

Baciu, Ionuț Cristian; Iftimoaei, Ciprian Constantin

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## Statistical analysis of the socio-demographic and economic characteristics of rural areas in Romania after Eu accession

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# STATISTICAL ANALYSIS OF THE SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF RURAL AREAS IN ROMANIA AFTER EU ACCESSION

CIPRIAN IFTIMOAEI<sup>1</sup>, IONUȚ CRISTIAN BACIU<sup>2</sup>

**Abstract:** *Today's socio-economic development leads to a dilution of the "border" between rural and urban areas, especially if we look at economically developed economies, members of the OECD and/or the most powerful economies in the world united in the G7. Technology and computerization of agriculture and related industries, urban-like living spaces, reducing disparities in quality of life between urban and urban have generated a lot of controversy around the concept of "rural space". In Romania, more than half of the population lives in rural areas above the EU average. The contribution of agriculture to GDP formation is only 4%, while the employed population in this sector is 25%. Romanian agriculture remains predominantly subsistence and large agricultural holdings administer the majority of agricultural land. External migration and migration to the urban environment have led to an aging population in rural areas. Rural areas well connected to utilities and transport infrastructure has a much greater chance of economic development. The proximity of rural settlements with large urban agglomerations is also an extra chance for rural development. Statistical analysis of the socio-demographic and economic characteristics of the Romanian rural area after the accession to the EU (2007-2017), based on the data provided by the National Institute of Statistics and EUROSTAT, complemented by a SWOT analysis will highlight recent trends and prospects on short-term rural development from a human resource perspective.*

**Keywords:** *statistical analysis, rural space, rural development, agriculture*

**JEL Classification:** C10

## INTRODUCTION

Due to the broad use of the concept of rural space and to achieve the comparability of data at European level, three types of regions have been established at Union level since 2010 based on a population grid and total population analysis: predominantly rural regions (rural population is over 50%), intermediate regions (20% to 50% of rural population) and predominantly urban areas (the rural population is below 20%). If a region is originally classified as predominantly rural, but it also includes a city with more than 200,000 inhabitants, whose share in the total regional population represents 25% of the total, then it becomes an intermediate region. Also, if an intermediate region includes a city with more than 500,000 inhabitants, which gives over 25% of the total population of the region, then it becomes a predominantly urban region.<sup>3</sup> According to this methodology, 53.8% of the Romanian population lives in predominantly rural areas, 33.1% in intermediate regions and 13.1% in predominantly urban areas. In other specialized papers (Kerekes, 2010), the rural economy and social area is divided into the following categories: peri-urban rural space (includes the area around the big cities, being a very dynamic area), intermediate rural space (the economic structure is dominated by agricultural activities) and peripheral rural space.

From an administrative point of view, Romania's territory is organized at NUTS 5 level in 320 localities (of which 103 municipalities - the most important cities) forming the urban area and 2,861 communes, which constitute the rural area, according to Law 350/2001 on Territorial Settlement and Urbanism and Law 351/2001 regarding the approval of the National Plan for Territorial Arrangement. In most of them, the communes are made up of several villages (with a total of 12,957 villages), which do not have administrative responsibilities. Cities and communes are grouped in counties (NUTS3 level), which have administrative functions. At present, the 42 counties are grouped in 8 development regions (NUTS2), which do not have administrative functions, with statistical and geographic functions only.

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<sup>1</sup> PhD., Deputy Executive Director, Iasi County Directorate of Statistics/Associate Lecturer, "Al. I. Cuza" University of Iasi, Faculty of Philosophy and Social-Political Sciences, [Ciprian.Iftimoaei@iasi.insse.ro](mailto:Ciprian.Iftimoaei@iasi.insse.ro).

<sup>2</sup> PhD., Economic Statistics Office of Iasi County Directorate of Statistics, [ionut.baciu@iasi.insse.ro](mailto:ionut.baciu@iasi.insse.ro).

<sup>3</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Urban\\_rural\\_typology](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Urban_rural_typology).

## MATERIAL AND METHODS

In this study, we will make the forecast the evolution of the employment rate of the Romanian population in the agricultural sector through the autoregressive-moving-average processes (ARMA). Autoregressive patterns (AR) are characterized by the fact that the value of the variable  $Y$  at a time  $t$  depends on the previous values of the variable. A moving average process is a linear combination of residual terms.

