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Daniela TSVYATKOVA[1], Dilyana BOYADZHIEVA[2]

[1] Institute of Agricultural Economics, Sofia, Bulgaria
[2] Institute of Agricultural Economics, Sofia, Bulgaria - Agricultural Academy
[1] daniela_80@abv.bg; [2] dilyana.boyadzhieva@gmail.com

SCENARIOS FOR FUTURE PERSPECTIVES FOR THE LABOUR FORCE IN BULGARIAN AGRICULTURE UNTIL 2030

ABSTRACT

Agricultural development depends on workforce and human capital, which drive competitiveness. Despite EU funding, the sector faces depopulation, ageing, and reduced labour input in rural areas, and in Bulgaria agricultural employment is declining alongside low incomes, weak infrastructure, and growing demotivation among young people. This study analyses changes in Gross Regional Employment (GRE) in agriculture across rural and urban areas and across rural versus non-rural municipalities, using a 10-year historical dataset. Based on the results, three employment scenarios for agribusiness towards 2030 are developed. The methodology applies proportional extrapolation within the TSSA framework (Ivanov, 2022), which is used to quantify factor effects on GRE change between 2010 and 2020. External shocks – climate change, COVID-19 impacts, and the war in Ukraine – further intensify pressures on the sector. Bulgaria faces competition in the EU single market but also opportunities if workforce stability improves. A comprehensive policy approach is required to retain rural population, upgrade infrastructure, and support agricultural workers.

Key words: Annual Work Units, rural areas, scenarios

JEL Classification: Q01, Q13, Q18

INTRODUCTION

During the 20th and 21st centuries, the globalisation of agricultural markets, the diffusion of technologies, the Green Revolution, and the rise of industrial agriculture, further transformed the nature of agricultural labour. These changes were accompanied by significant demographic shifts, as many workers moved from rural to urban areas in search of better opportunities within the industry and the services sector. Income, employment, and consumption should not be observed individually, but in interrelation with other indicators which determine the socio-economic development of rural areas. Employment is examined in close connection with poverty reduction and quality of life improvement. The agricultural workforce plays a central role in the global economy and food security. According to data from the Food and Agriculture Organization of the United Nations (FAO), about 28% of the world's workforce is engaged in agriculture, with this share being higher in developing countries.

Employment in Bulgaria is a key indicator of the country's economic development and social stability. There are substantial differences in employment between urban and rural areas, due to a range of economic, social and demographic factors. Cities in Bulgaria are the main centres of economic activity.

STATE OF KNOWLEDGE

Rural areas in Bulgaria face serious employment-related challenges (Hristov, 2013; European Commission, 2021). Demographic decline, lack of investment and limited job opportunities are major problems. Rural areas often experience higher unemployment rates, especially among young people, who prefer to migrate to cities or abroad.

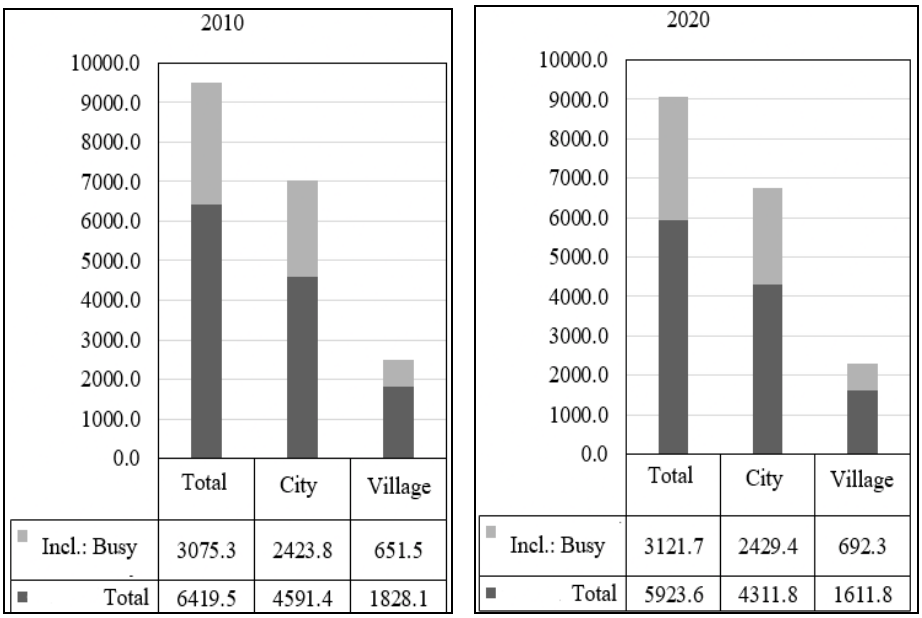
The workforce in rural and non-rural municipalities in Bulgaria shows significant differences in terms of demographic characteristics, educational structure, employment patterns, and economic indicators (Hristov, 2013; Republic of Bulgaria, 2013). Unemployment-related problems at the level of urban and rural areas in Bulgaria can be examined in the context of various factors that affect employment and economic development. Here are some of the main problems:

