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Improving agricultural performance for the working poverty reduction in the European Union

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Abstract: The main objective of the paper is to highlight the impact of agricultural performance on working poverty in the EU countries, in the 2008–2013 period, for identifying some measures that need to be taken to increase the agricultural performance so that the in-work poverty reduces. The comparative analysis shows that agricultural performance, according to the agricultural indicators analysed and the phenomenon of working poverty vary significantly across the EU countries. The correlation and regression analysis results suggest that the high level of employment in agriculture in some EU countries can be mainly explained by the small scale agriculture, a high share of subsistence holdings and a low agricultural labour productivity. The results of the multiple regression analysis highlight that working poverty at the EU level is influenced positively by the employment in agriculture, and is influenced negatively by the economic size farm and land productivity. Moreover, the results show large cross-country differences in terms of agricultural performance-working poverty link, fact which emphasizes the need to take specific actions to improve efficiency of the EU agricultural sector for reducing the working poverty. The findings of the study can be useful for the policymakers to formulate policies for a decent and productive employment within a sustainable development of agriculture.

Keywords: agricultural holdings, employment, in-work at-risk-of-poverty, labour and land productivity.

There is a widespread recognition that agriculture is an important sector for the economic development and poverty reduction in many countries. At the European Union (EU) level, the farming and food sectors together provide 7% of all jobs and generate 6% of the European gross domestic product, being the important elements of economy and society (EU 2014). The EU through the Common Agricultural Policy (CAP) mainly aims to increase the agricultural productivity and to provide a fair standard of living for the EU farmers (EU 2014).

The agriculture's ability to contribute to the development and lifting people out of poverty is conditioned by the improvements in productivity (WTO 2014). The ILO experts (ILO 2011) argue that the productivity growth is an essential ingredient for the sustainable poverty reduction, because the working poor do not suffer from a lack of employment, but rather from the low level of productivity of their work and their consequent low remuneration. Working poverty (or in-work poverty) is a complex concept which implies mixing two different dimensions, work and poverty (Herman 2014).

The EU Report (2012) underlines that, at the EU level, there are some concerns about the quality of many of the jobs that have been created over the recent years in terms of job insecurity and the relatively low levels of pay. Therefore, stronger links are needed between those policies which focus on the job creation and the ones which aim to reduce poverty. The recent crisis has had a negative impact on the quality of employment in most countries (ILO 2014) as the incidence of in-work poverty, informal work, job and wage polarization and income inequality has further increased. Moreover, the statistical data (Eurostat 2015) prove that, between 2008 and 2013, the in-work poverty rate increased in most of the EU countries, there being large differences between the member states. Behind these cross-country differences, there are specific factors that require specific measures (Herman, 2014).

Different researches (Andreß and Lohmann 2008; ILO 2012a; Lewandowski and Kaminska 2015) find a greater incidence of working poverty for those working in agriculture. Furthermore, working poverty is strongly linked to the vulnerable employment (own-account workers and unpaid family workers) who are usually engaged in subsistence agriculture. A high share of vulnerable employment in the total employment reflects a limited progress in the crea-

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tion of decent jobs (ILO 2011) and this represents a significant challenge for the economies in terms of creating a sufficient number of quality jobs. The high incidence of working poverty proves that "even if employment growth still represents the best way to avoid poverty risk it is not always enough" (Herman 2014). Therefore, actions are needed that can help to improve both the quantity and the quality of jobs in all sectors of the economy, especially in the agricultural sector.

In the light of these considerations, *the aim of this article* is to highlight the impact of agricultural performance on working poverty in the EU countries, in the 2008–2013 period, in order to identify some possible measures that need to be taken to increase the agricultural performance so that the in-work poverty reduces. In order to achieve this goal, *the following objectives* were set out: to investigate the link between employment in agriculture and in-work poverty; to explore agricultural performance and its implications on working poverty; to identify some possible actions for improving the effect of the EU agricultural sectors on reducing working poverty.