The general formula of an autoregressive-medium moving model (ARMA) is the following:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \dots + \beta_p Y_{t-p} + \varepsilon_t + \alpha_1 \varepsilon_{t-1} + \dots + \alpha_q \varepsilon_{t-q},$$

where:  $p$  is the order of the autoregressive part,  $q$  is the order of the moving average and represents the term error.

The values of the analyzed variable (population occupancy rate in agriculture -%) are influenced by the last evolution of the phenomenon (the autoregressive component), and the shocks produced on the variable are quantified by the average mobile component. The data used are recorded annually for the 2007-2017 period, taken from the EUROSTAT database. The necessary steps for estimating an ARMA model are (Jemna, 2012): identifying the model type, estimating and testing the parameters, and making predictions based on the chosen model.

## RESULTS AND DISCUSSIONS

Romania is distinguished from other EU Member States by the high share of the employed population in agriculture. According to Table 1, in 2017, 22.9% of the employed population was in the agricultural sector, compared to the EU average of 5%.

Table 1. The employment rate of the population in the agricultural sector (% of the total employed population) in the countries of the European Union and the share of agriculture in the Gross Domestic Product (% of GDP) in the countries of the European Union

Țara	Year 2007		Year 2017	
	Employment Rate	Share in GDP	Employment Rate	Share in GDP
UK	1.4	0.6	1.1	0.5
Germany	2.3	0.7	1.3	0.6
Belgium	1.9	0.9	1.3	0.6
Estonia	4.8	3.0	3.9	2.5
Ireland	5.5	1.0	5.4	0.9
Greece	11.3	3	12.1	3.5
Cyprus	4.4	2	3.5	1.8
Latvia	10.2	3.3	7.5	3.4
Luxembourg	1.8	0.4	1	0.3
Netherlands	3.0	1.8	2.2	1.9
Austria	5.5	1.4	4.3	1.1
Malta	1.8	1.7	1.3	1.1
Slovenia	9.9	1.9	4.9	1.8
Croatia	12.4	4.1	7.5	3.3
Denmark	3.0	1.2	2.6	1.1
Lithuania	11.3	3.5	7.8	3.1
Sweden	2.2	1.4	1.9	1.1
France	3.5	1.6	2.9	1.5
Italy	4.0	1.9	3.9	1.9
Finland	4.5	2.4	3.9	2.3
Spain	4.5	2.4	4.1	2.6
UK	4.6	3.4	5.0	3.3
Germany	7.5	4.6	6.3	3.7
Belgium	11.8	2.0	6.8	1.9
Estonia	14.7	3.0	10.6	1.7
Ireland	4.2	3.6	2.9	3.3

Greece	3.6	2.0	2.9	2.2
Cyprus	29.5	5.4	22.9	4.4

Source: <http://databank.worldbank.org/data/reports.aspx?source=2&Topic=1>

Even if there is a decrease of the employed population in agriculture compared to 2007, Romania is at a considerable distance from Greece and Poland, the following ranked countries. Although the employed population in agriculture has a high share, the contribution of the agricultural sector to GDP formation is low for Romania (4.4% in 2017). The explanation is that the agriculture practiced in Romania is subsistence, determined by the faulty use of production factors, the lack of involvement of the decision makers, the technically overbuilt infrastructure. Also, a high percentage (about 85%) of the agricultural labour force is non-salaried (working on the farms). Countries with a higher number of agricultural workers (Spain, Germany, France) also get the best return on agricultural production.

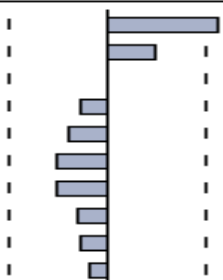
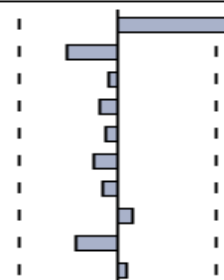
In the first quarter of 2007, according to the International Labour Office (ILO), the unemployment rate was at national level of 7.2%, in the urban area of 8.2%, and in the urinary environment by 5.9%. Unemployment in Romania declined significantly, so that in the first quarter of 2018 the unemployment rate according to ILO at the national level was 4.7%, in the urban area of 4.1% and in the rural area by 5.3%. The decrease of the unemployment is explained by the upward trend in economic growth in 2012 and the increased demand for labour.

