figure 6: Turnover in the bio-based economy (2014–2021; EU-27)

Figure 6 shows the development of the turnover in the bio-based industries from 2014 to 2021. During this period, the bio-based chemicals and plastics sector in the EU-27 has increased its turnover by 5.8% from 52 billion Euro to around 55 billion Euro between 2014 and 2021. Compared to 2019 data the overall turnover has increased from 732 billion to 748 billion Euro which depicts an increase of 2.2%. While the turnover in the bio-based pharmaceutical industries had already increased by 26% between 2014 and 2019, from 87 billion Euro to 110 billion Euro, the year 2020 even saw growth of more than 45 billion Euro to 158 billion Euro turnover overall. This translates into a growth of 182% in the timespan of 2014–2020. While in 2021, and compared to 2020, the turnover in pharma decreased to 134 billion Euro, this still depicts a significant increase compared to previous years. Taking into consideration the COVID-19 pandemic starting in 2020, these drastic increases in 2020 and 2021 could be linked to the development and production of respective vaccines.

Other sectors, such as the bioenergy industry in particular, also saw a similar rise in turnover from 50 billion Euro in 2014 to over 100 billion Euro in 2021 (202% increase). More stable developments can be observed for industries such as the textiles sector, which recorded a turnover of 73 billion Euro in 2014, 78 billion Euro in 2018 and in turn a visible decline to 65 billion Euro in 2020, that may also be explained by effects of the pandemic.

4.2 Employment

Employment in the EU bioeconomy (EU-27; 2014–2021)

Looking at the employment figures for the bioeconomy in 2021 (Figure 7), it becomes obvious that the so-called primary sectors (agriculture, forestry and fishing) generate the most jobs in the bioeconomy with a share of over 53% (about 8.5 million employees). These sectors are followed by the food and beverage industry with 4.2 million employees (27%).

The tobacco industry, on the other hand, accounts for much less employment and only employs about 40,000 people. The rest of the employment is attributed to the bio-based sectors with almost 20% (3.3 million employees). A more detailed breakdown of the distribution can be found in Figure 9.

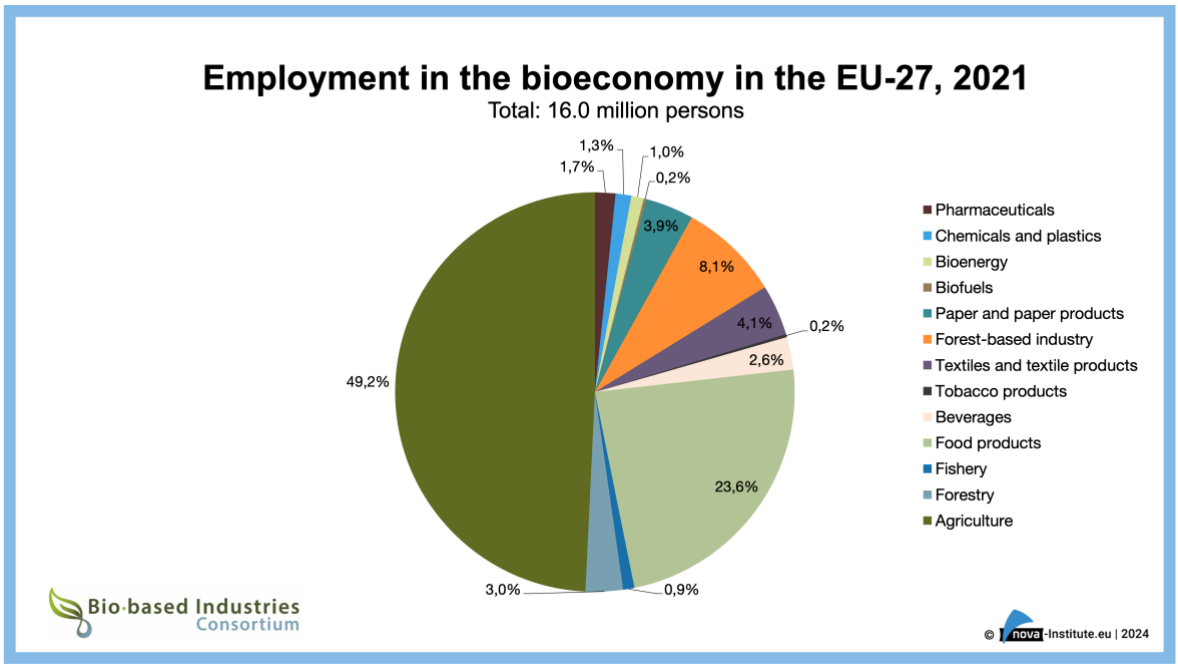

Figure 7: Employment in the bioeconomy (2021; EU-27)

Similar to the presentation of the turnover, Figure 8 shows the development of employment for the entire bioeconomy in the period from 2014 to 2021, measured in terms of the total number of employees. The comparison of Figure 8 with Figure 3 clearly shows that, in contrast to total turnover, total employment of the EU bioeconomy is declining. However, as Figure 8 shows, this decline of employment of the total bioeconomy is mainly due to the decline of the agricultural sector, which is caused by the increasing optimisation, automation and digitalisation and increased efficiency in its production processes.