a) Problems in urban areas:
   - High competition: in urban areas, competition for jobs is intense due to the large number of applicants (Atanasov *et al*., 1994). This can lead to wage suppression and poor working conditions.
   - Mismatch between skills and requirements: there is often a mismatch between candidates' skills and employers' requirements. Many vacancies require specific qualifications or experience that do not always align with the profile of the available workforce (Hristov, 2013; Republic of Bulgaria, 2013).
   - Seasonal and temporary employment: although urban areas offer more permanent jobs, seasonal and temporary employment still accounts for a significant share of the labour market. This creates insecurity for workers and makes long-term career planning more difficult (Atanasov *et al*., 1994).
   - Economic crises and recessions: urban areas are more vulnerable to economic crises and recessions, which lead to mass layoffs and rising unemployment. Examples include the COVID-19 pandemic and global economic downturns (European Commission, 2010).

b) Problems in rural areas:
   - Depopulation and migration: the lack of jobs and low incomes drive young people to migrate to cities or abroad. This leads to depopulation of rural areas and a shrinking workforce (European Commission, 2021).

– Lack of investment and infrastructure: rural areas often suffer from insufficient investment in infrastructure, transport, and communications. This hampers local economic development and the creation of new jobs (Republic of Bulgaria, 2013).
– Low level of education and qualifications: in rural areas, the education and qualification level of the workforce is lower compared to urban areas. This limits opportunities to find well-paid and stable employment (Hristov, 2013).
– Dependence on agriculture and livestock farming: the main sources of income in rural areas are agriculture and livestock farming, which are highly dependent on natural conditions and subsidies. This makes these activities uncertain and vulnerable to climate change and market fluctuations (IAE, 2020; Ministry of Agriculture and Forestry, 2020).
– Social isolation and lack of services: rural areas often lack access to health, education, and social services. This hinders people's integration into society and limits their opportunities for professional development (European Commission, 2021; Republic of Bulgaria, 2013).

Addressing these problems requires coordinated efforts by the state, business, and civil society, aimed at stimulating economic development, improving education and qualifications, and ensuring equal opportunities for all citizens (European Commission, 2010; Republic of Bulgaria, 2013).



Source: NSI, calculations At. Djodjova.

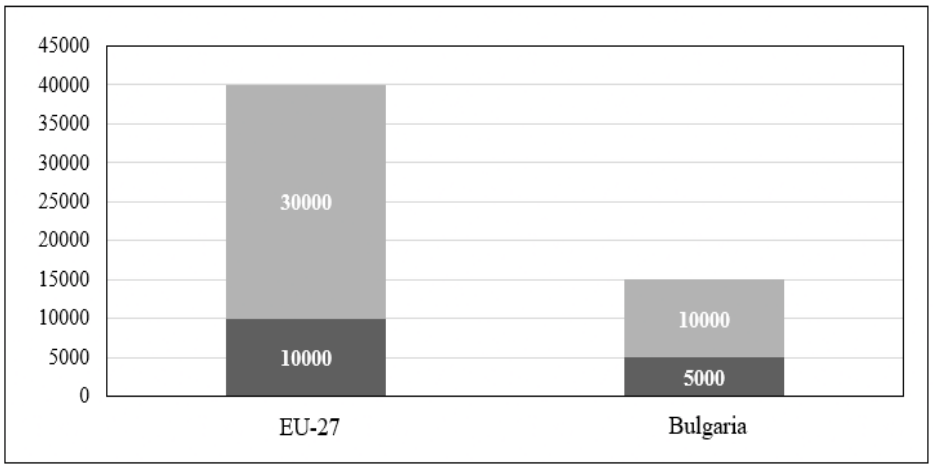
Figure 1. Employed for the place of residence for 2010 and 2020, thousand.

The main employment sectors in rural municipalities include:

- Agriculture – Despite the declining share of employment in agriculture, it remains a primary source of livelihood for many people in rural areas (IAE, 2020; Ministry of Agriculture and Forestry, 2020).
- Small and medium-sized enterprises (SMEs) – Small family businesses play an important role in employment, but they are often constrained by limited market access and lack of investment (Hristov, 2013; Republic of Bulgaria, 2013).
- Seasonal employment – Many people in rural villages find work in tourism or agriculture for short periods during the year (IAE, 2020; Ministry of Agriculture and Forestry, 2020).

Agriculture remains a core economic activity, especially in rural economies, while at the same time undergoing significant transformations (Ivanov, 2022; IAE, 2020). In Bulgaria and in the European Union, as the population in rural areas declines, the trend of depopulation has a serious impact on the availability of labour in agriculture. This leads to reduced production capacity and confronts us with challenges such as population ageing and difficulties in attracting young people to agriculture (European Commission, 2021; Ivanov, 2022).

