doi: 10.36689/uhk/hed/2022-01-063 HED Hradec Economic Days

Employment in the Agriculture and Forestry in the European Union, V4, and the Czech Republic in the period 2000–2019

Michaela PERUNOVÁ

Czech University of the Life Sciences, Prague, Czech Republic; perunova@fld.czu.cz

Abstract: Ways are currently being sought to smoothly replace a linearly functioning economic system with a more sustainable one. Globally, pressure is increasing on the demand side for food, feed, biomaterials, and bioenergy resources, putting more pressure on natural resources. Globally coordinated cooperation is essential. Currently, the global challenge is to unlock the potential of the bioeconomy. The main aim of this paper is to evaluate the improvement of the employment in the agriculture and forestry in the European Union, V4, and Czech Republic in the period 2000–2019. According to main target, the sectoral approach will be applied, and the statistical data collected. Dealing with methodology, the literature review, desk research, and time series analysis, the sectoral comparative analysis will be used. Focusing on the results, the share of employed people in the bioeconomy sectors, such as agriculture and forestry in the period 2000–2019 in the European Union, V4, and the Czech Republic displayed a slightly declining trend.

Keywords: employment; forestry; agriculture; Czech Republic

JEL Classification: J21; Q57

1. Introduction

Ways are currently being sought to smoothly replace a linearly functioning economic system with a more sustainable one. The transformation to a circular economy and bioeconomy that respect the planet's natural borders is beginning.

The circular economy contrasts with the linear economy. The current economic system based on linear flows of materials and energy can be imagined in a simplified model in which raw materials are extracted, products are made, and after a very short time, the products are thrown away. The circular economy is trying to close the loops of materials and energy into never-ending closed flows. The circular bioeconomy is then an economy based on biological materials and is a renewable segment of the circular economy. The main sectors of the bioeconomy are typically agriculture, forestry, aquaculture, food and chemical industries.

The circular bioeconomy has a significant impact on the environment. Globally, pressure is increasing on the demand side for food, feed, biomaterials, and bioenergy resources, putting more pressure on natural resources. Globally coordinated cooperation is essential. Currently, the global challenge is to unlock the potential of the circular bioeconomy.

Based on scientific literature (Ronzon et al., 2015), national bioeconomies of the EU states can be divided into four groups of countries, such as agricultural bioeconomies (Slovenia,

Greece, Romania), agro-food industry and bio-based chemical industries (Italy, France, Germany), forestry bioeconomies (Finland, Sweden, Estonia), and non-specialised bioeconomies (the Czech Republic, Slovakia, Hungary).

According to the European Union calculations (European Comission, 2018), the bioeconomy employment is around 18 million persons and by 2030, up to a 2 million new jobs could be created. Study performed by Hetemäki (2016) emphasizes, that there is a lack of studies that develop an area such as the forest labor market.

Bioeconomy is a key sector of the European Union employment, and the highest number of employees refers food, beverage and tobacco industry. The article (Drejerska, 2017) summarized that more than 40% of employment in mentioned sectors seem in the United Kingdom, Germany, Belgium, Malta, and Luxemburg. Regarding employment, the sector with the majority shares of employment in the EU Member States bioeconomy is represented by the agriculture sector. The same applies to the Czech Republic. Agricultural employment accounts for nearly 36 percent of total employment in bioeconomy. Drejerska (2017) also highlights three dominant sectors as the main suppliers of biomass in the economy, such as agriculture, forestry, and fisheries. The high employment numbers in the individual subsectors of bioeconomy are the result of natural and geographical conditions.

Philippidis and his team (Philippidis et al., 2014) focused on profiling of the EU clusters. Regarding geographical scale, the results present six potential groups. Namely, (1) Northern EU (Denmark, Finland, Lithuania, Latvia, Poland, Sweden, United Kingdom, Belgium, Netherlands), (2) Luxembourg (Luxembourg), (3) Mediterranean Islands (Cyprus, Malta), (4) Mediterranean and Eastern EU (Spain, France, Greece, Italy, Portugal, Bulgaria, Romania, Hungary), (5) Central EU (Austria, Czech Republic, Germany, Slovakia), and (6) a Mixed cluster (Estonia, Ireland and Slovenia). Based on the results, the employment multipliers for the EU-27 represent 14 new jobs for every million euros of additional output value in the bioeconomy. The results show that the bioeconomy drivers of job creation are the forestry, fishing, and wood sector.

In the study (Ronzon et al., 2018), authors concluded that the bioeconomy employment represents more than eight percent of the EU-28 total employment. Over time, we observe the opposite development of indicators, while employment decreased, added value increased. Focusing on the agriculture restructuring, bioeconomy employment decreases by 2.5 million jobs in the reference period 2008–2015. In the observed period, added value increased by 23 percent.