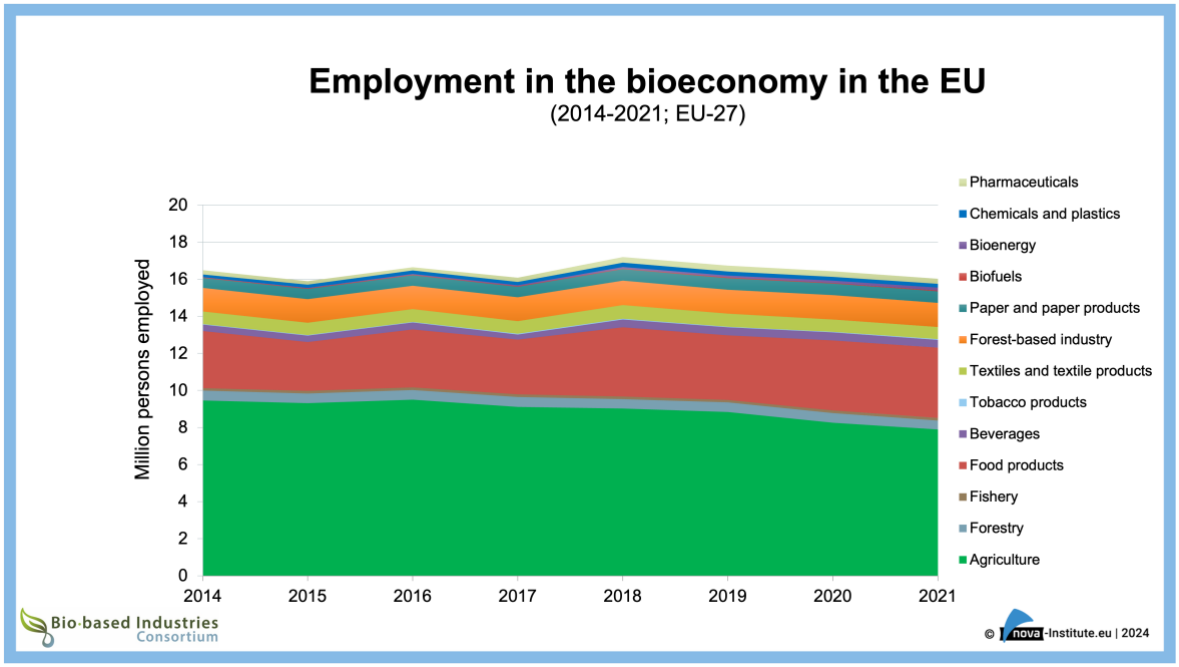

Figure 8: Employment in the bioeconomy (2014–2021; EU-27)

In the EU-27, the agricultural sector recorded a decrease of around 943,000 employees in 2021 compared to 2019 levels which translates to a decrease of more than 10%. Opposing effects can be seen in the food sector: In 2019, around 3.5 million people were employed in this sector in the EU-27. In 2021 however, there are about 3.8 million people employed. In total, the number of employed persons in the EU bioeconomy amounted to 16 million in 2021 (Figure 7 & Figure 8)

Employment in the EU bio-based sector (EU-27, 2014–2021)

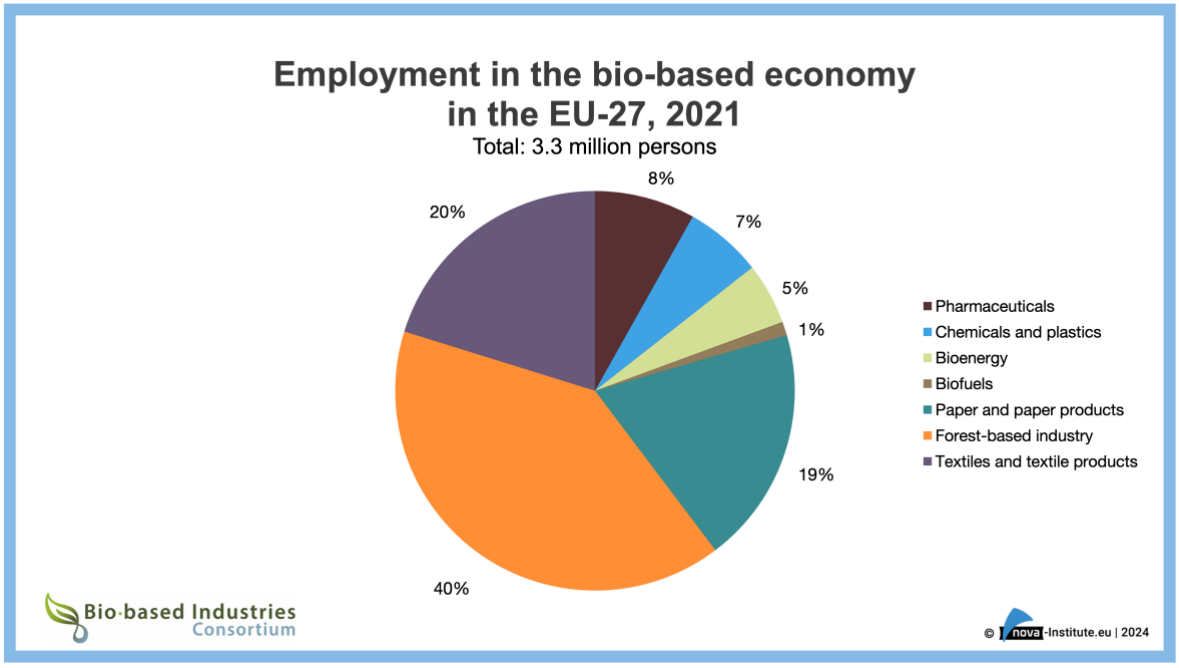

Figure 9: Employment in the bio-based economy (2021; EU-27)

The development of employment in the bio-based industries during the period from 2014 to 2021 shows a steady increase up until 2018 followed by a minimal downward trend in the years until 2020 (**Figure 10**). Employment increased from 2.9 million in 2014 to approximately 3.3 million in 2021, with the chemicals and plastics industries and the pharmaceuticals sector contributing with notable increases in employment. In the chemicals and plastics sector, employment increased from 148,000 people in 2014 to 204,000 people in 2021. The pharmaceutical industries see a similar trend, with an increase of 81,000 employed people from 2014 to 2020, resulting in 314,000 people employed in 2020. From 2020 to 2021 however, the pharmaceutical industries' employment numbers sank to 265,000 people employed, which is still an increase compared to 2014 levels, but a significant drop compared to the numbers of the previous year. The bioenergy sector is the third sector showing strong increases in employment with over 100,000 additional employees in 2021 compared to 2014.