In order to forecast the evolution of employment rate in agricultural sector, through autoregressive and medium moving processes, we need to identify the type of econometric model that we will estimate. Correlograms of autocorrelation and partial autocorrelation provide information about the evolution of the time series.

Table 2. Autocorrelation and partial autocorrelation functions of the population occupancy rate in the agricultural sector

Sample: 2007 2020

Included observations: 11

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
		1 0.669	0.669	6.4076	0.011
		2 0.280	-0.305	7.6514	0.022
		3 0.008	-0.065	7.6525	0.054
		4 -0.162	-0.110	8.1856	0.085
		5 -0.245	-0.081	9.6107	0.087
		6 -0.296	-0.142	12.114	0.059
		7 -0.302	-0.083	15.380	0.031
		8 -0.185	0.091	17.005	0.030
		9 -0.160	-0.257	18.825	0.027
		10 -0.108	0.057	20.507	0.025

Source: E-views processing

According to Table 2, the autocorrelation function decreases abruptly to zero after the third term, anticipating an MA(3) process, and the value of the partial autocorrelation function drops to zero after the first term, indicating an AR( 1) process. Based on the results obtained in the previous stage, we consider for our analysis several autoregressive and medium moving models. Using the Akaike, Schwarz, Hannan-Quinn information criteria, the model is chosen with minimal values.

Table 3. Values of the information criteria

	R <sup>2</sup>	AIC	Schwarz	Hannan-Quinn
ARMA (1,1)	0.75	3.99	4.08	3.89
ARMA(1,2)	0.75	3.99	4.08	3.89
ARMA(2,1)	0.77	4.09	4.16	3.95
<b>ARMA (1,3)</b>	<b>0.9</b>	<b>3.05</b>	<b>3.14</b>	<b>2.95</b>

Source: E-views processing

According to the value of the information criteria and the determination ratio, we will choose the ARMA model (1,3). The order of the autoregressive component is  $p = 1$ , and the order of the moving average component is  $q = 3$ .

Table 4. ARMA Model Estimate (1,3)

Sample (adjusted): 2008 2017  
Included observations: 10 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4453.615	3251307.	0.001370	0.9989
AR(1)	1.000266	0.195137	5.125966	0.0014
MA(3)	-0.964320	0.130779	-7.373674	0.0002
R-squared	0.905452	Mean dependent var		27.70000
Adjusted R-squared	0.878438	S.D. dependent var		2.827248
S.E. of regression	0.985742	Akaike info criterion		3.052481
Sum squared resid	6.801815	Schwarz criterion		3.143257
Log likelihood	-12.26241	Hannan-Quinn criter.		2.952901
F-statistic	33.51806	Durbin-Watson stat		2.262860
Prob(F-statistic)	0.000260			