Understanding these needs is essential for properly targeting economic policies, developing training programmes, and creating sustainable working conditions in rural areas. Sustainable growth in employment is key to raising living standards and reducing social inequalities (European Commission, 2010; Hristov, 2013).



Source: NSI.

Figure 2. Average annual salary in agriculture, compared to all other economic sectors (data on Bulgaria and the EU-27), in EUR.

To track how the data vary over a longer period, attention should be paid to the social problems faced by people employed in agriculture and those living in rural areas in recent years. The incomes of agricultural producers are lower than the national average–when comparing the average annual wage for general labour and civil service in the agricultural sector with the annual wage across all other economic activities (IAE, 2020; Hristov, 2013).

Opportunities for young people to realize themselves professionally are limited. A key reason is the highly fragmented land ownership structure and the predominance of small farms compared to large-scale entities, which further intensifies social differentiation (Ministry of Agriculture and Forestry, 2020; Ivanov, 2022). The data show that in the EU-27 the average annual wage in agriculture is about 10,000 EUR, while in other economic sectors it reaches approximately 30,000 EUR. In Bulgaria, the values are considerably lower–around 5,000 EUR in agriculture and 10,000 EUR in other sectors (Eurostat, 2023). This means that Bulgarian agriculture reaches only about half of the EU average in the sector, while remuneration in other economic activities is roughly one third of the European level.

Overall wage levels in Bulgaria also remain at about 37–38% of the EU-27 average, indicating incomplete income convergence towards European standards (Hristov, 2013; European Commission, 2010). The main economic factor behind these differences is labour productivity and the value added created. Agriculture, although a strategic sector, traditionally remains characterised by lower productivity, stronger dependence on natural factors, and higher seasonality, which explains its substantial lag behind other industries (IAE, 2020; Ivanov, 2022). In Bulgaria, the general level of wages is significantly lower, reflecting weaker productivity of the economy as a whole, a more limited presence of high-paying industries, and lower capital endowment (Hristov, 2013).

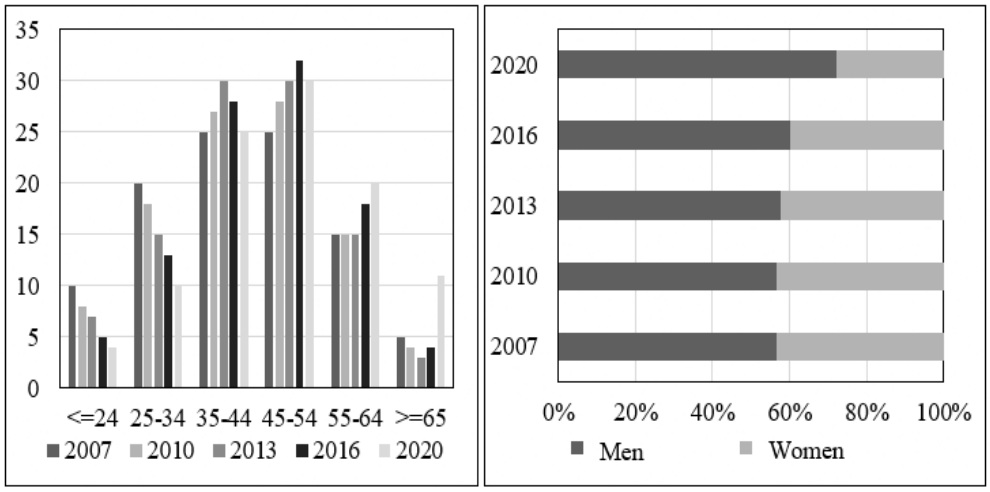
The structural characteristics of the agricultural sector further explain the low level of pay. These include seasonal employment, a higher share of temporary and part-time contracts, and greater participation of self-employed individuals and family farms, which affects official statistical indicators of average wages. In addition, agriculture often occupies a weaker position within the value chain, as a large share of profits is generated in processing, trade, and marketing (IAE, 2020; Ivanov, 2022).

The development of the labour market in Bulgaria in recent years has also been influenced by other environmental factors, such as the penetration of digital technologies in all spheres of socio-economic life, negative demographic trends associated with a shrinking working-age population, the green transition, and others. These processes have led to interregional disparities and mismatches between labour supply and labour demand in terms of specific educational, and qualification profiles and skills (European Commission, 2021; Republic of Bulgaria, 2013).

In the European Union's new long-term vision for rural areas up to 2040 (European Commission, 2025), it is noted that, in the long run, the approach should move beyond purely demographic issues and encompass all aspects relevant to the future of rural areas. High migration is evidence that labour demand in another

country or region is higher, and that the region/country with higher demand can attract labour from another region/country where labour supply is greater. The economic development of countries and regions is the most important factor shaping the labour market and labour demand. From the perspective of household incomes across different types of regions, it is clear that, despite positive trends, the relative position of rural areas compared to urban centres has not improved (European Commission, 2021).

