

COVID-19 pandemic and agricultural SMEs of Central Europe: A forecast study to evaluate the performance indicators

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Abstract: COVID-19 is a global pandemic that has tangible effects on the agricultural economy. This study investigated the effects of COVID-19-related events in Central European agriculture, forestry, and fisheries, as well as the future of the economy of agricultural Small and medium-sized enterprises (SMEs). The data for agricultural SMEs in Austria, Czechia, Germany, Hungary, Poland, Slovakia, and Switzerland was obtained from the Eurostat database, and the duration of the data was from 2011 to 2021. The number of employees, labour force input, Gross Domestic Product (GDP), wages and salaries, value-added, and agricultural output was the performance metrics considered in this study. Data from this study revealed that agricultural SMEs in Poland, Switzerland, and Germany produced less employment than in the other Central European countries, although Hungary's labour force input was more affected. During the COVID pandemic, GDP in Hungary and Slovakia dropped significantly. Wages and salaries in Germany and Poland fell, while value-added and agricultural output fell in Germany, Hungary, and Slovakia. Employment in Poland and Germany is expected to fall until 2025, while labour force input in Germany, Poland, and Hungary may drop. Wages and salaries, as well as agricultural output in all of the addressed countries, may rise, while GDP may fall. In conclusion, the COVID-19 pandemic had a detrimental impact on agricultural output, labour force input, employment, GDP, value-added, earnings, and salaries in SMEs of Central European countries. The pandemic regulations and restrictions disrupted the market distribution network, causing a stop in production, transportation, and a scarcity of labour and materials.

Keywords: employment, GDP, labour force, pandemic, value-added

JEL Classification: E23, E25, E27, O47, O52

1 Introduction

Agricultural production generates labour market equilibrium through a unique implementation of non-labour markets, commonly depending on intermediaries, such as contractors to corporate groups of employees and moving them to the farm, and implementing piece-rate salary processes to encourage businesses and labourers to cooperate with the labour supply (Xing & Xiaofeng, 2021). In addition, the possible volumes of gross value added of goods in agriculture, forestry, and fisheries are determined while considering the current level of investment efficiency under credit circumstances and investment potential expansion. The principles of creation and growth of investment potential of the agricultural sector of the economy by extending the credit component are substantiated based on the generalization of ways to determine the investment potential of agricultural businesses (Matsybora, 2020). COVID-19 not only influenced farming favourably, but many impacts of the pandemic can be observed in all aspects of socio-economic life. For instance, domestic input prices are observed to be increases during the pandemic; import input has been restrained, and, among many other factors, food consumption, agricultural production, and product prices are also increased. Food supply has become a priority, with

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a preference for local production and a reduction in imports. Promotional trends have been changed, web ordering and delivering orders have increased, and advertisements have become increasingly creative. As the processed food demand and domestic manufacturing companies, fresh food consumption increased during the pandemic, the cost of processed foodstuffs has increased, while processing technologies have become more diversified. There are several improvements in agricultural strategies, such as online financial transactions, widespread information transmission, broad sharing of agricultural experiences, an increase in pricing information, and multi-stakeholder sessions are becoming more common (Mariyah et al., 2021).

The pandemic hit small enterprises more than bigger ones. SMEs operations mostly involved lower sales (75%), trouble obtaining inputs (54%), and demand depression, which resulted in reduced sales and business revenue, resulting in the unemployment of many employees in the SMEs. Government initiatives included SMEs growth, online selling, provision of local products, and risk management in terms of employee accessibility (Brown, 2020).