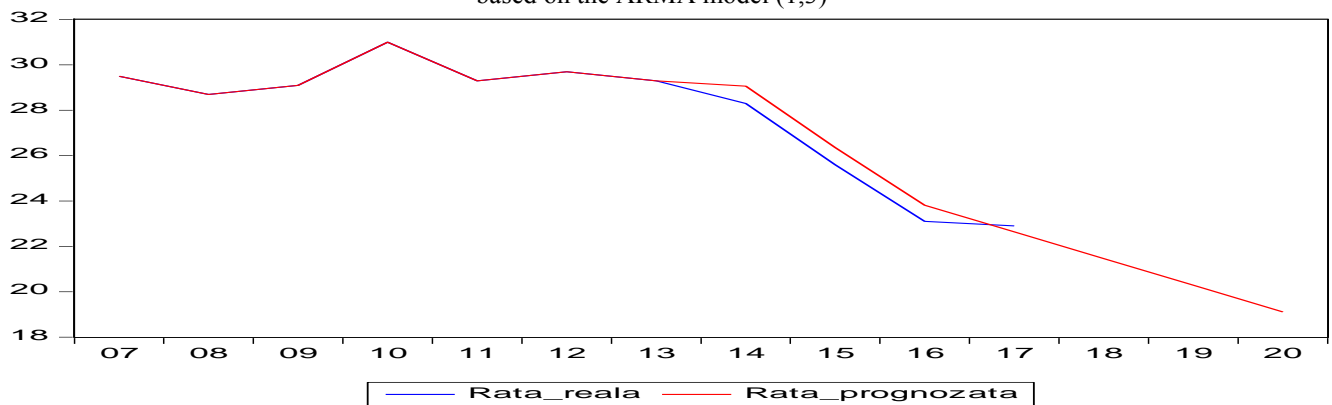
Source: E-views processing

The equation of the model is as follows:

$$Y_t = Y_{t-1} + \varepsilon_t - 0.964\varepsilon_{t-3}$$

According to Table 4, the coefficients of the model are significantly different from zero (the probability of the t-Student test is less than the significance threshold of 0.05). The constant term of model (C) was not included in the equation because it is not statistically significant. Based on the chosen model, we have made the forecast of the occupancy rate of the population in agriculture in Romania for the period 2018-2020.

Figure 1. The forecast of the evolution of the employment rate in agricultural sector for the period 2018-2020 based on the ARMA model (1,3)



Source: E-views processing

Figure 1 shows that the evolution of the agricultural employment rate in Romania for the period 2018-2020 will continue to decrease, reaching the projected value of 19.1% in 2020. The main limit of the ARMA models is the non-inclusion of the influence of the other factors determinants of the phenomenon analyzed. The prognosis of the time series is based only on the previous values of the studied variable.

In a modern economy that wants to align with EU standards, certain strategies need to be implemented by which part of the population working in agriculture is relocated to the industrial and services sector where there is a deficit and the contribution of these sectors to growth in the current context is significant. In Romania, after joining the EU, the share of those working in the services sector had an upward trend, reaching 46.3% in 2017 (the European average being 73.9%).

As far as the industry sector is concerned, the share of persons working in this field is 29.9% in 2017 in Romania, compared to the EU average of 21.6%. This gap is explained by the fact that in our country the labor cost is lower compared to the other EU member states.

The rural environment in Romania faces important socio-economic imbalances, many of which are consequences of the overall situation in the whole country. Rural areas have a considerable gap with urban areas in terms of economic development and social welfare. In Romania, the prosperity is polarized around the big cities of the country (Bucharest, Cluj-Napoca, Timisoara, Iasi, Constanta, Oradea, Sibiu, etc.) and their metropolitan areas.

Romania is characterized by a high percentage of the rural population (about 46%) compared to other EU countries (the EU average is 28.5%). At the time of Romania's accession to the EU on 1 January 2007, the resident (stable) population of the country was 21130503 inhabitants, of which 9413931 resided in rural areas, representing 44.56%. After more than a decade of European integration, on 1 January 2018, the country's stable population dropped to 19523621, of which 9025562 were resident in the countryside, accounting for 46.23%. Compared to 2007, the stable rural population declined by 4.12%, amid the intensification of external migration, rural-urban migration and declining fertility. These factors also led to an increase in the aging of the rural population, relative to the urban population (Rotariu, 2012). On 1 January 2007, the stable rural population (65 years and over) in the rural area represented 18.64% of the total rural population, and on 1 January 2018 the rural population increased to 20.25% of the total rural population. We therefore see an increase in demographic aging in rural Romania – an irreversible trend that will severely affect all social and economic aspects of rural communities.

The main factors of the negative demographic trend in rural areas are external migration and negative natural growth (Rotariu, 2010). By age category, as compared to 2007, 0-14 year old rural population declined by 13.8% (from 1751786 in 2007 to 1509417 in 2017). Instead, the over 65 age group had a 2.38% upward trend (from 1780912 in 2007 to 1823470 in 2017).

The rate of natural growth - a demographic indicator that measures the algebraic difference between live-birth rate and the mortality rate of the population - was in 2007 at national level of -1.7 ‰, in urban by +0.2 ‰ and in rural area by -4 ‰. At the level of 2018, the natural growth rate evolved to "negative", being -3.1 ‰ at national level, -1.5 ‰ in the urban area and -5.2 ‰ in rural areas. In other words, at 2018, in rural areas, the rate of natural growth is negative, with 5.2 more deaths than births per thousand inhabitants.