The number of people employed in agriculture in Bulgaria declined dramatically from 2007 to 2020, which has negatively affected value added and production (Ministry of Agriculture and Forestry, 2020; IAE, 2020). Low pay, an ageing workforce, and a lack of economic incentives deter potential workers from entering the sector. Population ageing and migration to large cities and other countries further exacerbate the problem (Hristov, 2013; European Commission, 2021).



Source: MAF, Agrostatistics.

Figure 3. Number of persons employed in agriculture by age and gender, 2007–2020.

The study also highlights the demographic changes in the structure of the agricultural workforce. Statistics show that a large share of people employed in Bulgarian agriculture are over 65 years of age, which is a serious challenge for the sector's sustainability. At the same time, young people (under 24) account for less than 15% of total employment, underscoring the ongoing difficulty of attracting a new and qualified workforce (Eurostat, 2023). Hidden unemployment is a key precondition for the development of various forms of employment (fixed-term contracts, part-time contracts, seasonal contracts, flexible working hours, shift work, weekend work, etc.). Working conditions in the sector are, at certain times, characterised by very high work intensity and pace. In agriculture there are no jobs or activities defined exclusively for men or exclusively for women. Workers may

be exposed to high or low temperatures, noise and dust, and work involving chemicals (crop protection products) (IAE, 2020; Ivanov, 2022).

According to Eurostat, the unemployment rate in Bulgaria in 2023 continues to be lower than the EU average (5.8%) (Eurostat, 2023). High unemployment in rural areas leads to poverty, demographic problems (population ageing), and social isolation. Agricultural work is often associated with low incomes and harsh working conditions, which makes the sector unattractive for many people (Hristov, 2013; IAE, 2020).

3. MATERIAL AND METHOD

The aim of the present study is to analyse changes in Annual Work Units (AWU) in agriculture in rural and urban areas in Bulgaria, based on data from a 10-year historical period, and to develop three scenarios for future prospects in agribusiness (more specifically, employment) for 2030. The objective is achieved by: analysing the influence of local, national, and regional (oblast) level factors on changes in AWU in agriculture (a territorial model by municipalities – rural and non-rural – is developed); tracing trends and changes in the workforce in Bulgarian agriculture; and, on the basis of the data analysis, forecasting scenario-based assessments of viability and competitiveness in agriculture.

A methodology is developed for producing forward-looking scenarios for AWU in agriculture and their distribution across rural and non-rural municipalities in Bulgaria towards 2030. The methodology is based on a proportional extrapolation method, building on the Territorial Shift–Share Analysis (TSSA), tested by Ivanov (2022).

Territorial analysis (TSSA) is used to examine the quantitative impact of factors affecting changes in AWU in agriculture in rural and non-rural municipalities between two periods (*e.g.*, 2010 and 2020) at different territorial levels – national, regional (oblast), and municipal. The method makes it possible to calculate AWU in agriculture at these levels and to identify the specific influence of factors operating at different territorial levels. This is the main forecasting method and is based on extrapolating the proportions of AWU changes from previous periods (*e.g.*, 2020, taken as the base year) to a future period (*e.g.*, 2030). Proportional extrapolation coefficients are calculated for each territorial level (national, regional, and municipal).

Three different scenarios are developed:

- An “extrapolation method of proportions based on Territorial Shift–Share Analysis (TSSA)” is applied, following a methodology proposed by Ivanov, B. (2024), with two periods selected: 2010 and 2020.
- **Realistic scenario** – the baseline scenario, presenting the current state and trends in the future development of employment, varying according to the current state of work units in agriculture.

– **Optimistic scenario** – assumes the most favourable conditions and the highest rates of economic growth.
– **Pessimistic scenario** – assumes the least favourable conditions and the lowest growth rates.

After calculating the values for the different scenarios, an assessment is made of the probabilities of each scenario occurring. This is achieved through an algorithm that incorporates a confidence level, based on how employment processes in agriculture evolved historically over the ten-year period 2010–2020. The resulting probabilities are used to determine the most likely changes in AWU towards 2030 for each possibility. Depending on which scenario is considered most favourable (optimistic, pessimistic, or baseline), the forecast values for AWU in future years are determined.