The instability in the economic situation due to the COVID-19 pandemic and the fall in demand has a detrimental impact on the development of SMEs. High investment risks and a lack of confidence limit productive and opportunity-based entrepreneurial growth opportunities. Nevertheless, SME's sectoral structure has expanded, and the percentage of online services has increased. Because of the pandemic's forced digitization, these processes may accelerate, particularly in huge cities and areas (Zemtsov, 2020). During the early stages of the European pandemic, a country's GDP per capita fell (Pardhan & Drydakis, 2021). The unemployment, business, oil price, and productivity fluctuations began in September 2020. According to the data, the COVID-19 lockdowns generate a 7.2% drop in worldwide GDP and a 9% drop in grain prices. As a result of these changes, the number of persons facing food shortages was expected to climb by 211 million by 2020, a rise of 27.8% (Beckman et al., 2021). The global financial problem (in the short-term) and climate change (in the long-term), along with national calamities (for instance, the COVID-19 pandemic), all contributed to a weakening of the economy, particularly its growth, rising unemployment, and diminished buying power (Elizabeth, 2021). The gap between long-term and current political and economic growth was mainly attributable to the COVID-19 pandemic's impact on the economy and people. A substantial decline in aggregate demand as a result of lower household and corporate expenditure, investments, and exports increased visible high unemployment. The COVID-19 pandemic exacerbated pre-existing basic issues, such as de-industrialization, a wide urban-rural, East-West, and inter-regional virtual divide; high unemployment; poor human wealth improvement; low involvement in worldwide value chains; and poor educational efficiency (Ssenyonga, 2021).

The issues and difficulties SMEs suffer in a pandemic condition propose that the government must have a pivotal role in helping firms resume work and stabilize employment, continue to optimize public services, utilize fiscal and taxation policies intelligently, and guide enterprises to digitalization. Enterprises must prioritize pandemic prevention and usage, make excellent use of preferential policies, strengthen their credit rating, use Internet technologies effectively, and accelerate enterprise transformation and upgrading (Hu et al., 2020).

2 Literature Review

COVID-19 is a highly contagious virus that produces a significant health problem and leads to deaths in humans worldwide (Al-Fadly, 2020). No place on the earth has escaped the pre-emptive construction of a worldwide recession to battle a global infection. In this light, Caiazza et al. (2021) have evinced that Covid-19 has disrupted supply networks, purchasing behaviours, and business strategies in a wide range of sectors, including a sizable proportion of SMEs because SMEs provide for the majority of employment in market-based economies; any examination of the economic impact of COVID-19 would be insufficient without including the SME sector (Caiazza et al., 2021). During the period of the COVID-19 outbreak, a large number of agricultural processing and manufacturing firms experienced severe difficulties in the consumption of agricultural goods, even when they were unable to sell. Businesses have become increasingly challenging; in addition, many businesses are not strong enough to resume production; thus, ways to overcome this difficult moment are required (Nguyen, 2021). The COVID-19 outbreak has impacted agriculture and the economy, forcing states to block borders, whereas there is a constant increase in the sector of agro-industrial output. Such strict limitations have not been imposed on critical food items (Kuandykova, M. B. et al., 2021). The pandemic has had a substantial impact on food systems across the world; specifically, agricultural supply and product markets, food production, and labour throughout food supply chains are all observing an increase in unemployment and nutrition and health insecurity. The pandemic is still dangerous and worsening in some nations, while it is under control in others (Huang, 2020).

Farmers and farmworkers are critical to ensuring a secure food supply, but they are also at high risk of catching COVID-19. The reduction in labour availability caused by COVID-19 is predicted to lower agricultural output (Lusk & Chandra, 2021). Disruptions in agricultural and food systems hugely influence the livelihoods of a significant portion of the world's population (Özkan, 2021). The labour force with a strong representation of revenue profile, with a smaller

proportion of wage resources, is connected to the market's ability to drastically decrease agriculture wages compared to other marketplaces (Valdés, 2020). According to the employment structure, levels of weighted pay share were the lowest in agriculture and the greatest in the service sector before Covid-19 (Mihnenoka & Senfelde, 2015). The drop mainly influenced the change in the aggregate wage share in the primary and secondary sectors, mainly based on a decrease in employed individuals. The overall labour investment of farmer households has decreased slightly as labour costs have risen; there are considerable variations in the distribution of labour investment across farmers due to changes in labour needs resulting from different trading variables in consequences of the COVID-19 pandemic (Yuan & Chen, 2019). All kinds of labour, cropped area, revenue, and input costs play vital roles in enhancing the value of output and productivity. However, the situation is the exact reverse: it is witnessing a fall in the labour force leading to outmigration and a decrease in the number of farmers (Nakasone et al., 2021).