In the Czech Republic, we can find studies focused on bioeconomy. For example, Hájek et al. (2020) offers the current condition of bioeconomy in the Czech Republic. The results indicate intensive research activities in the field of biology and chemistry. The developed forestry, agriculture and food industries provide the basis for the improvement of the locally oriented circular economy.

Based on the literature review, it is obvious that there is an opportunity for improvement. There is still significant knowledge gap in the field of labor market in the European circular bioeconomy. This research will add the statue of the bioeconomy employment in the European

Union, V4, and Czech Republic. For achieving the main target, two hypotheses were established, namely:

H1: The development of employment in agriculture and forestry in the years 2000–2019 in the Czech Republic is the same as in the V4 countries.

H2: Employment in agriculture and forestry in the European Union fell between 2000 and 2019.

2. Methodology

The main aim of this paper is to evaluate the improvement of the employment in the agriculture and forestry in the European Union, V4, and Czech Republic in the period 2000–2019. According to main target, the sectoral approach will be applied, and the statistical data collected. Dealing with methodology, the literature review, desk research, and time series analysis, the sectoral comparative analysis will be used. The analysis will be focused on the period 2000–2019, to observe possible changes and transformation processes of the employment in the agriculture and forestry.

This research is based on various resources. The key data sources are data published in scientific studies (databases WoS, Scopus, Research Gate, etc.). The main data sources for the employment in number of persons and bioeconomy sectors shown in the figures are Eurostat (Eurostat, 2021). Searched data will be divided into several categories. Materials and data focus mainly on the bioeconomy and employment in two subsectors of the bioeconomy, namely agriculture and forestry.

3. Results

In Figure 1, we can observe several categories of Member States. Countries such as Latvia and Lithuania show lower employment numbers in agriculture and forestry in 2000 and 2019. On the other hand, the share of employees in agriculture and forestry in total employment in 2000 and 2019 seems to be high.

Countries such as Bulgaria, Germany, Greece, France, and Italy show roughly the same employment numbers in agriculture and forestry in 2000 and 2019. Regarding the share of employees in agriculture and forestry in total employment in 2000 and 2019, Bulgaria and Greece display a higher share of employees, especially in agriculture. On the other hand, countries such as Germany, France and Italy show a lower share of employees, especially in agriculture, in total employment in 2000 and 2019.

The highest share of employees in agriculture in 2000 and 2019 displays Romania and Bulgaria and the highest share of employees in forestry in 2000 and 2019 displays Croatia and Slovakia.

For an overall comparison of employment in 2000 and 2019, figure 2 shows the share of agriculture and forestry employees in total employment in the EU in 2000 and 2019. We can observe a declining trend in the period 2000–2019. The highest share of employed persons in agriculture and forestry in 2000 displays Romania (44.87%), Bulgaria (24.05%), Poland (20.18%), Lithuania (18.36%), and Greece (15.35%). To consider year 2019, the highest share of employed persons in agriculture and forestry refers Romania (22.25%), Bulgaria (16.85%), Greece (10.18%), Poland (9.04%), and Portugal (7.49%).