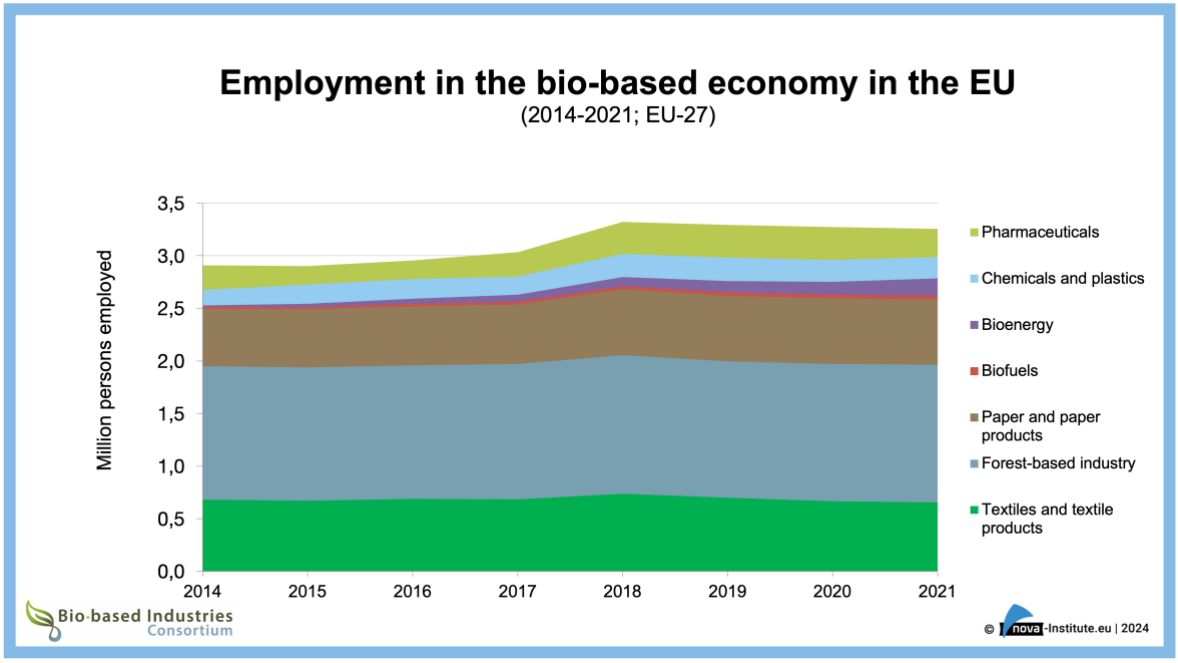

Figure 10: Employment in the bio-based economy (2014–2021; EU-27)

Overall, employment in the bio-based industries reached a level which remained relatively stable over the last couple of years starting in 2018. The greatest employment in total numbers can be found in the textiles, forest based and paper industries, which make up more than three quarters of the total employment in the bio-based economy in the EU-27 in 2021.

Turnover and employment ratios in the EU bio-based economy by Member State

Figure 11 below sets the total turnover in the bio-based economy (excluding agriculture, forestry, fisheries, food, beverages and tobacco) in relation to the respective employment numbers for each EU-27 Member State in 2021. This metric shows how much turnover is generated by one unit of employment in full-time equivalents (FTEs) and can hint at the structure of the industries in the Member States. A higher value of turnover per employment implies a larger share of refining and value-adding industries in a country whereas a lower share usually implies a larger share of production of primary biomass. The figure shows clear differences between groups of Member States, e.g. the Western and Northern European countries generate much higher turnover compared to employment generated in 2020. Countries such as Finland, Belgium, Sweden, Denmark and Germany, among others, show a large difference between turnover and employment. By comparison, Eastern European countries such as Lithuania, Romania and Bulgaria are stronger in less value-adding sectors of the bio-based economy, which require more employment per turnover. This is an observation that holds true for 2021 as well.

The strong figures for Belgium can be attributed to a particularly strong pharmaceutical sector which itself is already a sector which higher added value in its value chains compared to others and which also likely profited from the COVID-19 pandemic and the introduction of vaccinations.

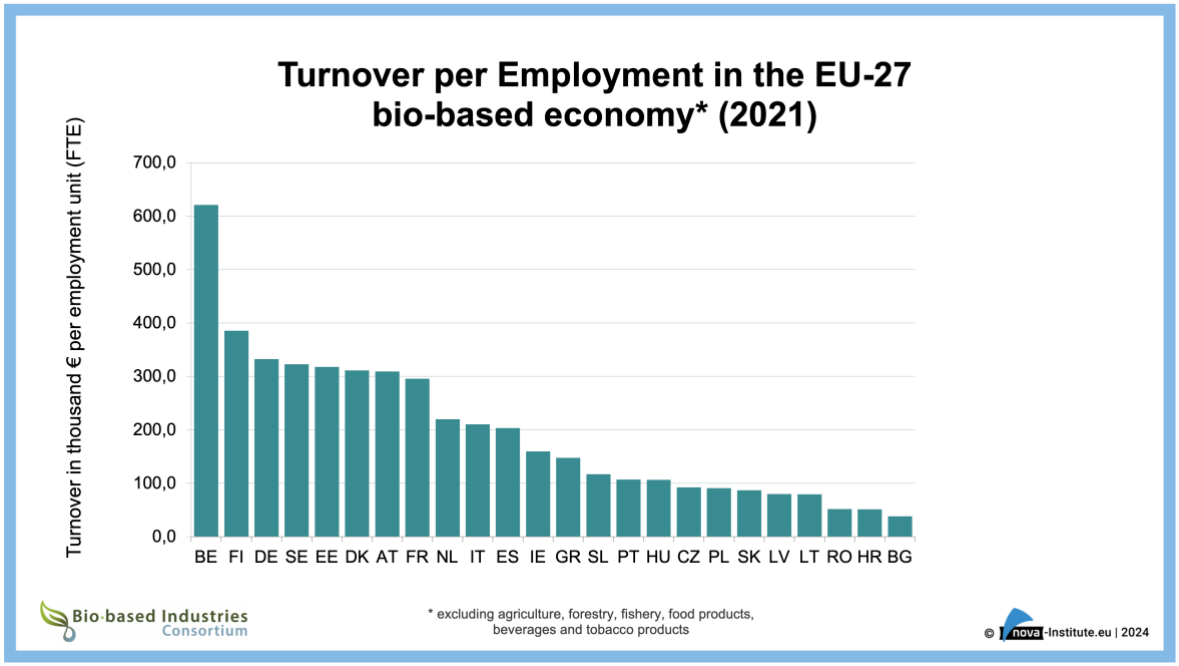

Figure 11: Turnover in thousand € per employment unit (FTE) in the bio-based economy per Member State (2021; EU-27)

Employment per turnover in sectors of the bio-based economy

Figure 12 compares the number of employed persons per one million Euro of generated turnover for the bio-based sectors textiles and textile products, forest-based industry (wood products and furniture), paper and paper products, chemicals and plastics, pharmaceuticals, biofuels and bioenergy over the period of 2014–2021.

This figure shows that sectors such as biofuels and bioenergy generate a lot of turnover with comparatively little employment. Conversely, the forest-based and textile processing industries require a great amount of work force to produce and generate turnover. Note that employment and turnover here always refer to the end product manufacturing stage only, meaning that neither the employment and turnover in primary biomass production nor indirect effects in other sectors due to machinery purchases etc. are accounted for in any of the industrial sectors.