COVID-19 has negatively influenced the country's macroeconomics, reducing national GDP, decreasing tax collection, delaying economic growth rate, falling wage rate, price inflation, and generating job losses. Every area of socioeconomics has weakened, harming the country's economy. Remittances, labour and employment, tourism, education, and agriculture (Dairy, vegetables, and Poultry) have all been mentioned to impact (Khanal, 2020). The COVID-19 outbreak delayed the gross domestic product (GDP). The anticipated short- and long-term scenarios indicated that in contrast to farming, the services and manufacturing companies will be more affected in all countries (Islam et al., 2020). Inflation has a negative and significant long-run relationship with agricultural sector progress, implying that inflation is more destructive than beneficial to agricultural industry growth (Zhang & Diao, 2020). Agriculture industry development is directly tied to its lag value, investment, workforce, factors output, inflation, and currency exchange in the short-run (Mekonen, 2020). Fiscal and investment determinants have a direct influence on economic development. Spending on education, health, wages and salaries, agriculture, and interest payments has a bigger impact on long-term economic development than the remaining expenditure composition (Chen et al., 2020). As per the long-run model, employed people with higher education considerably affect gross agricultural value-added (Buchta, 2018). The coefficient in front of employed people with higher education is positive, indicating that as the number of employed persons with higher education grows, so does the gross value-added, and vice versa. The human component appears to be quite crucial for gross agricultural value-added (Metodieva & Bartos, 2021).

The role of agriculture as an economic activity in the construction of gross added value of nations based on sectoral structure, as well as to identify and define areas of economic development based on comparison and experience of different countries. Compared to the Russian Federation, most European nations have a small degree of variances in the sectoral structure of gross added value. Relatively modest levels of sectoral structure disparities and different growth rates of the significant macroeconomic indicator are feasible (Salimova et al., 2020). The spread of COVID-19 has led to a fall in commercial and economic activity and an output recession - practically all international economies have experienced a considerable drop in GDP. The agricultural industry encountered significant logistical challenges as a result of the decline in production, the closing of markets and borders, and the cancellation of orders. Furthermore, the economic crisis hampered farmers' access to financial resources (Kaminskyi et al., 2021). Optimizing farm workforce levels aid in the growth of the industry's financial and socially sustainable development. Transfers of excess supply created in secondary and tertiary industries must, at the very minimum, decrease, if not remove, the economic consequences of these discrepancies might be at a technologically, financially, environmentally, and socially acceptable level of labour in farming (Kołodziejczak, 2020). The rural workforce level, agricultural labour, and net economic benefit must be considered the most when assessing direct payments. Agricultural business revenue is primarily influenced by total factor productivity while farming R&D investments are influenced by gross value-added, direct payments, and gross value added in the agriculture industry (Cristea et al., 2021).

The present economic crisis is unusual, including many businesses and industries encountering completely unseen problems and risks. Grondys et al. (2021) revealed that in the current financial situation, the workforce component was thought to be a determinant of the perception and assessment of the degree of selected risks arising from economic activities in the marketplace. The effects of private sector, financial, fiscal, and logistical threats on the performance of micro, small, and medium-sized enterprises (MSMEs) are regularly threatened by the strong industrial rivalry, rising energy prices, and inadequate profit (Grondys et al., 2021). Organizations must monitor and assess all events related to the transmission of the emerging virus and establish and implement emergency plans in the event of a COVID-19 pandemic. According to him, the role of SMEs in economic development and Vision 2030 is critical. Countries should continue to examine COVID-19's impact on SMEs and provide help based on the evaluation report (Nurunnabi, 2020).

3 Materials and Methods

The current study aimed to create a detailed schematic of the COVID-19 crisis's effects on agricultural SMEs in Central European countries, including Austria, Czechia, Germany, Hungary, Poland, Slovakia, and Switzerland. To conduct the

study, an empirical analysis was used as an effective way to collect information for prediction research to examine the outcome measures. The keywords for this objective, such as COVID-19, international lockdowns, business disturbance, agriculture, food distribution network, food shortages, economic recession, climate modification, and natural hazards, were examined using research engines, for instance, Google Scholar, Scopus, as well as other global and domestic data sources. Eurostat and other European databases were utilized to assess the outbreak's impact on agricultural circumstances in European countries using indicators such as the number of employees, labour force input, Gross Domestic Product (GDP), wages and salaries, value-added, and agricultural output and the duration of the data was from 2011 to 2021. This study mainly focused on the literature evaluation divided into COVID-19 and Agricultural disasters, COVID-19 economic crises, and agricultural forecasts for European nations and prediction of the study will be till 2025. The collected evidence was linked to the Eurostat database. After obtaining all relevant information, the study's findings were presented by graphs in a categorized way.