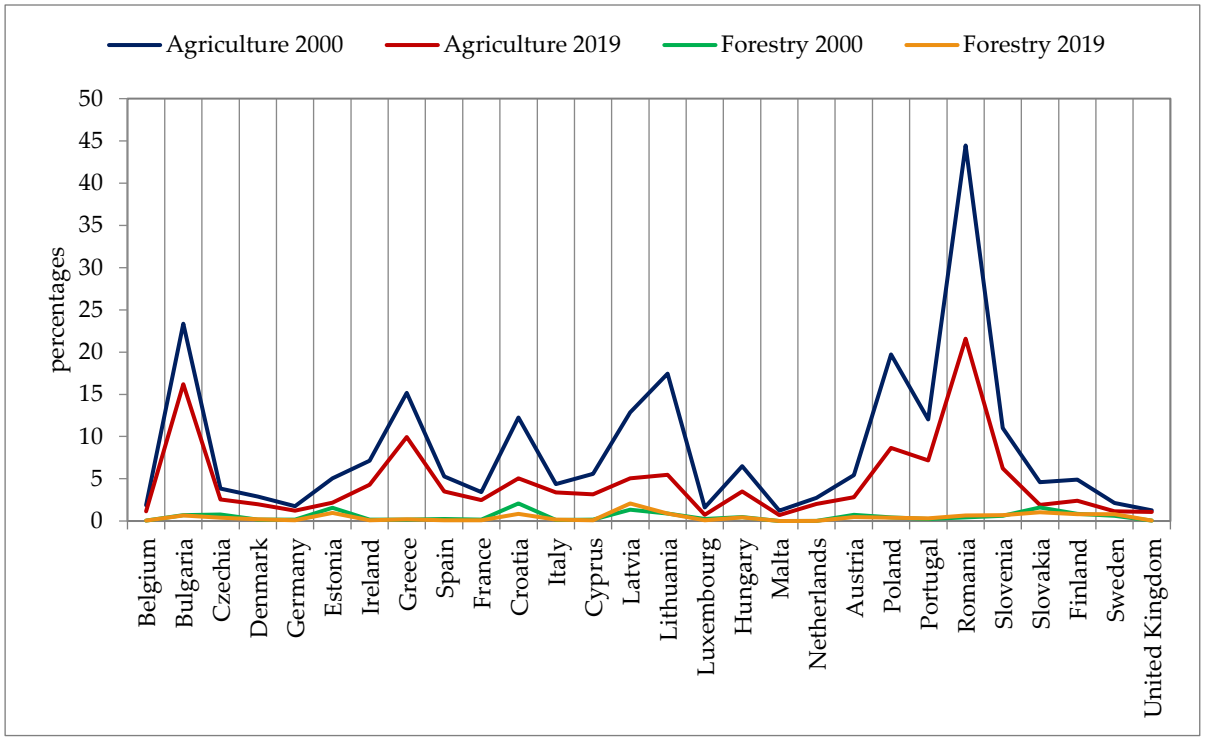

Figure 1. The share of employees in agriculture and forestry on total employment in the EU-28 in 2000 and 2019 (%)

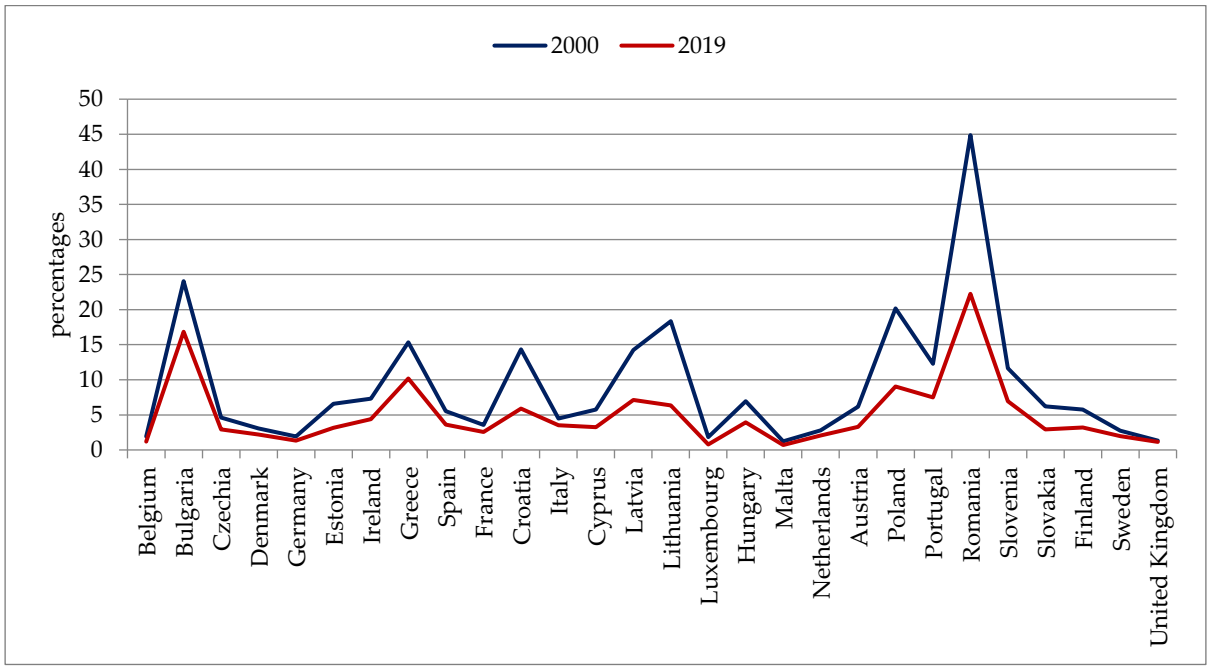

Figure 2. The share of employees in agriculture and forestry in total employment on the EU-28 in 2000 and 2019 (%)

Figure 3 compares the employment in agriculture and forestry in the years 2000 and 2019 in V4 countries. Dealing with the figures, the total number of people employed in the bioeconomy sectors, such as agriculture and forestry has been declining over the years. In total, in the V4 countries, more than 3,566 thousand persons worked in agriculture and forestry in 2000 and more than 1,897 thousand persons in 2019. We see a declining trend in

the period 2000-2019. Compared to 2000 and 2019, we observe a decrease in the number of persons employed in the agriculture and forestry sectors by almost 47%.