The pulp and paper sector, meanwhile, can be found in an intermediate position. Here, production requires more labour but also generates higher turnover than textiles and textile products as well as the forest-based industry. In general, a decline in the employment-turnover ratio can point to improved productivity, indicating a continued competitiveness of Europe.

The chemicals and plastics sector shows a fairly stable development in this area, despite the increase of efficiency in 2017, which could be due to data gaps in the SBS database on employment figures. A somewhat similar situation applies to the bioenergy sector, which shows a clear trend towards more employment per turnover from 2016 on. It is worth noting that the analysis of the bioenergy sector is based, among other, on the turnover figures of the SBS database in the fields of “Manufacture of gas”, “Production of electricity” and “Steam and air conditioning supply”. Only since 2018 have these turnover figures been fully available for the EU-27 for the first time since 2011. In between these years, data gaps strongly influenced results for the bioenergy sector.

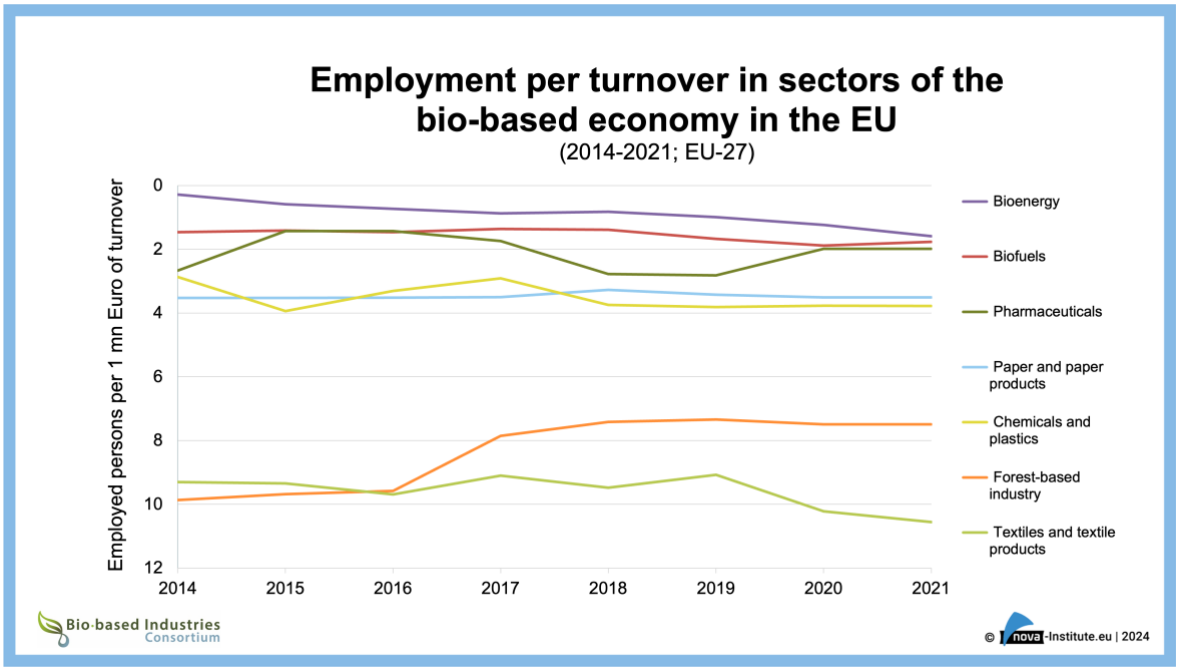

Figure 12: Employment per turnover in sectors of the bio-based economy (2014–2021; EU-27)

4.3 Bio-based shares in the manufacture of chemicals and chemical products

This sub-chapter takes a deeper dive into the chemicals sector C20 to understand how and where biomass already is a factor in chemical products. The different Member States in the EU-27 have substantially different profiles when it comes to the extent of the use of bio-based resources in the chemical industries as Figure 13 shows. The general assumption, that Eastern European Member States are stronger in less value-adding industries can also be made for the chemical sector since the chemical sector itself does count to the more value-adding industries. Therefore, we see a similar, yet not identical distribution of the Member States as in Figure 11.

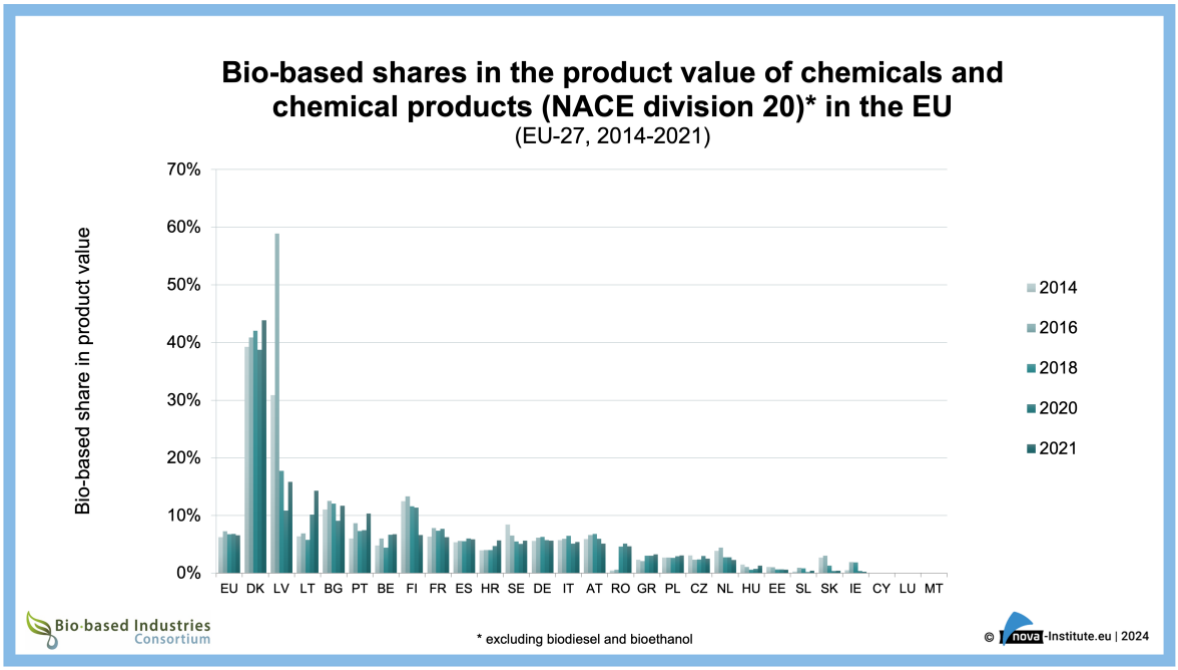

Figure 13: Bio-based shares in the product value of chemicals and chemical products in each Member State (2014–2021; EU-27)

The raw material composition for the chemical industry is about 50% organic (fossil and bio-based) and 50% inorganic (minerals, metals). If only the organic share is taken into account, because only this can be substituted by biomass, the total bio-based share in production value rose from 12.5% in 2014 to 13.6% in 2020 and fell back to 13.1% in 2021 (Table 1) with a notable peak in 2016. This peak is based on a gap in Eurostat data, which sees discontinued reporting for high value bio-based products in the man-made fibre category starting in 2017.