4 Results and Discussions

This study analyzed the COVID-19 outbreak's influence on the output of agricultural, labour force input, the number of employees, GDP, value-add, wages, and salaries in agricultural, forestry, and fishing SMEs in Central European countries. The following results of indicators of the study were as below:

4.1 Wages and Salaries

The agricultural sector employed a disproportionate proportion of its workforce in low-wage jobs, and for many vocations, the sector had lower earnings, whereas other industries had higher average rates and salaries.

Fig. 1. Impact of the pandemic on wages and salaries of agricultural, forestry, and fishing SMEs in Central European countries

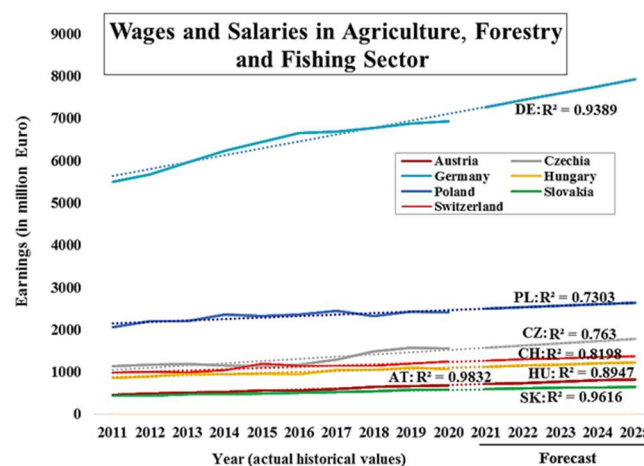
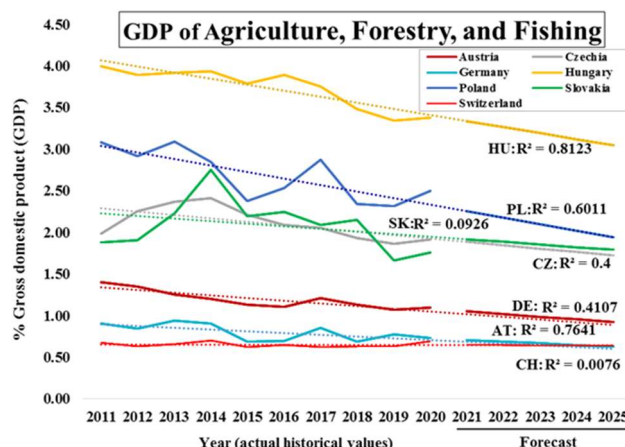


Figure 1 represents earnings and salaries in Central European agricultural SMEs' agricultural, forestry, and fishing sectors before and during COVID-19 from 2011 to 2021, with projections through 2025. In Germany and Poland, wages and salaries in agriculture were approximately 5,499 and 2,061 million euros in 2011, respectively, which were higher than those in the Czech Republic, Austria, Hungary, and Switzerland. While wages and salaries in Germany and Poland declined in 2021 as compared to the pre-COVID. The forecast revealed that in 2025 Germany would increase the wages and salaries of agriculture SMEs. A ten-year data set revealed that agricultural earnings and salaries in the remaining European nations were slightly improved. Salaries were also impacted by the agricultural occupational structure of the industry, with a significant number of employees in low-wage occupations. Additionally, the occupational employment statistics for the highest-paying occupations were low. Farmworkers and labourers (crops, nurseries, and greenhouse; farm workers, farm, and aquacultural animals), directly connected to the sector's principal economic activity, dominated employment in the agricultural sector, impacting salaries.

