Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 21, Issue 1, 2021
PRINT ISSN 2284-7995, E-ISSN 2285-3952

EVOLUTION OF THE AGRICULTURAL LABOUR MARKET IN THE EUROPEAN UNION BETWEEN 2011-2020

Cristina Vasilica ICOCIU[1*], Ana-Maria IFRIM[1], Cătălin Ionuț SILVESTRU[1***], Marius-Mihai MICU[2]**

[1]University Politehnica of Bucharest, *Economic Engineering Department, **Faculty of Electrical Engineering, ***Robots and Manufacturing Systems Department,313 Splaiul Independentei, District 6, 060042, Bucharest, Romania, Emails: cvicociu@gmail.com, amifrim@gmail.com, catalin.silvestru@gmail.com
[2]Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Sisesti", 61 Marasti Boulevard, District 1, 011464, Bucharest Romania, Email: micumariusmihai@yahoo.com

Corresponding author: micumariusmihai@yahoo.com

Abstract

In the current context, in which the pandemic crisis is wreaking havoc in all socio-economic fields, causing both loss of life and immeasurable economic losses, fundamental research conducted to identify directions for rapid and sustainable socio-economic recovery is of great importance. Over time, the agricultural sector has played a particularly important role in accelerating the expansion and economic development of the least developed countries and their integration into world trade. The basic hypothesis is that, over time, agriculture has been the premise for the economic development of the world's states, the agricultural transition being quite well correlated with general growth processes. By improving their competitiveness and strengthening their agricultural production capacities, the countries of the world can recover from any crisis, especially after a health crisis. The work aims to present the possible impact that agriculture can have on economic development by applying known principles and foundations. Making investments in agriculture, increasing the level of employability leads to the development of this branch of the economy and implicitly of the other branches of industry that are connected with agriculture, such as the food industry. Using a mathematical algorithm for studying the impact of the evolution of the agricultural labour (salaried) in the context in which it is desired that agriculture be a sustainable branch from the point of view of employability at the level of the European Union. The results of this study can then be materialized in strategic directions of development of every country, in the hope of moving to another level of development. In the context in which agriculture is the basis for the horizontal development of other industries (such as the food industry) it is necessary to carry out an investment program and research programs in the agricultural field. Applying Lewis's model of development, governments must strive to increase agricultural productivity while stimulating capital accumulation and in the other sectors of the economy.

Key words**:** *agricultural, Lewis's theory, human development, labour, employees, investments*

INTRODUCTION

Agriculture is the cradle of human activity and this activity continued to be at the centre of development from then until today. This is because even if less than 5% of the active population in developed countries work in agriculture, it remains the main activity of people in poor and developing countries. In fact, it is this human activity that provides food for the world's population, hence its consideration as the primary sector of the economy. Over time, economists have looked at the various stages of human development to understand the role and importance of the primary sector in securing a country's wealth, what are the factors influencing it, and how poor countries can develop to catch up with rich countries. This research only seeks to shed light on the importance of agriculture in the formation of national wealth, in the development process of a country, taking into account the degree of development of society and public policies specific to the field [1, 6, 10].

Agriculture is changing due to globalization, climate and societal change. Partly in response, the common agricultural policy (CAP) and other EU agricultural policies are changing. This creates important new data

needs for agricultural statistics that are currently not being met. At the same time, official statistics are changing due to technological progress and the availability of new data sources, while resources continue to be depleted.

According to European Strategy, the priorities in the field of agriculture and rural development are: increasing competitiveness, ensuring the sustainable management of natural resources in agriculture and improving the standard of living in rural areas. The lack of financial resources and the non-operationalization of the objectives included in the European Strategy at budgetary level, as well as the reduced attention for human resources in rural areas were just some of the problems identified regarding the non-achievement of the objectives proposed [5, 8, 9].

In all political currents and economic theories, over time, agriculture has been seen as a major element in changing and improving the structuring of economies. But in practice, the rhythm of these structural changes and their impact on the growth and development of economies vary greatly from country to country and often in an uncertain way. In addition, since Adam Smith, the theory and practice of international trade have changed; the era of liberalization promotes trade based on comparative advantages [10]. The general movement is then questioned and the ideology that agriculture is the engine of development is challenged. However, it would seem that the development of many poor countries depends on the agricultural transition, even if the process resulting from the industrial revolution leading to a transfer of assets from agriculture to other sectors seems difficult.