The survey on the quality of life carried out by the National Institute of Statistics (NIS) shows that the share of rural households that in 2007 could not have made some expenditure on time was 22.4%, and in 2016, the share of rural households with the same problem increased 35.3%, which means a worsening of the financial situation of the population in this rural areas. According to the same NIS survey, in the last decade (since Romania's accession to the EU) the situation current expenditures of the rural households is declining in terms of welfare.

Table 5. The structure of households by the ability to make ends meet in rural area

The ability to make ends meet	Year 2007	Year 2016
With high difficulty	25.3%	19.2%
With difficulty	29.1%	29%
With some difficulty	33.5%	40.4%
Rather easily	8.3%	8.8%
Easily	3.3%	1.9%
Very easily	0.5%	0.7%

Source: National Institute of Statistics - TEMPO, Households Living Conditions Survey

As can be seen from Table 6, in the year 2017, 109,403 Romanians (a rate of 7 per 1000 place) moved from the city to the rural area while only 87097 people (a rate of 11.3 per 1000 place) migrated from rural to urban. This aspect of increasing the share of those who leave the city to the village has positive consequences only if these people go and invest in rural areas. Otherwise, we

can not talk about economic development of the rural environment through migration from the city to the village.

Table 6. The internal migration flow from Romania during 2007-2017

<b>Internal Migration Flow</b>	<b>From rural to urban</b>		<b>From urban to rural</b>	
<b>Year</b>	<b>Number of people</b>	<b>Rates per 1000 inhabitants</b>	<b>Number of people</b>	<b>Rates per 1000 inhabitants</b>
2007	80235	6.3	118237	12.1
2008	78671	6.2	124828	12.8
2009	70246	5.5	96513	9.9
2010	96201	7.5	133052	13.7
2011	66784	5.3	97013	10
2012	74470	5.9	118383	12.2
2013	74023	5.9	102710	10.6
2014	78411	6.2	110658	11.4
2015	77878	6.2	106647	11
2016	82612	6.6	120950	12.5
2017	87097	7	109403	11.3

Source: National Institute of Statistics, [www.insse.ro](http://www.insse.ro)

A population category, the elderly, prefers to change their residence in the countryside, because daily spending is lower, enjoys an environmentally and naturally enhanced comfort compared to large urban agglomerations. The higher the number of people migrating from the city to the village is explained by the massive departure of the rural population abroad, to the detriment of accepting a job in the city in Romania (thus reducing the potential of migration from rural to urban). Another important aspect is that urban / rural migration is mostly done to rural areas close to big cities with high economic potential. Thus, peri-urban areas have developed, where the population has experienced significant growth.

Compared to the EU-28 average, the contribution of agriculture to GDP formation is higher in Romania, as most of the economies were based on industrial growth driven by the industrial sector. Productivity in the agricultural sector in Romania is very low (20%), compared to the EU average (36%). The poor yield of agricultural production is caused by several factors, among which<sup>4</sup>:

- fragmentation of agricultural holdings (92% of holdings are under 5 ha) and large share of those without legal personality; this leads to difficulties in accessing internal or external financing lines, hinders the development of farms, the introduction of new technologies;
- low level of agricultural labour training, most workers have a low level of training, incomplete to perform in the agricultural field;
- Deficient, expensive irrigation system; agriculture in Romania is dependent on weather conditions, influencing farmers' incomes;
- low level of capitalization of agricultural holdings due to fragmentation of farms and poor technological facilities. According to the survey, the average capital invested per hectare is 858 euro / ha, below Poland, Hungary;
- increasing tax evasion in the agricultural sector, both in terms of black work and trade in unprocessed agricultural products.
- lack of cooperation between farmers.