4.2 Gross Domestic Product (GDP)

Fig. 2. Impact of the pandemic on GDP on agricultural, forestry, and fishing SMEs in Central European countries

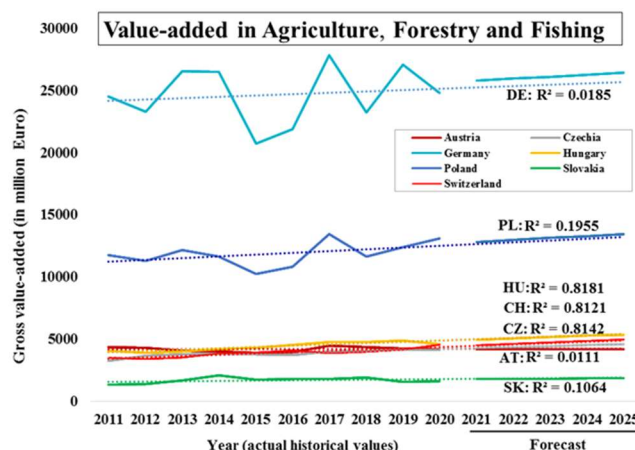


Agricultural, forestry, and fishing SMEs contribute significantly to GDP and economic growth through essential linkages between production and consumption, supplying raw materials for production and commodities to the non-agricultural sector (industry and commerce). Agriculture also consumes energy, minerals, and chemicals, among other things. Figure 2 depicts the GDP of agricultural, forestry, and fishing in Central Europe before and during COVID-19. In 2011, Hungary and Poland had higher GDP rates of approximately 3.99 and 3.09 %, respectively, compared to other European countries before the pandemic. The GDP rate of Austria, Czechia, Germany, Hungary, Poland, Slovakia, and Switzerland was inconsistent from 2011 to 2018, continuously declining and rising, but GDP in Hungary and Slovakia dropped significantly. However, It was noticed that during COVID-19 in 2020, there was a higher impact on the Central European economy and GDP because of agricultural market shocks, including the inclusion of demand, supply, and fiscal reactions in agricultural production/trade markets.

4.3 Value-Added

Value-added agriculture refers to a collection of agricultural strategies that enable farmers to fulfil customer needs for agricultural or food items with a unique form, space, time, identity, and quality characteristics unavailable in conventionally produced raw agricultural goods. Agriculture with added value is a crucial strategy for agricultural SMEs as well as rural development. Figure 3 depicts the value-add in agriculture, forestry, and fisheries in Central European agricultural SMEs from 2011 to 2021, before and during the COVID-19 crisis. The value-added (figure 3) in agriculture, forestry, and fisheries in Central European SMEs was compared in the pre-pandemic era (2011-2019) and during the COVID-19 crisis (after 2019). During the pre-pandemic period, Germany's collection of value-added tax fluctuated; statistics revealed that Germany collected more than 24,512 million euros/year of value-added tax in 2011, 2013, 2014, 2017, and 2019, but it declined in 2012, 2015, 2016, and 2018. In the agriculture sector in Germany, value-added is expected to reach about 26420 million euros by 2025 in the agriculture, forestry, and fisheries sectors. In 2011, Poland's value-added tax collection was 11,718.9 million euros, which grew with volatility from 2012 to 2014, as well as in 2017, 2019, and 2020. In contrast, there was a decline in value-added in 2015, 2016, and 2018. Surprisingly, in 2020, amid the COVID crisis, Poland's value-added (13,103.1 million euros) was quite strong in comparison to the pre-pandemic era. However, by 2025, the value-added in Poland's agriculture sector is anticipated to rise by approximately 13444 million euros in the agriculture, forestry, and fisheries sectors. Austria's value-added climbed consistently from 4,347.7 million euros in 2011 to 4,259.7 million euros in 2019. It fell by 4,172.2 million euros in 2020 and is expected to be about 4173.3 million euros in 2025. In comparison, Hungary credited its economy with 4,081.2 million euros of value-added in 2011; the amount climbed gradually until 2019 (4,883.8 million euros).

Fig. 3. Impact of the pandemic on value-added in agriculture, forestry, and fishing SMEs in Central European countries