THE ROLE OF AGRICULTURE IN REDUCING POVERTY: A SHORT LITERATURE REVIEW AND RESEARCH HYPOTHESES

The incidence of working poverty (or in-work poverty) represents a significant challenge for the European economies and not only for them. Empirical studies point out the main determinants of working poverty: low earnings (Crettaz and Bonoli 2010), personal characteristics and professional status of the employed person (Fraser et al. 2011; Herman 2014), household structure of the worker (Pena-Casas and Latta 2004, Hellier and Chusseau 2013), different dysfunctions of the labour market (EU 2012; Herman and Georgescu 2012) and the welfare states regimes (Davoine et al. 2008). According to Palacios et al. (2009), the factors that explain working poverty are, generally, the same as those that explain the overall poverty and they can be divided "into three main complementary fields: individual and job characteristics, household characteristics and institutional countries characteristics".

Work in the agricultural sector is associated with a greater incidence of working poverty (Andreß and Lohmann 2008; Bodea and Herman 2014), especially in the EU countries where the own-account workers and unpaid family workers are predominant in agriculture (Zografakis and Karanikolas 2012; Lewandowski and Kaminska 2015) and who are engaged in the subsistence agriculture (Radu 2010). Stănculescu (2008) concludes that those self-employed in agriculture have the highest risk of being working poor. According to Lewandowski and Kaminska (2015), behind the high in-work poverty risk, there is a very high in-work poverty in agriculture and a modest in-work poverty in other sectors.

Our approach to agriculture is based on the premise that an efficient agricultural sector can contribute to working poverty reduction and implicitly reduce the overall poverty.

The agricultural sector can contribute to development in many ways, having a multifunctional role in the economy (OECD 2001), being "an inevitable activity for the human life" (Er and Özçelik 2014). Agriculture has the multiplier effects, being closely integrated with other sectors of the economy. First of all, agriculture is the sector which provides food supplies and raw material for other developing sectors, its output is provided to consumers and it generates the currency necessary for new industries through the export of agricultural products (Khorami and Pierof 2013). Secondly, agricultural holdings create demand for inputs for their farming activities (OECD 2009). Other researches (Bresciani and Valdes 2007; OECD 2010) show that more intensive agricultural activities often have higher multiplier effects on the regional economy, on income and employment. The WTO (2014) puts emphasis on the export of agricultural products as a fundamental ingredient in the recipe for agricultural success in the economic growth and alleviation of poverty, highlighting the fact that the development of high-value food export sectors can raise rural incomes and reduce poverty.

Agricultural growth contributes to both the aggregate growth and the overall poverty reduction through a direct effect as a sector of economic activity, and an indirect effect through growth linkages with the non-agriculture (de Janvry and Sadoulet 2010). Diao et al. (2007) state that agricultural growth has a strong poverty-reducing effect because it can generate both the agricultural and non-agricultural employment.

Christiaensen et al. (2010) and Byerlee et al. (2005) find that agriculture is significantly more effective in reducing poverty among the poorest of the poor because they live mostly in rural areas and earn their living in agriculture or the related activities. Other empirical studies (Christiaensen and Demery

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2007; Ravallion and Chen 2007; World Bank 2007) demonstrate that the agricultural income growth is more effective in reducing poverty than the growth in other sectors relying on the fact that there is a higher incidence of poverty in the agricultural and rural population than elsewhere and that most of the poor live in rural areas and most of them earn their living from agriculture (Cervantes-Godoy and Dewbre 2010).

Crucial ingredients of the poverty reduction represent increases in agricultural productivity (WTO 2014). According to Byerlee et al. (2009), the impact of agricultural productivity growth on the poverty reduction is the direct result of increasing farm incomes, but most of them are indirectly obtained through employment and food prices. According to Grabowski (2011) and Diao et al. (2010), the agricultural growth and productivity have a greater poverty reduction effect than the non-agricultural growth. De Janvry and Sadoulet (2010) analyse the effects of agricultural productivity on reducing poverty, pointing out that there is an inverse relationship between rising land productivity and reducing rural poverty. Furthermore, the authors point out that the labour productivity-poverty link can be quite different across countries depending on the production structure, being stronger if the smallholders participate to the gains in labour productivity and agriculture is labour intensive.