However, a look at the evolution of the primary sector of the economy throughout human society reveals that the infusion of financial and human resources, innovation and development can lead to an evolution of the sector.

Thus, innovations in certain agricultural sectors have led to increased productivity, which has not only made it possible to increase profits and therefore wages, but has also helped to reduce the price of agricultural goods. The increase in profits and salaries in this sector has generated an increase in demand attributed to the whole economy and thus created new jobs in other sectors of the economy.

According to Eurostat [2], production in Agriculture, Forestry and Fisheries in the EU-28 has evolved in the last 10 years: it decreased in 2010 by 3.9% and in 2012 by 5.5%; after increasing by 3.8% in 2013 and 6.1% in 2014, production in agriculture, forestry and fishing decreased by 0.9% in 2015 and again in 2016 before returning to an upward trend in 2017 (increase of 2.1%) and in 2018 (increase of 0.6%).

The current context of the pandemic crisis is an opportunity for all countries in the world to find effective ways to recover the agricultural sector, which will help improve the socio-economic situation of the world, overcoming the constraints of the past and those created by the current crisis. The current situation is a major turning point in the development of human society, and the reservoir of agricultural labour can be used as fuel for sustainable economic growth.

MATERIALS AND METHODS

The proposed analysis will use data published by Eurostat on labour market information for agriculture in the context of increasing agricultural production.

Table 1. Employees in agricultural labour in European Union (1,000 annual work units)

Years	Number of employees (salaried)
2011	9,803.99
2012	9,760.55
2013	9,655.40
2014	9,469.56
2015	9,303.02
2016	9,240.82
2017	9,104.88
2018	8,931.49
2019	8,737.83
2020	8,482.82

Source: Eurostat, Agriculture labor input statistics: absolute figures (1,000 annual work units), https://ec.europa.eu/eurostat/databrowser/view/aact_ali01/default/table?lang=en, Accessed on 19.02.2021 [2].

The information's about the number of employees in agriculture in absolute value (1,000 annual work units) are presented in Table 1.

Figure 1 presents the evolution of the number of employees in agriculture.

People working in agriculture accounted for about 4.2 % of total employment in the EU in 2016, corresponding to 9.7 million persons. In some countries in European Union are a lot of employees in agriculture.

In Romania, agriculture is one of the largest employers and represents only less than one in four people (23.0%) employed in the country. In Bulgaria, 17.5% of all jobs are in agriculture, Greece is in agriculture 10.7% of total jobs and Poland is 10.1%. [2, 7].

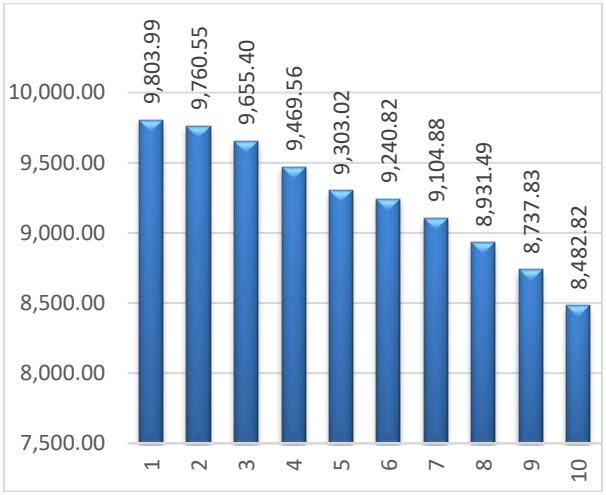

Fig. 1. Evolution of the number of employees in agriculture in European Union (1000 annual work units)

Source: Own design based on the data from Table 1.

In agriculture there are many more people involved in the activity of farms without being employed by them. Thus, the labour force in agriculture in the European Union is much higher, in the context in which for many of these people, working on the farm was only a minor activity.

Between 2005 and 2019, the employment rate for the total population with age between 20-64 has increased by 6.3 percentage points (p.p.) in the EU-27, from 66.8 % to 73.1 %. Countries have experienced very different labour market situations over the past years, so the employment rate has increased in the aforementioned period in all countries except Greece (-3.2 p.p.).