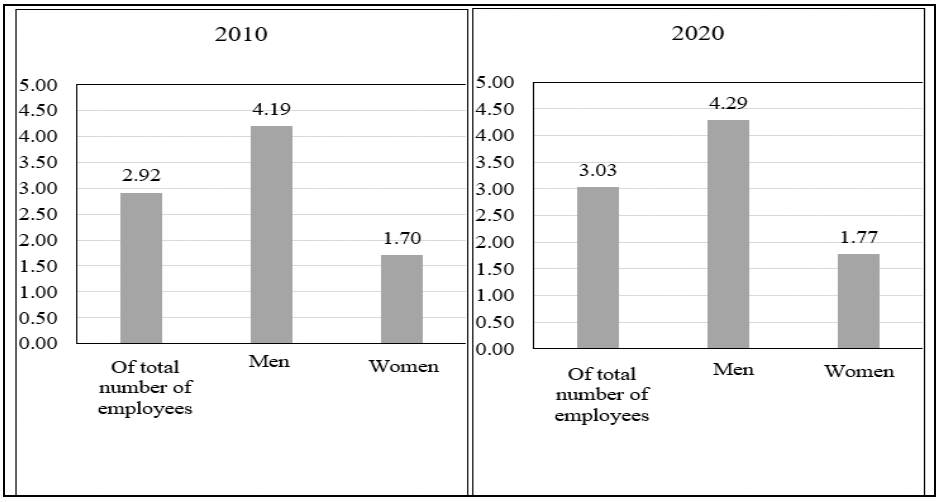
The probabilities for the different scenarios are estimated through statistical processing of data for different types of municipalities – rural and non-rural. In the next step of the study, the probabilities of each scenario emerging are assessed. The method for calculating probabilities is based on the approach proposed and tested by Ivanov *et al*. (2023), consisting of a statistical algorithm incorporating covariance, variance, the desired confidence level, and a pre-defined exclusion as degrees of freedom of a particular development, and a probability distribution.

4. RESULTS AND DISCUSSIONS

Agricultural employment has specific features linked to working economic conditions: labour processes and types of activities depend strongly on climatic conditions, on the qualitative characteristics of land, and on the adaptability of individual crops to soil and climate conditions of the area; and on seasonal influences in the market. Income from work in agricultural holdings is often supplemented by labour income from other activities, income from social funds, etc. The informal economy in Bulgaria is widespread in small family and household holdings, where people grow fruit, vegetables, poultry, and animals for their own consumption. Household production, besides being a widespread practice and established tradition in Bulgaria, proves to be a strong factor for the survival of agricultural producers' households, as well as the families of their relatives. People living in villages and small towns, due to high unemployment in these regions, rely on informal labour and self-produced output from their holdings as a primary means of subsistence and as a way to supplement the family budget.

According to data from the National Statistical Institute (NSI), in 2010 Bulgaria employed 1,168 thousand people in agriculture, corresponding to 650 thousand Annual Work Units (AWU). In 2020, the number of persons employed in agriculture in Bulgaria decreased to 294,300, which equals 168 thousand AWU. Over the same period in the EU-27, agricultural employment decreased

from 9 million people in 2010 to 7 million people in 2020, corresponding to a reduction of 22%. These data indicate that Bulgaria experienced a larger decline in agricultural employment compared to the EU-27 average. The utilised agricultural area per 1 AWU in Bulgaria is significantly higher than the EU average, indicating a lower concentration of labour relative to agricultural land. This is due to lower mechanisation and weaker technological endowment.



Source: NSI, calculations At. Dzhodzhova.

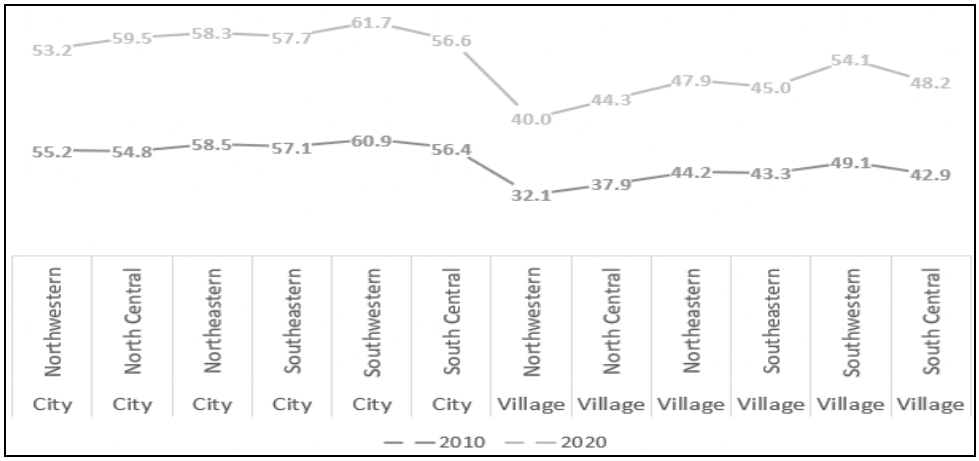
Figure 4. Share of employees under employment relationship in agriculture from the total hired for the country, %.

According to the coefficient of the economically active population at regional (oblast) level, a large divergence over a ten-year period between rural and non-rural areas is again evident. The differences in employment between cities and villages in Bulgaria confirm that cities maintain higher economic activity than villages across all regions. Rural areas, however, show higher growth rates in the North-Western region, which records the largest increase (+7.9 percentage points). The North-Western region has the lowest economic activity overall, yet it registers the greatest progress in rural areas. The South-Western region remains the most developed region, with the highest economic activity throughout the entire ten-year period.