Productivity gains in agriculture represent the support for raising the incomes of those who work in agriculture, and consequently they can determine a reduction in working poverty. Intensifying the effect of agriculture on the reduction of working poverty, by increasing agricultural productivity, requires investing into the rural infrastructure and agricultural technology (Ravallion 2009), as well as the intensification of farming systems through yield-enhancing technologies (Diao et al. 2010). According to Špička and Machek (2015), the farming intensity is a key determinant of the technical efficiency in agriculture. Moreover, measures that stimulate the diversification of production toward a higher-value agriculture are needed, making the smallholder farming more competitive and sustainable, increasing the employment opportunities in the agricultural value chains and the rural nonfarm economy (de Janvry 2010; de Janvry and Sadoulet 2010; WTO 2014).

Based on the specialist literature and our empirical observations, the following *research hypotheses (H)* were formulated in relation to the objectives set:

H1: Employment in agriculture is higher in the EU countries with a small scale of agricultural holdings and a high share of subsistence holdings.

H2: Higher employment in agriculture is associated with the low economic development and low labour productivity of agriculture at the EU level.

H3: There is a positive link between working poverty and vulnerable employment (agricultural employment and self-employment), in the EU countries, in the 2008–2013 period.

H4: In the EU countries, in the 2008–2013 period, a higher performance of agriculture determines the low risk of working poverty.

DATA AND METHODOLOGICAL FRAMEWORK

In order to analyse the multiple aspects of the agricultural sector, we use the indicators described in Table 1. Economic importance of agriculture is expressed through the employment and gross value added (GVA) generated by agricultural activities. Taking into consideration the key role of export of agricultural products in the economic growth and poverty reduction (WTO 2014), we analyse the agricultural products export per agriculture labour (per 1 agricultural work units – AWU).

In the international comparison of countries, the performance of agriculture is most frequently expressed in terms of the value of the total output per 1 ha of the utilised agricultural area (Grznár and Szabo 2012). This article analyses the performance of agriculture based on productivity in agriculture, expressed through two indicators: labour productivity (GVA in agriculture per 1 employed persons in agriculture (per 1 full-time equivalent AWU) and land productivity (GVA in agriculture per 1 ha utilised agricultural area – UAA). Performance of agriculture depends on the structure of farms, which is a multi-dimensional issue (EC 2014). According to Dos Santos (2013), in the EU countries, farms are distinguishable by three main factors: the first factor is related to the structural characteristics of farms; the second factor is concerned with their financial features and their productive orientation and the third factor is related to the importance of subsidies. In order to analyse the structure of farms and their implications on agricultural performance and working poverty, we use indicators provided by the Eurostat (2015) for the average size of holdings:

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Table 1. Variables included in analysis. Descriptive statistics (2008–2013 average, N = 27)

Variables	Minimum	Maximum	Mean	Std. Deviation
Agriculture* indicators				
GVA in agriculture (% of total GVA)	0.50 (SE)	6.05 (RO)	1.84	1.33
Employment in agriculture (% of total employment) – EMP.	0.90 (UK)	25.17 (RO)	4.93	5.02
Self-employment in agriculture (% of total AWU[1]) – Self_emp.	24.26 (CZ)	93.88(PL)	72.35	17.41
Labour productivity (thousand EUR / AWU) – LAB_prod.	2.97 (LV)	56.55 (NL)	17.88	14.18
Land productivity (euro /ha UAA) – LAND_prod.	164.99 (LV)	5 242.14 (MT)	1 114.19	12 49.32
Agricultural products export[2]/AWU – Agric_exp.	3.31 (RO)	758.10 (BE)	130.52	192.13
Agricultural holdings**				
Physical size (ha UAA/holding)– Ph_size	0.91 (MT)	152.38 (CZ)	33.13	33.80
Economic size (thousand EUR of SO/holding)– Ec_size	2.70 (RO)	261.75 (NL)	61.22	70.00
Labour size (AWU/ holding)– Lab_size	0.39 (MT)	4.58 (CZ)	1.16	0.81
Subsistence farms (% of total farms) – SUB_FARM	0.00[3]	93.02 (RO)	27.35	29.17
National socio-economic indicators				
Population in Predominantly rural regions (% of total population) – POP_PR	0.00 (MT, CY)	72.48	30.09	19.72
GDP per capita (euro)	3650 (BG)	37 566.67 (DK)	19 347.53	11 150.59
Poverty (At-risk-of-poverty rate – %)	9.00 (CZ)	21.90 (RO)	15.37	3.50
Working poverty				
In-work at-risk-of-poverty rate (%)	3.88 (CZ)	17.72 (RO)	7.94	3.13
In-work at-risk-of-poverty rate for self-employed (%)	6.58 (HU)	53.86 (RO)	19.56	9.34

*Agriculture includes crop and animal production, hunting and related service activities; **Data for Agricultural holdings are for 2010 (the most recent data available provided by Eurostat);

[1]AWU – agricultural work units; [2]thousand US dollars at current prices; [3]in nine EU countries (BE, DK, DE, IE, NL, AT, FI, UK, SE).