The highest number of people employed in the forestry sector displays Poland in both years. In more detail, more than 64 thousand persons in the year 2000 and 63 thousand persons in the year 2019. Further follows Czech Republic, Slovakia, and Hungary. Only in Hungary, we observe higher number of people employed in the forestry sector in 2019 (20.57 thousand persons) than in 2000 (18.61 thousand persons).

On the other hand, the highest number of people employed in the agriculture sector refers Poland. Further follows Hungary, Czech Republic, and Slovakia. In all V4 countries we can observe a declining number of people employed in the agriculture sector.

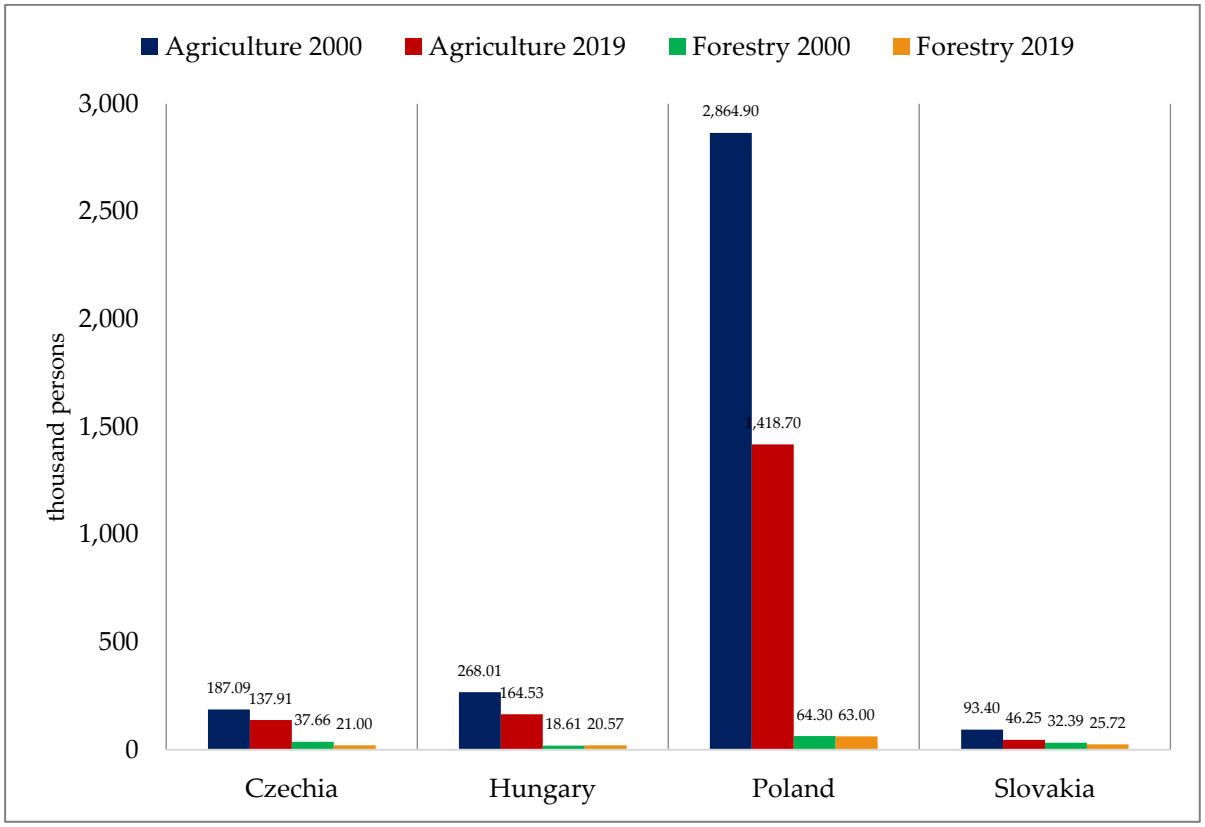

Figure 3. Employment in agriculture and forestry in V4 in 2000 and 2019 (thousand persons)

In Figure 4, we observe the share of employees in agriculture and forestry in total employment in the V4 countries in 2000 and 2019. Given the number of employees in agriculture and forestry in 2000 and 2019, the Czech Republic shows higher numbers in each sector and each year compared to Slovakia. Only in forestry in 2019, we can observe higher number of employees in Slovakia compared to the Czech Republic.