For most municipalities, a significant decrease in Annual Work Units (AWU) is noticed between 2010 and 2020. The largest change in the workforce at municipal level is in the municipality of Vidin, with a decrease of 1,031 AWU. Agriculture, a traditional sector for the region, is affected by adverse climate changes, which reduce productivity and employment in the sector. Vidin is among the economically least developed municipalities in Bulgaria, resulting in a limited number of jobs and low employment in industry and services. The low level of education and the lack of specialised qualifications among young people lead them

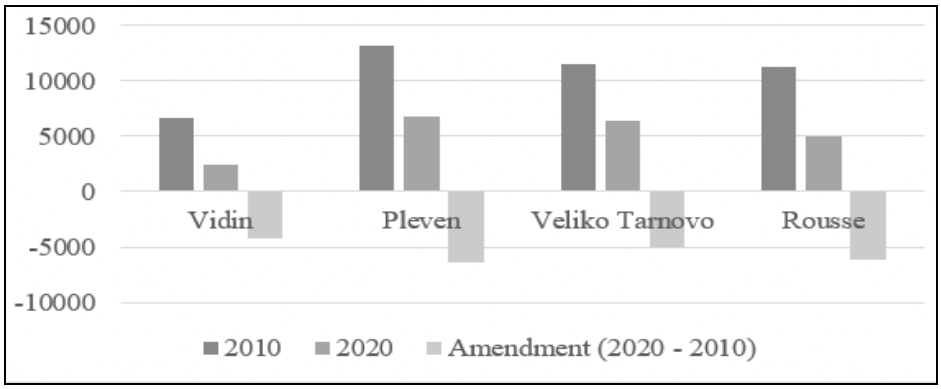
to leave the region in search of better opportunities for education and career development.

The largest change in the workforce at oblast (regional) level is in Pleven Province, with a decrease of 6,429 AWU. The largest change at national level is a reduction of 224,635 AWU. Examples include: Sliven – from 8,018 (2010) to 3,242 (2020), a decrease of 4,776 AWU; Aitos – from 2,840 (2010) to 1,420 (2020), a decrease of 1,420 AWU; Varna – from 958 (2010) to 217 (2020), a decrease of 741 AWU; and Targovishte – from 3,701 (2010) to 1,456 (2020), a decrease of 2,245 AWU.



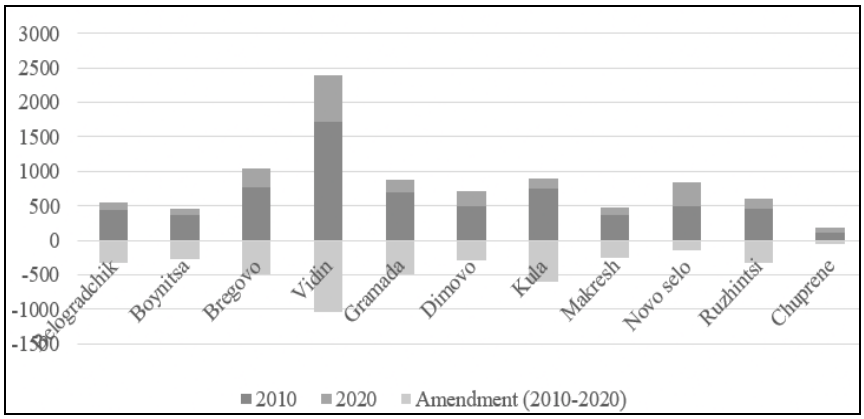
Source: NSI, own calculations.

Figure 5. Coefficient of economic activity at residence (in cities and villages) and statistical districts.



Source: Prepared by the author based on Ivanov method (2024) and data from Eurostat (2024).

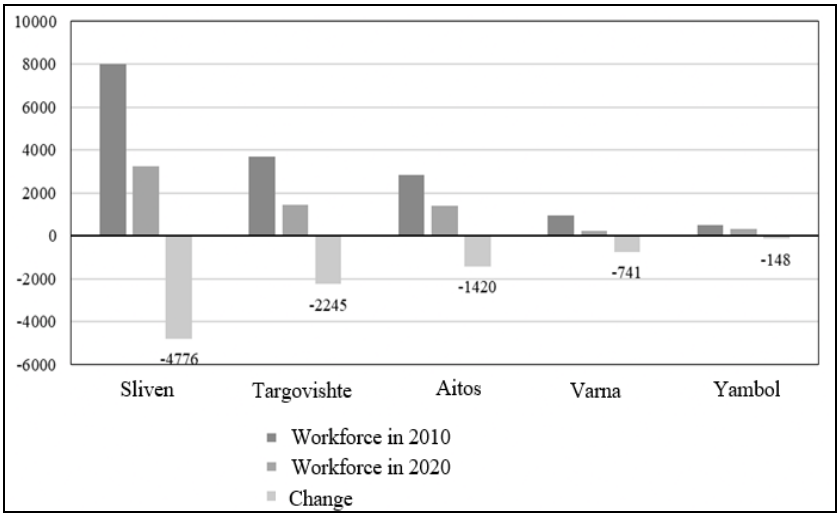
Figure 6. Changes in the workforce by municipalities, with the most influence of the factors at regional level (2010–2020).