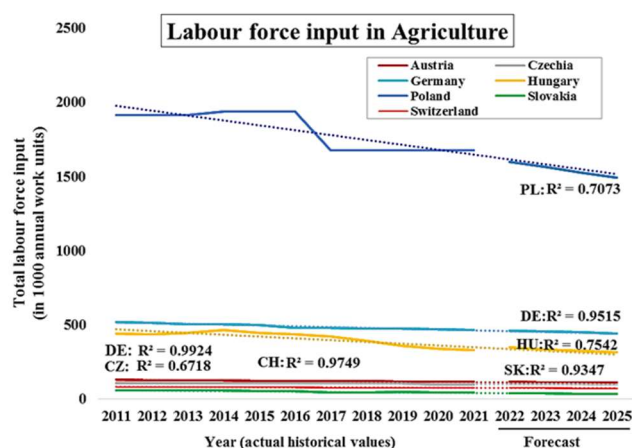


During COVID-19, it declined somewhat (4,614.6 million euros) in 2020. Hungary's value-added in agriculture, forestry, and fisheries is expected to reach over 5359.7 million euros in 2025. Switzerland's value-added has steadily increased from 3,490.2 million euros in 2011 to 4121.9 million euros in 2019. In 2020, it increased by 4,548.3 million euros, which is predicted to be about 4945.8 million euros in 2025. Czechia credited its economy with 3,275.2 million euros of value-added in 2011, continuously increasing through 2019. (4,198.3 million euros). It fell slightly (4,123.5 million euros) in 2020 during COVID-19. In 2025, Czechia's value-added in agriculture, forestry, and fisheries is predicted to exceed 4592.5 million euros. Compared to the other Central European nations, Poland and Switzerland's agricultural value-added was higher during the pandemic, while Germany, Hungary, Slovakia and Austria's value-added was relatively low and changed little over the decade and then declined again in 2021. Czechia had a relatively stable value-added during COVID-19. Central European nations involved farmers shifting their position in the supply chain, developing direct links between themselves and consumers, and adjusting production procedures to alter and retain certain fundamental features of their farm goods.

4.4 Labour Force Input

In Poland and Germany, people were directly engaged in the agriculture industry 1914.8 and 517.5 in thousand units, respectively, in 2011 compared with other European nations, as shown in figure 4 for agricultural labour force input. Between 2014 and 2016, the number of people working in the agriculture business in Poland climbed from 1914.8 to 1937.1 in thousand units and then declined dramatically from 2017 to 2018, and the line stayed stable until 2021. Although Hungary had a minor reduction in agricultural work during the pandemic in 2021, other European countries also saw much workforce in the industry. The impacts of COVID-19 on agriculture SMEs have been reported, with the main issues being labour and machinery shortages, limited access to crop fields and markets, poor access to agricultural inputs, services, and consultancy services, supply chain interruption, and product perishability due to limited access to markets and insufficient post-harvest handling. Furthermore, the lockdown considerably influenced the flow of agricultural commodities and product promotion.

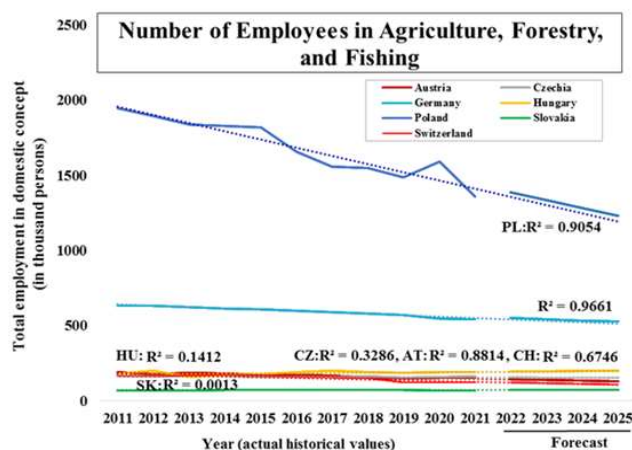
Fig. 4. Impact of the pandemic on labour force input on agricultural, forestry, and fishing SMEs in Central European countries



4.5 Number of Employees

Figure 5 shows the number of agricultural, forestry, and fishing employees in Central European countries un SMEs from 2011 to 2021. According to preliminary estimates, in 2011, the agricultural industry employed the most people in Poland and Germany 1,945, 000 and 631,000, respectively; other European countries had lower employment rates than Poland.