The largest increases are observed in Malta (19.8 p.p.: from 57.4 % to 77.2 %) and in Poland (14.7 p.p.: from 58.3 % to 73.0 %).

Table 2. Total employment in European Union (Thousand persons)

Years	Number of employees in Europe
2011	180,421
2012	179,695
2013	178,936
2014	180,407
2015	182,248
2016	184,812
2017	187,336
2018	189,298
2019	190,921

Source: Eurostat, Employment and activity by sex and age- annual data, https://ec.europa.eu/eurostat/databrowser/view/lfsi_emp_a/default/table?lang=en, Accessed on 19.02.2021 [3].

The information's about the total employment in European economy (salaried) are presented in Table 2 and Fig. 2.

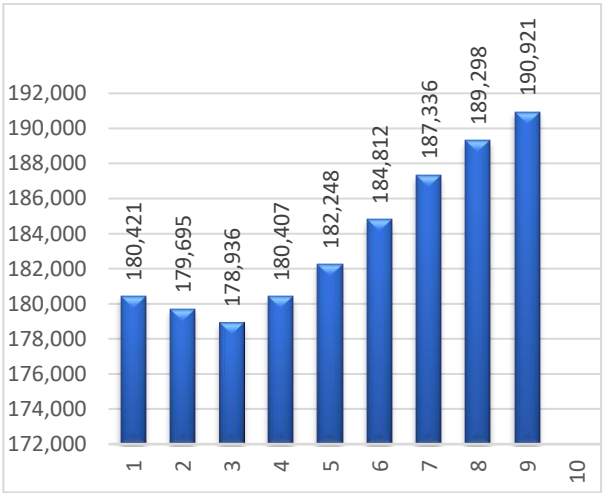

Fig. 2. Evolution of total employees in European Union (Thousand persons)

Source: Own design based on the data from Table 2.

It can be seen that the number of people permanently employed in agriculture is small compared to the total number of employees in the European Union. This fact is also due to the fact that agriculture uses a lot of work of seasonal workers, people who have other jobs. In the present analysis it is wanted to create a discussion regarding the need to make

investments in the field of agriculture, which will create jobs and implicitly economic growth.

The following mathematical algorithm was used to perform a comparative analysis of jobs in agriculture and the total number of jobs.

The mathematical algorithm used has the following structure [4]:

One method of estimating a dimension is that of the estimation using confidence intervals. More often than not, indicating an isolated (punctual) estimated value cannot be satisfactory without referring to the variation domain and to the corresponding probability. Since the sample estimators are random variables, one of the most important issues that arises consists in expressing the estimate accuracy or the estimate probability. However, the value of the P probability covers a certain interval (x_1, x_2) according to the relation:

$$P = Prob(x_1 < X < x_2) = \int_{x_1}^{x_2} f(x)dx \qquad (1)$$

to which the respective parameter belongs. In this way, a certain interval is established, called a confidence interval, has the property of containing the true value of the respective dimension with the P probability. Let a_0 be the true value of a characteristic for which a punctual estimate $\hat{a}$ is obtained through sampling experiments. We consider that the deviation $|\hat{a} - a_0|$ is lower than a ε value with a very high β probability (0.90, 0.95 or 0.99):

$$P(|\hat{a} - a_0| < \varepsilon) = \beta \qquad (2)$$

or

$$P(\hat{a} - \varepsilon < a_0 < \hat{a} - \varepsilon) = \beta = 1 - \alpha \qquad (3)$$

The punctual value $\hat{a}$ is calculated based on a sample and it defines the limits of the confidence interval: $a_1 = \hat{a} - \varepsilon$ and $a_2 = \hat{a} + \varepsilon$. Considering the risks for the lower part α_i and the upper part α_s to be unequal, the interval limits are defined by the relations $P(a_0 > a_2) = \alpha_s$ and $P(a_0 > a_1) = \alpha_i$, with the significance level $\alpha = \alpha_i + \alpha_s$.

In order to analyse the confidence interval for the values presented above in Table 1, the confidence interval will be analysed for the theoretical mean μ of a characteristic with normal distribution, where the dispersion σ is known.

The necessary stages are the following:

-We take a population to be analysed with an X characteristic having a normal distribution $N(\mu, \sigma^2)$.