On the other hand, focusing on the share of employees in agriculture and forestry in total employment in the Czech Republic and Slovakia in 2000 and 2019, Slovakia shows higher share in each sector and each year compared to the Czech Republic. Only in agriculture in 2019, we see higher number of share in the Czech Republic compared to Slovakia.

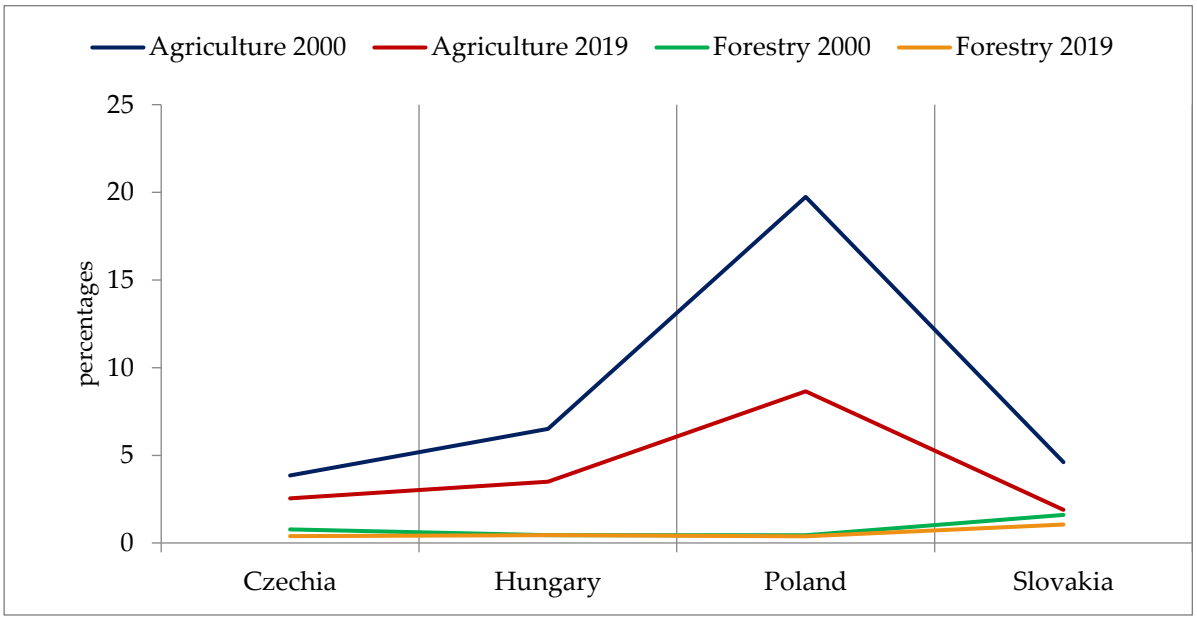

Figure 4. The share of employees in agriculture and forestry in total employment in the V4 in 2000 and 2019 (%)

If we consider the share of employees in agriculture and forestry in 2000 and 2019 in V4 countries, the highest share of employees in agriculture in 2000 and 2019 displays Poland and the highest share of employees in forestry in 2000 and 2019 displays Slovakia.

Figure 5 focuses on the development of the number of employees in agriculture and forestry in Czech Republic in the years 2000–2019. Regarding the results for the Czech Republic, we can observe the highest number of employees in agriculture in 2001 (189.67 thousand persons) and the lowest number of employees in agriculture in 2010 (128.39 thousand persons). Between 2000 and 2019, we see a decrease in the number of employees in agriculture in the Czech Republic by 49.18 thousand persons. In the previous year (2020), approximately 137 thousand persons worked in agriculture in the Czech Republic.

With focus on the development of the number of employees in forestry in Czech Republic in the years 2000–2019, we can see a gradual slightly declining trend. Regarding the results for the Czech Republic, the highest number of employees in forestry in 2000 (37.66 thousand persons) and the lowest number of employees in Forestry in 2019 (21 thousand persons) are displayed. Between 2000 and 2019, we see a decrease in the number of employees in forestry in the Czech Republic of 16.66 thousand persons. In the previous year (2020), approximately 21 thousand persons worked in forestry in the Czech Republic.

Figure 6 shows the share of employees in agriculture and forestry in total employment in the Czech Republic in 2000–2019. We can observe a declining trend in the period 2000–2019. The highest share of employees in agriculture and forestry in the Czech Republic displays in 2001, 2000 and 2002. In contrast, the lowest share of employed persons in agriculture and forestry in the Czech Republic shows in 2019. Between 2000 and 2019, we see a decrease in the share of employed persons in agriculture and forestry in total employment in the Czech Republic by almost 1.70%.