Source: Own calculations based on Eurostat database (2015) and World Trade Organization (WTO) database (2015)

physical size (average ha UAA/holding), economic size (EUR of the Standard Output – SO/holding) and labour force size (AWU/holding). For the characterization of farms, we have additionally used the subsistence farms indicator, which highlights farms with more than 50% of production self-consumed by the holder (as % of the total farms).

For describing the national socio-economic context, we use the following indicators: gross domestic product (GDP) per capita for economic development, population in predominantly rural regions (% of the total population) and at-risk-of-poverty rate. Working poverty is expressed by the in-work at-risk-of-poverty rate. According to the European definition of working poverty, the in-work at-risk-of-poverty rate shows "the share of persons who are at work and have an equalised disposable income below the risk-of-poverty threshold, which is set at 60 % of the national median equalised disposable income (after social transfers)" (Eurostat 2015). Working poverty mixes the individual and household dimensions.

Statistical data on these variables have been collected from the Eurostat Database (2015) and the WTO Database (2015) and they are for the 2008–2013 period. Our sample consists of 27 countries from the EU, without Luxembourg (an outlier in many variables) to ensure a greater data homogeneity.

In order to study the intensity of the relationship between variables, we have applied the Spearman's rank (ρ) and the Pearson correlation coefficient (r). For identifying a functional relationship among the variables (Chatterjee and Hadi 2006), we employed the regression analysis. We have used the simple regression analysis in order to highlight the influence of employment in agriculture on working poverty. The stepwise multiple regression analysis was employed to highlight the effect of the variables that measure agricultural performance on working poverty. The

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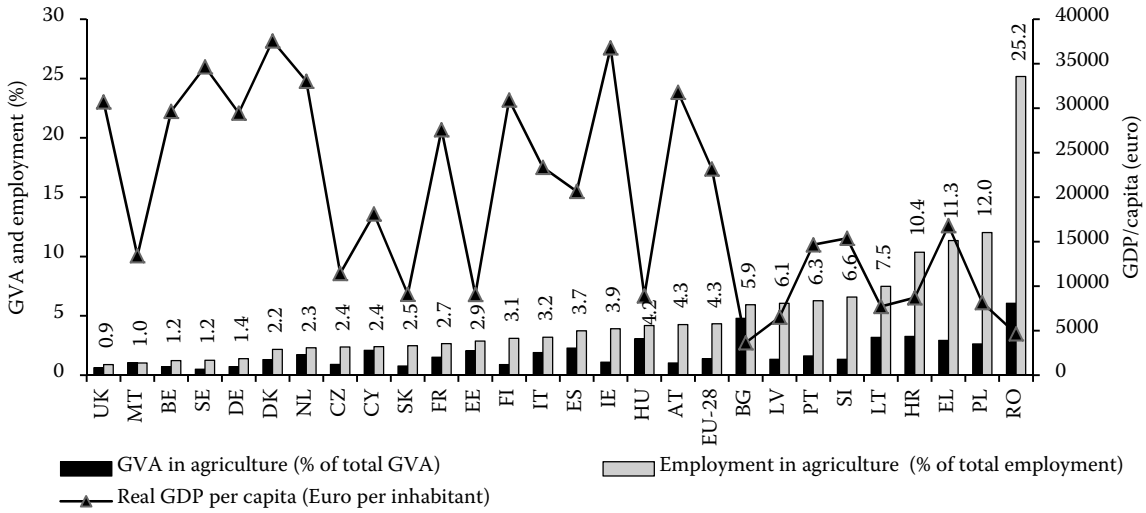