The bio-based shares in overall production volume developed from 9% in 2014 to 9.1% in 2020 and fell under the 9% threshold again in 2021 (Table 2) with a significant peak in 2017 at over 10%. This peak in 2017 originates from an anomaly in Eurostat data concerning other organic basic chemicals, more specifically the product group “D-glucitol (sorbitol)”, whose reporting has been very inconsistent over the years. Additionally, Figure 14 & Figure 15 show these results in graphical form.

Year	Overall bio-based share in the product value of chemical products	Bio-based share in the organic part of chemical products's value (approx.)
2014	6.3 %	12.5 %
2015	6.4 %	12.7 %
2016	7.3 %	14.5 %
2017	6.8 %	13.6 %
2018	6.8 %	13.5 %
2019	6.3 %	12.6 %
2020	6.8 %	13.6 %
2021	6.6 %	13.1 %

*Table 1: Bio-based shares in the product **value** of chemicals and chemical products (2014–2021; EU-27)*

Year	Overall bio-based share in the product volume of chemical products	Bio-based share in the organic part of chemical products' volume (approx.)
2014	4.5 %	9.0 %
2015	4.7 %	9.4 %
2016	4.6 %	9.1 %
2017	5.3 %	10.6 %
2018	4.7 %	9.5 %
2019	4.4 %	8.7 %
2020	4.5 %	9.1 %
2021	4.5 %	8.9 %

*Table 2: Bio-based shares in the product **volume** of chemicals and chemical products (2014–2021; EU-27)*

The underlying bio-based percentage share to calculate these values and volumes has not changed significantly over the years. The differences stem from varying production volumes and turnover generated with the products, that are in scope.

Note that there are differences compared to the reports published earlier due to the updates and differences in the Eurostat data and the revisions of the product-level bio-based shares as well as the update to data excluding the UK.

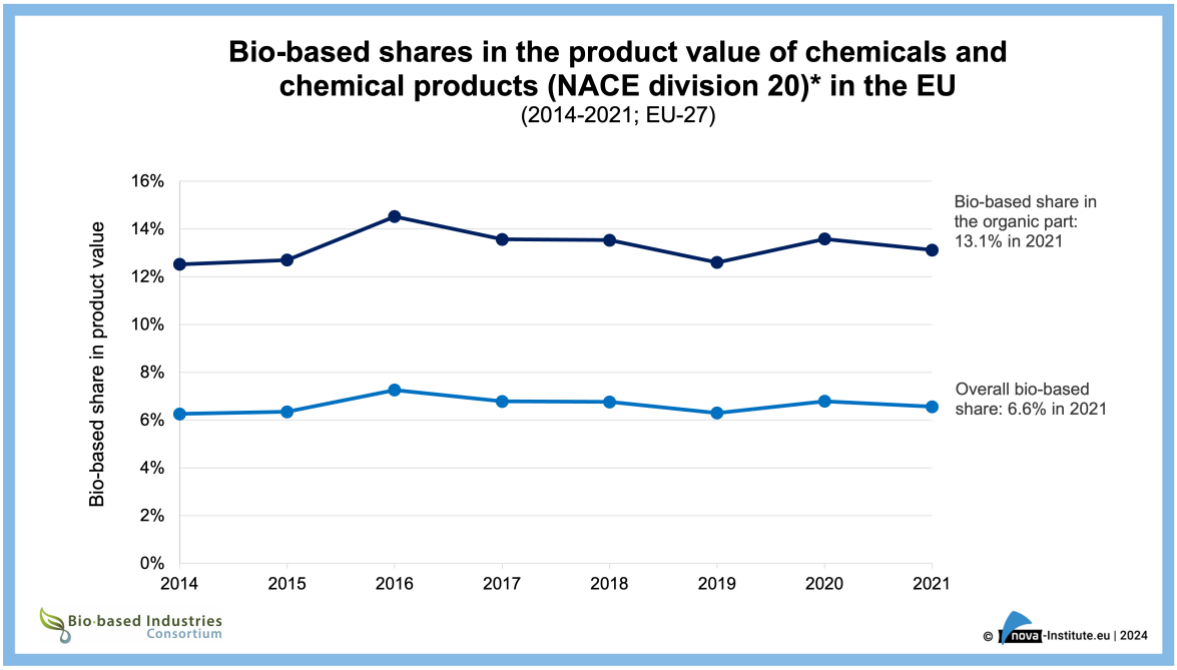

*Figure 14: Bio-based shares in the product **value** of chemicals and chemical products (2014–2021; EU-27)*

Figure 14 and Figure 15 show the developments of the respective bio-based share of chemicals and chemical products for:

Figure 14: Product **value** based on production value data taken from Prodcom
Figure 15: Product **volume** based on production volume data taken from Prodcom

These differences of the two bio-based shares are in the details. When assessing the product value, the respective bio-based share factors in the generated monetary value of the product in which bio-based feedstocks are being used. This analysis can hint towards applications, that are able to use bio-based feedstocks in their value chain while creating more added value from these feedstocks than other applications.
On the other hand, the bio-based shares of the production volume hint at the actual bio-based feedstock used in the sector and the amount of biogenic carbon bound in the actual products.