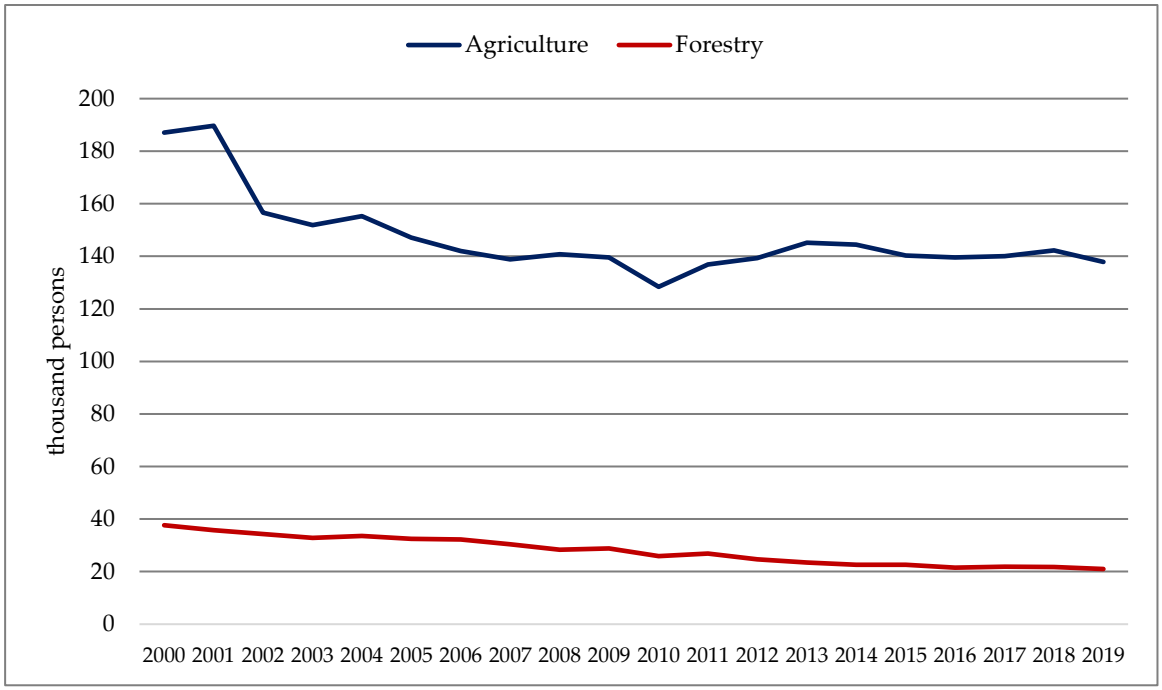

Figure 5. Development of the number of employees in agriculture and forestry in the Czech Republic in the years 2000–2019 (thousand persons)

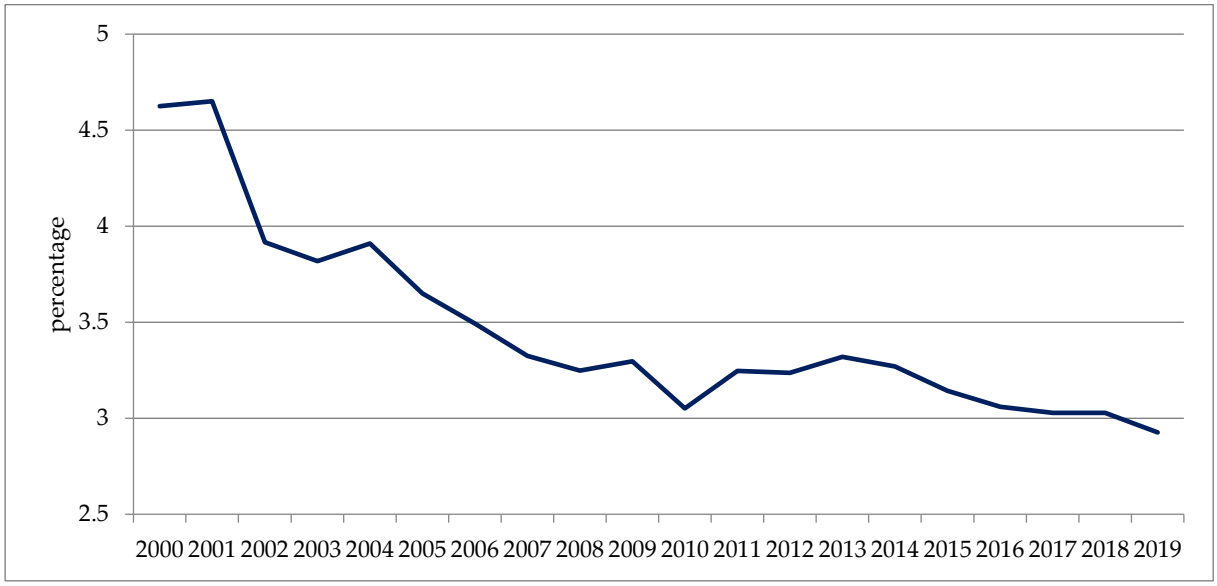

Figure 6. The share of employees in agriculture and forestry in total employment in the Czech Republic in 2000–2019 (%)