Fig. 5. Impact of the pandemic on the number of employees of agricultural, forestry, and fishing SMEs in Central European countries



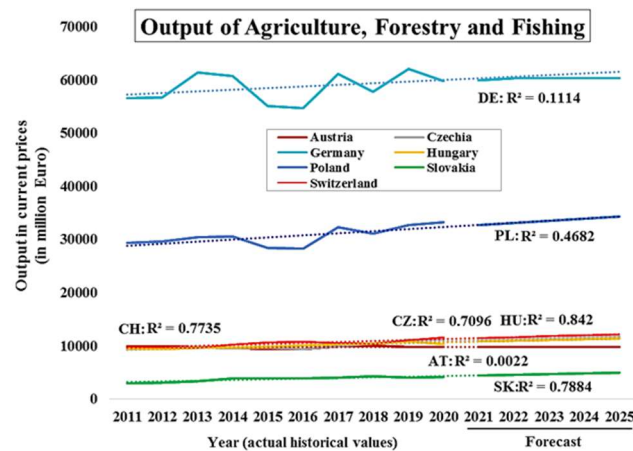
From 2011 to 2020, the employment rate in other European countries changed marginally, whereas, during the pandemic, Poland, Switzerland, and Germany hired fewer employees in 2021. The COVID-19 pandemic problem has influenced employment, productivity, and businesses in ways that have resulted in increased inequities. Most companies had had to close their doors, resulting in unprecedented concerns such as lost business, income, and job losses. The extreme measures necessary to stop the spread of COVID-19 necessitated many legislative initiatives that obstructed society's regular functioning. These examples were wearing face masks, social isolation, remaining at home, and the eventual restriction of all mobility. As a result, typical business operations could not be carried out for fear of spreading the disease.

4.6 Output of Agriculture

Agriculture, forestry, and fishing production output are significant for various reasons. Aside from supplying more food, boosting farm productivity influences the region's potential for agricultural market expansion and competitiveness, income distribution and savings, and labour migration. Figure 6 represents agricultural, forestry, and fishing output SMEs from 2011 to 2021. The output volumes of German, Poland, and Slovakia's agricultural SMEs fell in a generally consistent downward trend. The increasing output volumes were paralleled by the number of input commodities in Germany and Poland in 2014, which then fluctuated output until 2019 and decreased during the COVID-19 pandemic in 2020. In addition, central European countries had the lowest production compared to Poland and Germany. The COVID-19

pandemic altered the functioning of the entire agricultural production in Central Europe and across the world. The economy's shutdown and the resulting economic recession, limits on foreign commerce, and stalled production demand all damaged the financial foundations of local agricultural producers, the processing sector, transportation, energy, and trade firms.

Fig. 6. Impact of the pandemic on the output of agriculture on agricultural, forestry, and fishing SMEs in Central European countries



5 Conclusion and Recommendations

The COVID-19 outbreak significantly negatively influenced agricultural output, labour force input, number of employees, GDP, value-add, wages, and salaries in SMEs of agricultural, forestry, and fishing in Central European countries, impacting the worldwide food distribution network. We estimated that the pandemic affected the world's foods, agricultural SMEs, trade, and GDP based on the abovementioned. This severe pandemic has impacted livestock, fisheries, and agriculture. Food security and food safety are essential concerns globally in the present economy; COVID-19 significantly influenced the distribution network, threatening food security and safety worldwide. Agricultural consumption and production were being harmed internationally due to transportation limitations and decreased purchasing power. Besides, most migrants, mainly temporary seasonal agricultural and domestic workers, were relocated, which may influence the food supply. The COVID-19 outbreak is a worldwide issue that has impacted the food and agriculture industries. There is an urgent need to respond promptly to secure the sustainability of the Agri-based product distribution network, both domestically and internationally, to limit the possibility of major disruptions, which may significantly influence the poor and weak populations. Despite the assumption that there had been few disruptions to the food distribution network, it nevertheless confronted significant strategic concerns. Agri-product must transcend unbounded borders while adhering to established food safety requirements to reduce the pandemic's impact on agricultural production. The Food and Agriculture Organization encourages nations to achieve the international food needs of vulnerable individuals, improve social safety policies, continue world food trade progression, implement country's food distribution network approaches, and encourage small-scale farmers' ability to boost agricultural output. Economies with international issues are more likely to contract the COVID-19 outbreak. Although several national requirements may arise due to the outbreak, donor economies must continue to guarantee that emergency aid is supplied despite acute food shortages. The illness has little regard for national boundaries. The entire human population will be endangered if this issue is not solved. Consequently, the government must consider regulating pandemics without endangering its population's Agri-product security, safety, and distribution network problems.

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