-A volume sample *n* is extracted from this population. Let us estimate the μ mean with a 95% confidence interval with symmetrical bilateral risk. The significance level is α=0.05.

-We know that the sample mean $\bar{x}$ has a normal distribution $N(\mu, \sigma^2/n)$.

-Since the μ parameter is unknown, a confidence interval will be built for this dimension, its (-*z*, *z*) limits being established with the help of the Laplace distribution.

We know that the random variable:

$$z = \frac{\mu - \bar{x}}{\sigma / \sqrt{n}} \qquad (4)$$

has a normal distribution *N*(0,1).

-According to the distribution table, the 95% probability is defined as the (-1.96; +1.96) interval.

In this way we obtain the confidence interval with the P probability $P(-1.96 < z < 1.96) = 0.95$

Starting from this relation, we can write the double inequality:

$$-1.96 < \frac{\mu - \bar{x}}{\sigma / \sqrt{n}} < 1.96 \qquad (5)$$

which leads us to the interval limits:

$$\bar{x} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 1.96\frac{\sigma}{\sqrt{n}} \qquad (6)$$

The 95% confidence interval has thus been built for μ. The result can also be expressed as:

$$\mu = \bar{x} \pm 1.96\frac{\sigma}{\sqrt{n}} \qquad (7)$$

x

the interval being symmetrical in relation to the $\bar{x}$ value.

The results were illustrated in tables and graphics, being accompanied by comments and finally the main conclusions have been drawn.

RESULTS AND DISCUSSIONS

From the information extracted from Eurostat it can be seen that there is an insignificant evolution of the number of people employed in agriculture. In order to apply the previously described methodology, the main indicators must be calculated.

Table 3 shows the results of the average and the dispersion corresponding to the values of the number of employees in agriculture, employed with an employment contract for an indefinite period. Excluded from this category are non-employees, seasonal employees, part-time employees, family members of farmers who offer help on the farm.

It should be mentioned that the number of people involved in agriculture is much higher than that of employees. In this article we want to analyze only the number of employees because we aim to show the impact that agriculture can have on employability and economic growth if sustainable investments have been made. Taking into account the previously presented baseline values, the confidence interval that can be calculated for μ is 95 %.

Table 3. Mean and dispersion values for number of employees in agriculture

Indicators	$\bar{x}$	σ
Indicators for the number of employees in agriculture	9,249.04	129,923.60
Indicators for the number of employees in European Union	183,786	

Source: Own design based on the data from Tables 1 and 2.

Table 4 Confidence interval for the number of employees in agriculture

$2746{,}08 < \mu < 14219{,}56$

Source: Own design based on the data from Table 1.

The theory of surplus based on the work of Arthur Lewis (1954), inspired by classical political economy, is a viable model of growth. According to the theory, in the model of economic development, wages in the modern capitalist sector are not determined by labour productivity, but by its opportunity costs.

As the agricultural sector develops, the share of agricultural production in national income and wealth creation increases. Once the surplus labour in rural areas is consumed, wages rise, at which point the economy moves from a dual economy to an integrated economy. Obviously, with the increase of labour productivity in agriculture, wages will also increase, in accordance with conventional growth models, which will lead, especially, to improving the socio-economic life of human resources in rural areas.

Due to the specific situation in the context of the agricultural the most important resources are human resources and time, both imposing serious constraints on the work.

It can be seen that the labour force engaged in agriculture has a small fluctuation. The reference range retains this feature. It is also observed that the labour force employed in agriculture does not have a very big impact on employability at European level.

Compared to other economic sectors, it is extremely difficult to know how many people are employed in agriculture. This is also due to the approach taken by many farmers and agricultural workers who pursue agriculture as a part-time activity or that many farms are managed within the family and family members offer farm help at different times of the year, but not in lastly, due to the fact that in agriculture there are seasonal peaks in work and the employees are only involved in the activity for these periods.

In the European Union, the number of farms has decreased steadily in recent years, which has led to a decrease in the number of farmers and employees. Thus, the share of people employed in agriculture in 2016 was 4.4% lower than in 2005 when the share was 5.7% of total jobs in the EU.