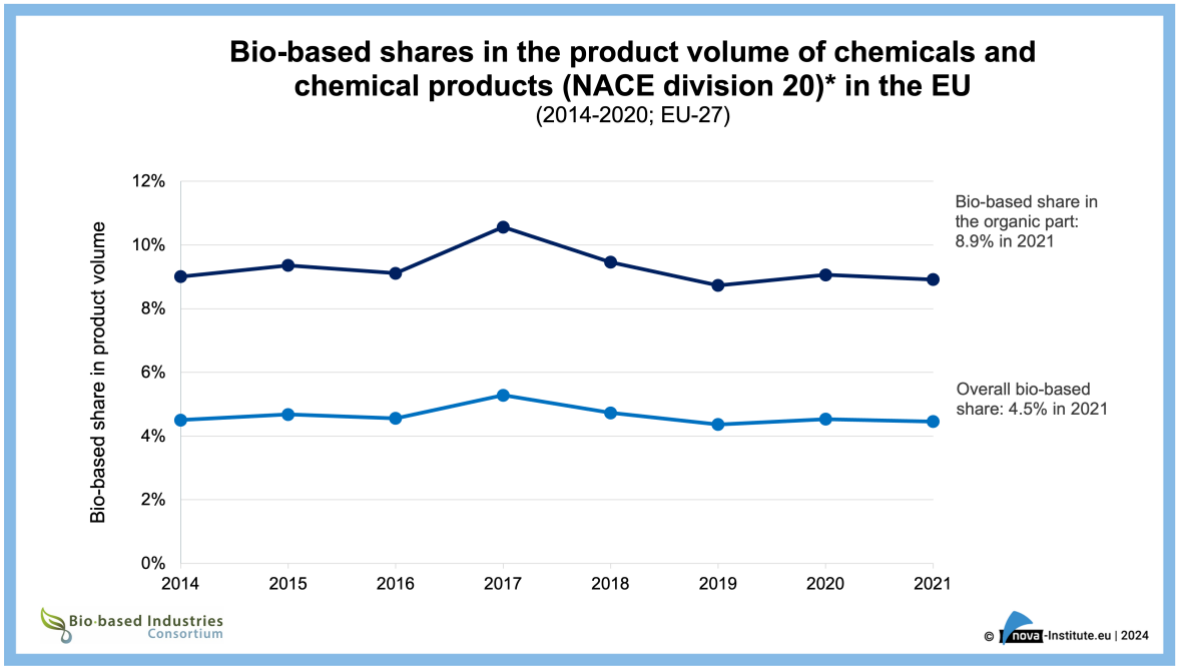

*Figure 15: Bio-based shares in the product **volume** of chemicals and chemical products (EU-27; 2014–2021)*

Figure 16 shows in more detail which NACE classes have contributed to the overall increase of the bio-based share in product value of the chemical industry, by illustrating the development of the bio-based products values in each NACE class of division 20. The resulting total product value of bio-based chemicals of 23.4 billion Euro in 2020 is 6.8% of the overall product value of chemicals and chemical products (both petro- and bio-based), therefore corresponding to the overall 6.8% share of bio-based chemicals shown in Figure 14. In 2021 this value increased even further to an overall value of 28.8 billion Euro which in turn only accounts for lower share of 6.6% of the overall product value of all products in the chemical sector C20. This indicates, that the overall turnover in the chemical sector increased significantly in 2021 compared to previous years with bio-based chemical products not explicitly benefitting more than other products from this development. In terms of increased value in 2021 especially NACE Class 20.14 “Other organic basic chemicals” is responsible for the significant increase from 23.4 billion Euro to 28.8 billion Euro as shown in Figure 16.

Figure 16 also shows that the bio-based share seems to have settled at a stable level at around 6.8% in 2020 and 6.6% in 2021, seeing a slight increase compared to 2019 levels back to levels of 2017 and 2018.

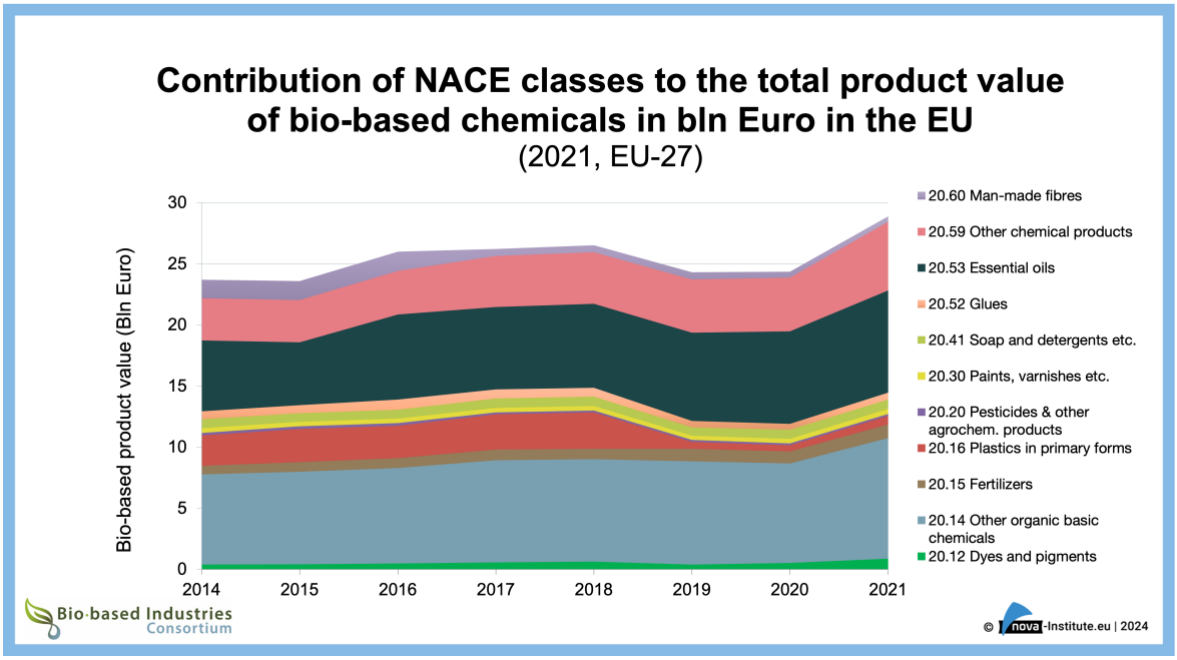

Figure 16: Contribution of NACE classes to the total product value of bio-based chemicals (2014–2021; EU-27)

While Figure 16 indicates the bio-based production value contributed by each whole NACE class within division 20 to the overall bio-based production value in the chemical industry, a deeper look is necessary to understand which products make up the lion's share in this total value.