4. Discussion

The main aim of this paper was to evaluate the improvement of the employment in the agriculture and forestry in the European Union, V4, and Czech Republic in the period 2000–2019. According to main target, the sectoral approach was applied, and the statistical data collected. Dealing with methodology, the literature review, desk research, and time series analysis, the sectoral comparative analysis was used.

Focusing on the results, we can conclude that the number of people employed in the agriculture and forestry and the share of employed people in the bioeconomy sectors, such

as agriculture and forestry in the period 2000–2019 in the European Union, V4, and Czech Republic showed a slightly declining trend.

According to data for the EU-28, the highest share of employees in agriculture in 2000 and 2019 displays Romania and Bulgaria and the highest share of employees in forestry in 2000 and 2019 displays Croatia and Slovakia. With focus on the share of employees in agriculture and forestry in 2000 and 2019 in EU-28 countries, the highest share of employees together in agriculture and forestry in 2000 and 2019 displays Romania and Bulgaria.

Based on the figures for V4 countries, we see a declining trend in the period 2000–2019 in the total number of people employed in the agriculture and forestry in the V4 countries. Compared to 2000 and 2019, we observe a decrease in the number of persons employed in the agriculture and forestry sectors by almost 47%. Only in Hungary, we can observe higher number of people employed in the forestry sector in 2019 (20.57 thousand persons) than in 2000 (18.61 thousand persons).

If we consider the share of employees in agriculture and forestry in 2000 and 2019 in V4 countries, the highest share of employees in agriculture in 2000 and 2019 displays Poland and the highest share of employees in forestry in 2000 and 2019 displays Slovakia.

Regarding the results for the Czech Republic, between 2000 and 2019, we see a decrease in the number of employees in agriculture by 49.18 thousand persons and in forestry by 16.66 thousand persons. Between 2000 and 2019, we see a decrease in the share of employed persons in agriculture and forestry in total employment in the Czech Republic by almost 1.70%.

According to study performed by Ronzon et al. (2015), four groups of the EU Member States are identified, especially (1) agricultural bioeconomies, (2) agro-food industry and bio-based chemical industries, (3) forestry bioeconomies, and (4) non-specialised bioeconomies. The Czech Republic belongs to a non – specialised bioeconomy, together with V4 countries, namely Slovakia and Hungary.

Changes in the development of employment in bioeconomy (Ronzon et al., 2022) are influenced not only by modernization and innovation, but also by structural changes between sectors in the economy, employment reallocation.

Focusing on the development of the bioeconomy employment, changes in the market are conditional on the perception of the environment in a national economy. We can observe the emergence of green jobs (Dordmond et al., 2021). Both agriculture and forestry sector face current challenges. As regards agriculture, the greening process has begun. On the other hand, the forestry sector in the Czech Republic (Purwestri et al., 2020) should meet the demand for sustainable forest biomass and high value-added products.

Dealing with scientific studies presented in the introduction chapter, all the research found points to the opportunity that the development of sectors of the bioeconomy can bring new jobs across the European Union. For example, Drejerska (2017) concluded that the agricultural sector, as one of the bioeconomy sectors, has the highest share of total employment in the European Union and high employment numbers in the individual subsectors of bioeconomy are the result of natural and geographical conditions. Agricultural employment in the Czech Republic accounts for nearly 36 percent of total employment in bioeconomy. Another study (Philippidis et al., 2014), highlights that the bioeconomy drivers

of job creation are the forestry, fishing, and wood sector. Another results (Hájek et al., 2021) show, that the developed forestry, agriculture and food industries in the Czech Republic provide the basis for the improvement of the locally oriented circular economy.

Study performed by Hetemäki (2016) emphasizes, that there is a lack of studies that develop an area such as the forest labor market. Therefore, this study has tried to fill this gap.

As it was mentioned, ways are currently being sought to smoothly replace a linearly functioning economic system with a more sustainable one. The European Union (European Commission, 2018) is currently making an intensive and significant effort to support and develop the concept of circular economy and bioeconomy at both European and local levels. The main targets are established, such as environment protection, the EU's long-term competitiveness, and a climate neutrality by 2050. We can speak of this issue as highly topical and with a global impact.