Source: Prepared by the author based on Ivanov method (2024) and data from Eurostat (2024).

Figure 7. Changes in the workforce by municipalities, with the most influence of the factors at municipal level (2010–2020).

The municipalities with the largest decrease in Annual Work Units (AWU) in the study period, which stand out most strongly due to the influence of factors at national level, are: Satovcha – from 5,325 in 2010 to 1,266 in 2020 (a 76% decrease); Kirkovo – from 8,420 in 2010 to 1,369 in 2020 (an 84% decrease); and Plovdiv – from 580 to 357 (a 38% decrease). Municipalities with the smallest decrease in AWU are: Petrich – from 4,808 in 2010 to 4,670 in 2020 (a 3% decrease); Dolni Chiflik – from 509 in 2010 to 476 in 2020 (a 6% decrease). Yakoruda – from 1,026 in 2010 to 1,064 in 2020 (an increase of ~4%).



Source: Prepared by the author based on Ivanov method (2024) and data from Eurostat (2024).

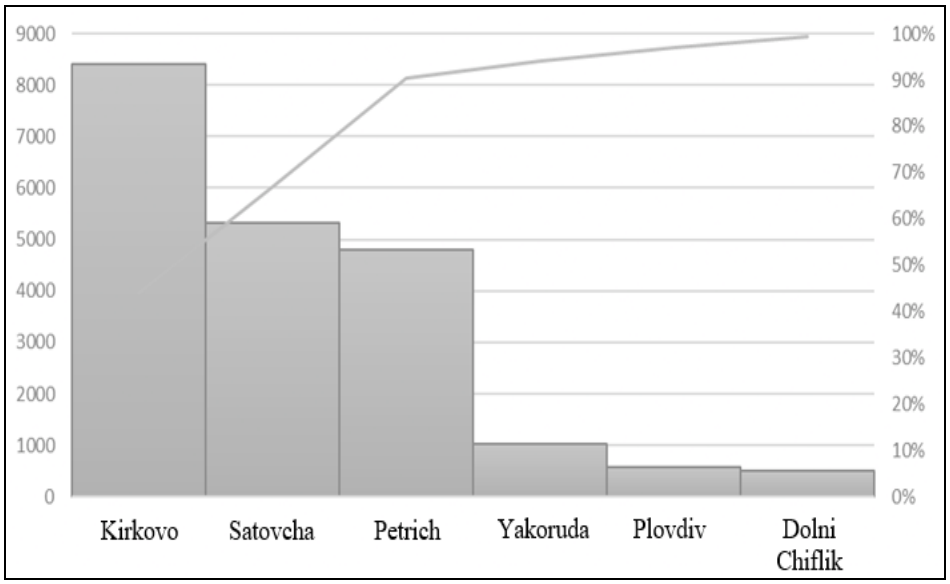
Figure 8. Changes in the workforce by municipalities, with the most powerful influence on the factors at national level (2010–2020).

With regard to regional differences, the North-Western region is the most affected by the decline in Annual Work Units (AWU) due to an ageing population and high emigration. The city of Vidin is the most strongly affected (from 1,712 to 681: a 60% decrease).

In the South-Central region, some municipalities manage to maintain employment levels in agriculture. This region, known for agriculture, is undergoing a process of innovation and mechanisation, which significantly reduces the need for human resources. The introduction of more efficient and automated methods leads to fewer jobs in the sector. Agricultural workers in Plovdiv and smaller municipalities often shift to other economic sectors, such as industry and services, where there are more job opportunities and better living conditions.

In the South-Western region, almost all municipalities show similar or mixed results, with stability in some municipalities such as Petrich, which stands out most clearly for its resilience over the ten-year period. In Petrich, agriculture remains a core sector of the economy. Unlike other regions, agricultural activities such as fruit and vegetable production continue to attract labour, which helps maintain employment levels. Trade in fruits and vegetables is well developed and provides income for the local population.

The baseline scenario shows values that reflect the current state and development of agriculture without significant changes in policies or conditions. This scenario has the highest probability (32%), suggesting a substantial likelihood that agricultural development will follow a stable pace without major fluctuations.