In intermediate rural areas, infrastructure remains poor; population is declining due to external migration. In the long run, it is difficult to predict the dynamics of migratory flows on residence areas, as there are many factors of influence both nationally and internationally. Also, the

<sup>4</sup> \*\*\* (2017). *Potential of Agricultural Sector Development in Romania*, PricewaterhouseCoopers Report.



survey of the INS-TEMPO database shows that the labour force in agriculture was 3460 annual work units (UAM) in 1998, then dropped to 2205 AMU in 2007, and in 2017 it was 1601 UAM.<sup>5</sup>

The SWOT analysis method is often used as a starting point for preparing rural development strategies. A feature of this analysis is the study of the influence of the internal and external environment, with the relief of both positive factors and negative factors.

Table 7. The SWOT matrix of the rural environment in Romania

<p><b>Strong points:</b></p> <ul style="list-style-type: none"> <li>- the existence of a very complex and valuable cultural and immaterial cultural patrimony;</li> <li>- a rich array of traditional activities and local produce made by the rural population;</li> <li>- extension of utility networks in rural areas: water - sewage - gas.</li> </ul> <p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>- aging rural population, negative demographic trend;</li> <li>- increasing the external migration of the labour force;</li> <li>- increasing the phenomenon of school dropout;</li> <li>- low income per household;</li> <li>- poor rural infrastructure;</li> <li>- a large proportion of the population is at risk of poverty;</li> <li>- lack of financing to combat the degradation of historical monuments and settlements of cultural value.</li> </ul>	<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>- aging rural population, negative demographic trend;</li> <li>- increasing the external migration of the labour force;</li> <li>- increasing the phenomenon of school dropout;</li> <li>- low income per household;</li> <li>- poor rural infrastructure;</li> <li>- a large proportion of the population is at risk of poverty;</li> <li>- lack of financing to combat the degradation of historical monuments and settlements of cultural value.</li> </ul>
<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>- support for rural development through national and European funding programs: transport infrastructure, public services, educational-cultural-social infrastructure;</li> <li>- projects funded through the Local Action Groups;</li> <li>- accessing services for the elaboration and implementation of European funded projects provided by companies with expertise in the field of European funds.</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>- trend of decrease of active population in rural areas;</li> <li>- demotivation, lack of initiative, inability to work for productive activities;</li> <li>- limited financial resources for the development of rural projects;</li> <li>- altering traditions;</li> <li>- the manifestation of negative phenomena in local communities: alcoholism, domestic violence, dependence on social aid etc.</li> </ul>

According to the demographer Vasile Ghețau (2018), the structure of the employed population in our country is characteristic of a developing country, with a considerable segment of the employed population in agriculture - 23%, compared to only 4% in the employed population of EU28 and 2.6% the population of the 15 more developed countries that comprised the EU15 before the 2004 enlargement. And in the secondary sector we have a higher proportion than in the EU28, and the synthesis of the country's employment and development is mirrored by the proportion of the population employed in services 47%, compared with 72% in the EU27 occupied population and 75% in the EU15 countries. At present, the rural population is 2164500, out of which 301700 are employed and 1862800 are self-employed. NIS data shows that labour productivity in the primary sector (agriculture and related branches) was of 8.8 RON/ hour at the level of 2015, while the labour productivity per total economic branches was 41.2 RON/ hour. At the level of the same reference year, labour productivity in the construction sector was 35.1 RON/ hour, and IT&C was 113.6 RON/ hour. These data demonstrate that agriculture is not an attractive area for young people and other working age categories, which are likely to migrate to the city or go abroad to work.

## CONCLUSIONS

Modernization and technology of farms, diversification of agricultural and food production, better management of agricultural holdings would increase the competitiveness of the

<sup>5</sup> According to the National Institute of Statistics, the volume of labor force in agriculture, expressed in thousands of annual labor units (UAM) represents the ratio between the total number of days worked by the employees and non-employees in the branch of agricultural activity, in one year, and the annual labor unit expressed in days. The annual work unit is the work carried out by a person in full-time equivalent to one year in agriculture (245 working days of 8 hours per day).



rural sector in Romania. Human resource is the central element for increasing the development of rural competitiveness. Priority needs are training courses and a good integration of research results. Also, creating new jobs, raising living standards, reducing poverty are major objectives that need to be met to diminish the disparities between rural and urban areas. Simplification of administrative procedures, greater involvement of rural population can lead to increased competitiveness in the field of agriculture and rural development in Romania.

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