Therefore, Table 3 shows the 20 partly or fully bio-based chemical products with the highest bio-based production value in 2020 with Table 4 showing the same but for 2021. While some values and the respective order of the top 20 have changed compared to last year's data, the main contributors largely remained the same. It shows, for example, that odoriferous substances for food or drink industries (part of class 20.53, essential oils) alone contributed 4.26 billion Euro (18.2% of the total value of 23.4 billion Euro) to the bio-based production value of division 20 in 2020 and 2021 respectively (16.7% of the 28.8 billion Euro). Together with their counterpart of odoriferous substances **not** used in food or drinks, these products of the essential oil group remain the largest part of the bio-based C20 sector. Class 20.14 (other organic basic chemicals) is represented with the highest number (eight) of different products out of the 20 high-value chemicals and generally increased its overall production volume visibly in both years compared to earlier numbers.

PRODCOM-code	Name	Bio-based production value (billion Euro)
20531075	Mixtures of odoriferous substances of a kind used in the food or drink industries	**4.26**
20531079	Mixtures of odoriferous substances (excluding those of a kind used in the food or drink industries)	**2.24**
20146470	Enzymes; prepared enzymes (not elsewhere specified or included) (excluding rennet and concentrates)	**2.16**
20596080	Gelatin and its derivatives (excluding casein glues, bone glues and isinglass)	**1.09**
20158000	Animal or vegetable fertilisers	**0.98**
20531020	Essential oils	**0.93**
20143280	Lauric acid and others; salts and esters	**0.81**
20142333	D-glucitol (sorbitol)	**0.80**
20595994	Other chemical products, n.e.c.	**0.80**
20596020	Caseinates and other casein derivatives (excluding casein glues)	**0.66**
20143473	Citric acid and its salts and esters	**0.60**
20595100	Peptones and their derivatives; other protein substances and their derivatives; hide powder including glutelins and prolamins, globulins, glycinin, keratins, nucleoproteids, protein isolates	**0.54**
20147150	Rosin and resin acids; and derivatives; rosin spirit and oils; run gums	**0.52**
20143195	Industrial monocarboxylic fatty acids distilled (excluding stearic, oleic tall oil)	**0.51**
20521080	Prepared glues and other prepared adhesives, n.e.c.	**0.48**
20122270	Colouring matter of vegetable or animal origin and preparations based thereon (including dyeing extracts) (excluding animal black)	**0.46**
20592000	Animal or vegetable fats and oils chemically modified	**0.45**
20142265	Lauryl alcohol; cetyl alcohol; stearyl alcohol and other saturated monohydric alcohols (excluding methyl, propyl and isopropyl, n-butyl, other butanols, octyl)	**0.42**
20602140	Artificial filament tow, of acetate	**0.38**
20143235	Palmitic acid, stearic acid, their salts and esters	**0.30**

Table 3 : The 20 partly or fully bio-based chemical products with the highest bio-based production value (2020; EU-27)

The bio-based production values of the 20 partly or fully bio-based chemical products in 2021 have increased compared to 2020 levels.

PRODCOM-code	Name	Bio-based production value (billion Euro)
20531075	Mixtures of odoriferous substances of a kind used in the food or drink industries	**4.80**
20146470	Enzymes; prepared enzymes (not elsewhere specified or included) (excluding rennet and concentrates)	**2.71**
20531079	Mixtures of odoriferous substances (excluding those of a kind used in the food or drink industries)	**2.40**
20595994	Other chemical products, n.e.c.	**1.20**
20158000	Animal or vegetable fertilisers	**1.12**
20596080	Gelatin and its derivatives (excluding casein glues, bone glues and isinglass)	**1.05**
20531020	Essential oils	**1.00**
20143280	Lauric acid and others; salts and esters	**0.99**
20596020	Caseinates and other casein derivatives (excluding casein glues)	**0.90**
20122270	Colouring matter of vegetable or animal origin and preparations based thereon (including dyeing extracts) (excluding animal black)	**0.80**
20595100	Peptones and their derivatives; other protein substances and their derivatives; hide powder including glutelins and prolamins, globulins, glycinin, keratins, nucleoproteids, protein isolates	**0.71**
20143195	Industrial monocarboxylic fatty acids distilled (excluding stearic, oleic tall oil)	**0.69**
20142265	Lauryl alcohol; cetyl alcohol; stearyl alcohol and other saturated monohydric alcohols (excluding methyl, propyl and isopropyl, n-butyl, other butanols, octyl)	**0.62**
20143473	Citric acid and its salts and esters	**0.60**
20147150	Rosin and resin acids; and derivatives; rosin spirit and oils; run gums	**0.60**
20592000	Animal or vegetable fats and oils chemically modified	**0.56**
20521080	Prepared glues and other prepared adhesives, n.e.c.	**0.55**
20142100	Industrial fatty alcohols	**0.39**
20143235	Palmitic acid, stearic acid, their salts and esters	**0.36**
20602140	Artificial filament tow, of acetate	**0.32**

Table 4 : The 20 partly or fully bio-based chemical products with the highest bio-based production value (2021; EU-27)

Finally, Figure 17 looks at the contribution of NACE classes and products to the total product **volume** of bio-based chemicals. This kind of analysis in terms of production volume needs to make use of conversion factors for some product groups for which Eurostat does not report production in metric tonnes but in other units, i.e. for example pieces (e.g. of furniture, clothing, etc.), square metres (e.g. textiles and fabrics) or cubic metres (e.g. forestry products). Conversion factors to metric tonnes are available from Eurostat, so that a reporting of all production in metric tonnes is possible.