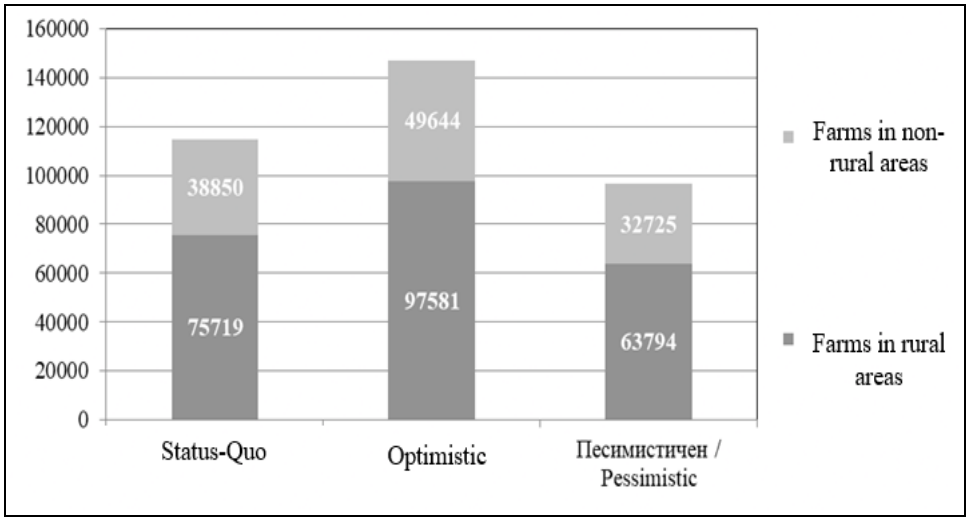


Source: Author's own calculations.

Figure 9. Municipalities with the highest and least change in the AWU for the period 2010–2020, %.

The optimistic scenario assumes an increase in Annual Work Units (AWU) to 147,224, which is a significant rise compared to the baseline level. This could be associated with favourable conditions such as innovation, support for farmers, or stable economic growth. However, the probability of this scenario is the lowest (16.38%), indicating that such growth is less likely. These low probability values suggest that rural areas may face a number of challenges in terms of employment growth and sustainability over the next few years. These economic, environmental, climate-related, and socio-economic challenges require that farmers remain at the centre of rural communities in Europe. This will direct attention towards supporting generational succession on farms and encouraging a new generation of farmers to actively participate in rural development.

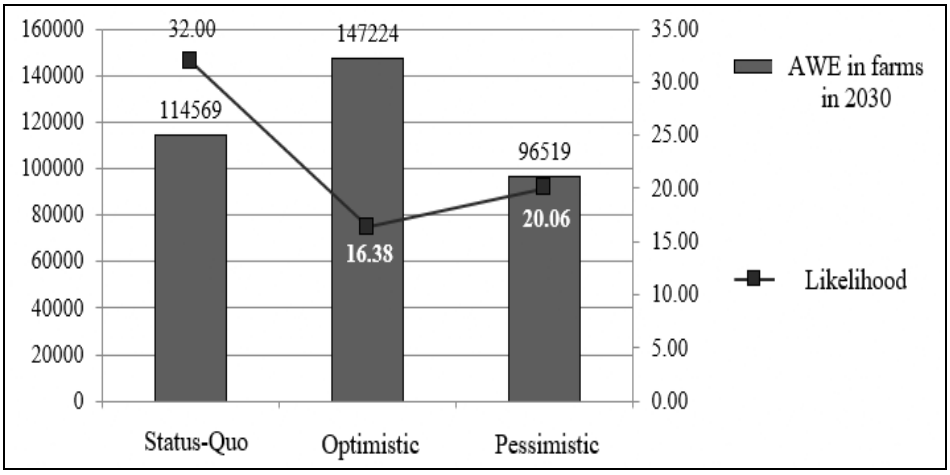
The pessimistic scenario forecasts a decline in AWU to 96,519. This may be driven by adverse factors such as climate change, economic crises, or reduced support for the sector. With a probability of 20.06%, this scenario is moderately likely, especially if no actions are taken to mitigate risks.



Source: Prepared by the author based on Ivanov method (2024).

Figure 10. Scenarios for changing the AWU in agriculture in rural and non-village regions according to estimated scenarios for 2030.

The baseline scenario is the most likely, which highlights a tendency towards stability. The optimistic scenario offers significant growth potential, but it requires targeted actions in order to be realized. The pessimistic scenario demonstrates the sector's vulnerability and the need for protective measures against adverse conditions. Comparing the scenarios, it becomes clear that agricultural development towards 2030 will depend on a range of internal and external factors, but the range of change will not exceed the defined limit (the maximum change will be up to 9,286 AWU, as an acceptable lag).



Source: Prepared by the author based on Ivanov method (2024).

Figure 11. Scenarios to change the AWU in agriculture in the more estimated scenarios for 2030 and the degree of probability.

5. CONCLUSIONS

In conclusion, the agricultural workforce continues to be a key driver of economic development in many regions, but in order to remain competitive and sustainable, the sector must undergo significant reforms focused on modernisation, innovation, and the inclusion of new generations. The main challenges facing the agricultural workforce include poverty, limited access to technologies, climate change, and insufficient training. Rural areas can become centres of innovation, sustainability, and cultural richness if approached through coordinated efforts and a long-term vision. Employment in villages is indeed crucial for the sustainable development of rural areas. The balance between tradition and modernisation is the key to successful development and to retaining young people in these regions.

With the right policies and investments in education, infrastructure, and support for small farms, agriculture can provide sustainable jobs and improve quality of life in rural areas.

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