According to Eurostat [2] the agricultural workforce in the European Union decreased

by 9.5 million people between 2005 and 2016. This decrease was a reduction of almost a third (-31.7%). Also in the period 2005-2016, the volume of labor in agriculture carried out by the labor force of the European Union decreased by 3.3 million UU, which represents a decrease of a quarter (-25.7%). Three-quarters (71.1%) of this steady decline in the agricultural workforce occurred in the Member States that joined the EU after May 2004. The hardest hit states were: (1.0 million AWU), Poland (0 , 6 million AWU) and Bulgaria (0.4 million AWU).

CONCLUSIONS

Agricultural production has been affected by declining labour. The research brings to the attention of political factors the importance of agriculture in the development process of countries. The evolution of number of employees in agriculture are low. This means that that it is necessary to realize public policies in agriculture can make a difference, leading every country to economic prosperity. In order to increase the role of agriculture in European Union, it is imperative, starting to develop a development strategy in this field. It would be useful to research the share of innovation in agriculture.

The results of this study can then be materialized in strategic directions of development of every country, in the hope of moving to another level of development.

In the context in which agriculture is the basis for the horizontal development of other industries (such as the food industry) it is necessary to carry out an investment program and research programs in the agricultural field. These actions will lead to an increase in the number of employees in agriculture. In the context of the Covid 19 pandemic, when many people have lost their jobs, agriculture can be a solution in terms of reducing unemployment.

As such, it must identify its comparative advantage, to continue structural reforms and to implement a model of economic development based on Lewis's theory, on investments and innovations, which will generate the increase of labour productivity. Of course, agriculture was the first human activity and this allowed the industrial revolution; agriculture is also the guarantor of food security. But applying Lewis's model of development, that is, for the least developed and developing countries to achieve significant and sustainable levels of growth, governments must strive to increase agricultural productivity while stimulating capital accumulation in all countries and in the other sectors of the economy.

REFERENCES

[1]Crowder, D. W., Reganold, P., 2015, Financial competitiveness of organic agriculture on a global scale, PNAS, 112 (24): 7611-7616

[2]Eurostat, Agriculture labor input statistics: absolute figures (1,000 annual work units), https://ec.europa.eu/eurostat/databrowser/view/aact_ali01/default/table?lang=en, Accessed on 19.02.2021.

[3]Eurostat, Employment and activity by sex and age-annual data, https://ec.europa.eu/eurostat/databrowser/view/lfsi_emp_a/default/table?lang=en, Accessed on 19.02.2021.

[4]Ifrim, A., M., Mathematical tools in quality engineering – Application in project management - LAP LAMBERT Academic Publishing, Saarbrücken, Germany, 2016.

[4]Iorga, A.M., 2017, Characteristics of the Romanian agriculture workforce, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17(2), 183-186.

[5]Macau, I., Micu, A.R., Tudor, V., 2013, Considerations regarding organic agriculture in Romania, Scientific papers, Agronomy, Ion lonescu de la Brad House Publishing, U.S.A.M.V laşi, Vol. 56(1), 131-134.

[6]Ministry of Agriculture and Rural Development, Interim evaluation and revision of the National Strategy for Agricultural and Rural Development for the years 2014-2020, February 28, 2018, Government Decision no. 409, of 04-06-2014, regarding the approval of the National Strategy for agricultural and rural development for the years 2014-2020, Report on the implementation of the National Development Strategy agricultural and rural areas for the years 2014-2020, 2016.

[7]Ministry of Public Works and Administration, https://www.madr.ro/agricultura.html, Accessed on 19.02.2021

[8]Smedescu, D., Fintineru, A., Tudor, V., Carbarau, C., Vasile-Tudor, B., 2018, The development of trade with wheat at the global level, 36th International Scientific Conference on Economic and Social Development – "Building Resilient Society", pp. 488-495, 2018

[9]Tudor, V., Alecu, I.N., 2013, Management of production, Ceres Publishing House, p. 58.
[10]Vaut, S., Dahm, J., Dauderstädt, M., Franz P., Gombert, T., Gurgsdies, E., Krell, C., Mayer, F., Pascha, W., Schroeder W., Tidow, S., Weinkopf, C., 2009, Economics and Social Democracy, Friedrich - Ebert-Stiftung, Department of Political Academy, Bonn, p. 21.