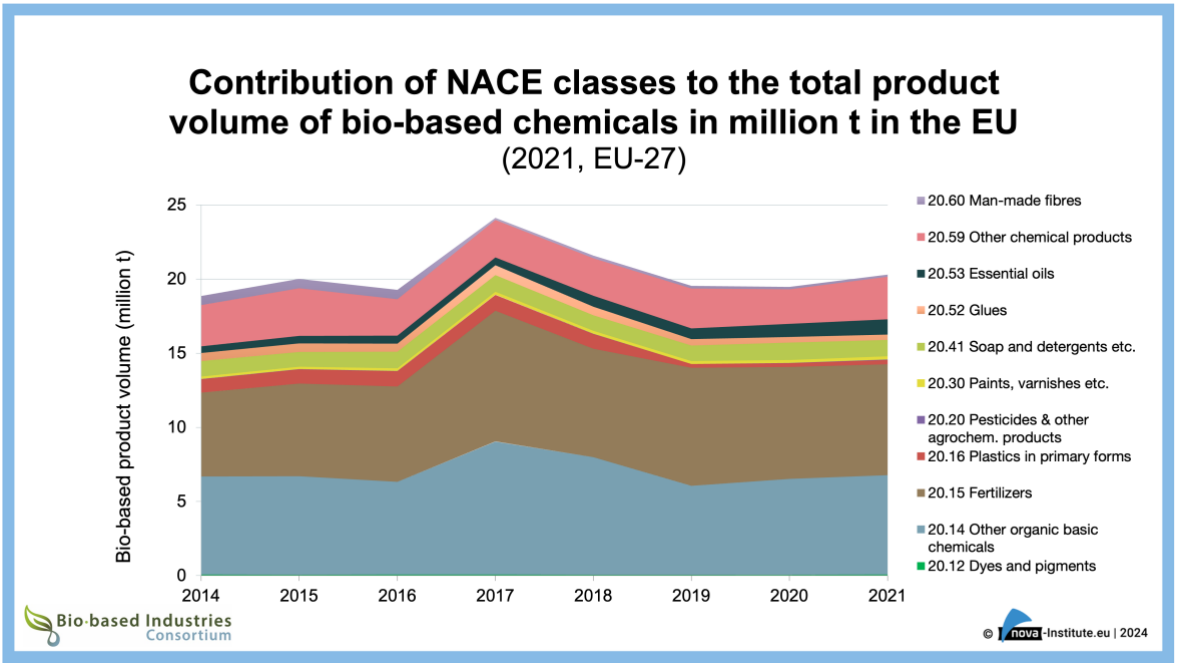

Figure 17: Contribution of NACE classes to the total product volume of bio-based chemicals (2014–2021; EU-27)

In the case of chemicals, such a conversion is only necessary for a few groups of products such as industrial gases, which are reported in cubic metres. Figure 17 shows that class 20.14 (other organic chemicals) is also a major contributor in terms of production volume and is joined by fertiliser production (20.15) as the two greatest contributors to the overall bio-based chemical volumes. As Table 5 shows, however, also other products dominate in terms of bio-based production quantity. According to Table 5 (2020) and Table 6 (2021) animal and vegetable fertilisers alone contribute 7.56 million t (38.8% of the total of 19.5 million t) and 7.48 million t (36.8% of the total of 20.3 million t) to the bio-based production volume of division 20.

For animal or plant fertilisers, a production volume of 7.96 million tonnes has been reported in 2019 and they remain one of the largest contributors to bio-based production volume in the chemical sector with a production roughly six to eight times the volume of the second most produced product.

PRODCOM-code	Name	Bio-based production volume (million tons)
20158000	Animal or vegetable fertilisers	**7.56**
20595994	Other chemical products, n.e.c.	**0.91**
20592000	Animal or vegetable fats and oils chemically modified	**0.65**
20411000	Glycerol (glycerine), crude; glycerol waters and glycerol lyes	**0.65**
20531075	Mixtures of odoriferous substances of a kind used in the food or drink industries	**0.64**
20142333	D-glucitol (sorbitol)	**0.60**
20143195	Industrial monocarboxylic fatty acids distilled (excluding stearic, oleic tall oil)	**0.60**
20142360	Glycerol (including synthetic; excluding crude, waters and lyes)	**0.51**
20147120	Activated natural mineral products; animal black	**0.50**
20147130	Tall oil; whether or not refined	**0.45**
20143473	Citric acid and its salts and esters	**0.44**
20147150	Rosin and resin acids; and derivatives; rosin spirit and oils; run gums	**0.43**
20521080	Prepared glues and other prepared adhesives, n.e.c.	**0.37**
20143280	Lauric acid and others; salts and esters	**0.33**
20147200	Wood charcoal whether or not agglomerated (including shell or nut charcoal)	**0.32**
20142265	Lauryl alcohol; cetyl alcohol; stearyl alcohol and other saturated monohydric alcohols (excluding methyl, propyl and isopropyl, n-butyl, other butanols, octyl)	**0.31**
20146470	Enzymes; prepared enzymes (not elsewhere specified or included) (excluding rennet and concentrates)	**0.28**
20143120	Industrial stearic acid	**0.24**
20142100	Industrial fatty alcohols	**0.20**
20531079	Mixtures of odoriferous substances (excluding those of a kind used in the food or drink industries)	**0.18**

Table 5: The 20 partly or fully bio-based chemical products with the highest bio-based production volume (2020; EU-27)

PRODCOM-code	Name	Bio-based production volume (million tons)
20158000	Animal or vegetable fertilisers	**7.48**
20595994	Other chemical products, n.e.c.	**1.32**
20531075	Mixtures of odoriferous substances of a kind used in the food or drink industries	**0.80**
20592000	Animal or vegetable fats and oils chemically modified	**0.72**
20411000	Glycerol (glycerine), crude; glycerol waters and glycerol lyes	**0.65**
20143195	Industrial monocarboxylic fatty acids distilled (excluding stearic, oleic tall oil)	**0.56**
20147120	Activated natural mineral products; animal black	**0.56**
20147150	Rosin and resin acids; and derivatives; rosin spirit and oils; run gums	**0.54**
20142360	Glycerol (including synthetic; excluding crude, waters and lyes)	**0.53**
20147130	Tall oil; whether or not refined	**0.52**
20143280	Lauric acid and others; salts and esters	**0.44**
20142265	Lauryl alcohol; cetyl alcohol; stearyl alcohol and other saturated monohydric alcohols (excluding methyl, propyl and isopropyl, n-butyl, other butanols, octyl)	**0.42**
20142333	D-glucitol (sorbitol)	**0.40**
20143473	Citric acid and its salts and esters	**0.40**
20521080	Prepared glues and other prepared adhesives, n.e.c.	**0.36**
20146470	Enzymes; prepared enzymes (not elsewhere specified or included) (excluding rennet and concentrates)	**0.28**
20147200	Wood charcoal whether or not agglomerated (including shell or nut charcoal)	**0.27**
20143120	Industrial stearic acid	**0.22**
20143235	Palmitic acid, stearic acid, their salts and esters	**0.16**
20412020	Anionic organic surface-active agents (excluding soap)	**0.16**

Table 6: The 20 partly or fully bio-based chemical products with the highest bio-based production volume (2021; EU-27)

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