The European Green Deal (European Commission, 2019) is currently one of the European Union's key policies and addresses the global challenges of climate change. The sustainable economy policy package is complemented by the EU Bioeconomy Strategy (European Commission, 2018), and the New EU Circular Economy Action Plan (European Commission, 2020). Further, the US Sustainable Development Goals (United Nations, 2015), the European Forests for biodiversity, climate change mitigation and adaptation (Science for Environment Policy, 2021), and the New EU Forest Strategy for 2030 (European Commission, 2021) have already developed.

In the Czech Republic, the first strategic framework for the circular economy has been approved since the end of 2021. The Circular Czech Republic 2040 (Ministerstvo životního prostředí, 2021) should create new jobs across the Czech Republic.

All these initiatives have a common vision, namely, to ensure the sustainable development of society and ensure well-being for current and future generations. And it is precisely the concept of circular bioeconomy that represents the link between the above-mentioned concepts. At the same time, it is an area of the economy with huge potential to meet a set of global challenges. The circular bioeconomy represents an opportunity to increase the efficient use of biological resources. It is a promising way to mitigate the effects of climate change and kick-start a sustainable economic system that respects the planet's natural limits. Currently, the global challenge is to unlock the potential of the bioeconomy.

Conflict of interest: none

References

Dordmond, G., de Oliveira, H. C., Silva, I. R. et al. (2021). The complexity of green job creation: An analysis of green job development in Brazil. *Environment, Development and Sustainability*, *23*, 723–746. https://doi.org/10.1007/s10668-020-00605-4.

Drejerska, N. (2017). Employment in vs. Education for the bioeconomy. In *Proceedings of the 8th International Scientific Conference Rural Development 2017*. https://doi.org/10.15544/RD.2017.245

Hájek, M., Holecová, M., Smolová, H., Jeřábek, L., & Frébort, I. (2020). *Current state and future directions of bioeconomy in the Czech Republic*. New Biotechnology.

Hetemäki, L., & Hurmekoski, E. (2016). Forest Products Markets under Change: Review and Research Implications. *Current Forestry Reports, 2*, 177–188. https://doi.org/10.1007/s40725-016-0042-z

European Commission. (2021). *New EU Forest Strategy for 2030*. COM (2021) 572 final.

European Commission. (2020). *A new Circular Economy Action Plan*. Document 52020DC0098.

European Commission. (2019). *The European Green Deal*. COM/2019/640 final. Document 52019DC0640.

European Commission. (2018). *A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment.* Update Bioeconomy Strategy. https://doi.org/10.2777/478385

Eurostat. (2021). *National accounts employment data by industry (up to NACE A*64)* [data set]. Retrieved from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a64_e&lang=en

Ministerstvo životního prostředí. (2021). *Strategický rámec cirkulární ekonomiky české republiky 2040. „Maximálně cirkulární česko v roce 2040"*. Retrieved from https://www.mzp.cz/C1257458002F0DC7/cz/news_20211213_Vlada-schvalila-Cirkularni_Cesko_2040/$FILE/Cirkul%C3%A1rn%C3%AD%20%C4%8Cesko_2040_web.pdf.

Philippidis, G., Sanjuán, A. I., Ferrari, E., & M'barek, R. (2014). Employing social accounting matrix multipliers to profile the bioeconomy in the EU member states: is there a structural pattern? *Spanish Journal of Agricultural Research*, *12*(4), 913-926. https://doi.org/10.5424/sjar/2014124-6192

Purwestri, R. C., Hájek, M., Šodková, M., Sane, M., & Kašpar, J. (2020). Bioeconomy in the National Forest Strategy: A Comparison Study in Germany and the Czech Republic. *Forests*, *11*(6), 608. https://doi.org/10.3390/f11060608

Ronzon, T., Iost, S., & Philippidis, G. (2022). Has the European Union entered a bioeconomy transition? Combining an output-based approach with a shift-share analysis. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-021-01780-8

Ronzon, T., Santini, F., & M'Barek, R. (2015). *The Bioeconomy in the European Union in numbers, Facts and figures on biomass, turnover and employment*. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain.

Ronzon, T., & M'Barek, R. (2018). Socioeconomic Indicators to Monitor the EU's Bioeconomy in Transition. *Sustainability*, *10*(6), 1745. https://doi.org/10.3390/su10061745

Science for Environment Policy. (2021). *European Forests for biodiversity, climate change mitigation and adaptation*. Future Brief 25. Brief produced for the European Commission DG Environment by the Science Communication Unit, UWE Bristol. Retrieve from https://ec.europa.eu/ science-environment-policy.

United Nations. (2015). *Sustainable Development Goals*. Retrieved from https://sdgs.un.org/.