Figure 1. Agriculture contribution to employment and GVA and economic development, 2008–2013 average

Source: Eurostat (2015)

data analysis method is the Backward Step-by-Step regression, which starts with a model including all the variables and eliminates the variables one by one, at each step choosing the variable for exclusion as that leading to the smallest decrease in R^2 (Landau and Everitt 2004). The Fisher Snedecor (F) statistic is used to assess the validity of the transformed model that characterizes the dependency between working poverty and independent variables. In order to check if the results are affected by multicollinearity, we tested the variance inflation factors (VIF) and the tolerance of the explanatory variables. If the tolerance value is less than 0.1 and the VIF value is higher than10, this means that there is a high multicollinearity (Hair et al. 2010). For the data processing, the SPSS software package was used.

RESULTS AND DISCUSSIONS

The share of agriculture in the GVA and employment gives an overview of the importance of agriculture in the national economy. Data from Figure 1 illustrate that the agricultural sector, in terms of both employment and GVA, is generally more important in the EU countries with a lower level of economic development, expressed by the GDP/capita. In the 2008–2013 period, the highest value of employment in agriculture (as % of total employment) was recorded in Romania (on the level of 25%), followed by Poland (12%), Greece (11.3%), Croatia (10.4%) and Lithuania (7.5%). As for the GVA created in agriculture, the maximum value of 6.1% was recorded in Romania, followed by Bulgaria (4.8%), Croatia (3.3%) and Lithuania (3.2%). In all member states (except Malta), the contribution of agriculture to employment is higher than the contribution to the GVA. However, what differentiates the analysed countries, is a large and persistent gap between the agriculture's shares in the GVA and employment, the fact that suggests that the output per worker in agriculture is lower than in the non-agriculture and poverty is concentrated in the agricultural sector and rural areas (World Bank 2007).

The high level of employment in agriculture can be explained by examining the holdings structure. The results of the correlation analysis show that employment in agriculture is negatively correlated with the small scale of holdings (Table 2). Thus, at the EU-28 level, in the countries where agricultural holdings are small, in terms of both the physical and economic size, there is a high level of workers in agriculture.

Table 2. Correlation between agriculture indicators and agricultural holdings

Spearman rank correlation (ρ)	Agricultural holdings			SUB_FARM
	Ph_size	Ec_size	LAB_size	
EMP.	–0.556**	–0.684**	–0.380	+0.536**
LAB_prod.	+0.469*	0.788**	+0.267	–0.784**

*$p < 0.05$, **$p < 0.01$

Source: Own calculations based on Eurostat (2015)

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The physical farm size, expressed by the utilised agricultural area per total number of holdings (average ha UAA/holding), differs significantly at the EU level, there being a high share of small farms in most EU-13 Member States (Figure 2). Thus, in 2010 (the most recent data available), the average farm size was more than 50 ha UAA /holding in six Member States (the Czech Republic, the United Kingdom, Slovakia, Denmark, Germany and France), less than 10 ha UAA /holding in six countries (Croatia, Slovenia, Hungary, Poland, Italy and Greece) and less than 5 ha UAA per holding in three others countries (Malta, Romania and Cyprus). Wider gaps between countries are identified in terms of *economic farm size, measured by* standard output (SO) per holding. The minim value was recorded by Romania, of 2.7 thousand EUR of SO/holding, which is more than nine times lower than the EU-28 average, of 25.25 thousand EUR of SO/holding. In eight countries (Romania, Bulgaria, Lithuania, Malta, Croatia, Hungary, Latvia, Greece), there are very small farms (below 10 thousand EUR of SO/holding) which accounts for 40% below the EU-28 average.

A strong positive link ($\rho = +0.788$, $p < 0.01$) was identified between the physical farm size and the economic farm size, at the EU-28 level, which entails that in those countries where the physical farm size is higher, the economic output of farms is high as well and vice versa. As Figure 2 illustrates, the labour farm size indicator reflects a very low level in the countries where the physical farm size is also low (Romania, Malta, Cyprus) and a higher level in EU states where the physical farm size is higher (the Czech Republic, the United Kingdom, Slovakia). At the EU-level, the labour farm size is strong and positively correlated with the economic ($\rho = +0.717$, $p < 0.01$) and physical ($\rho = +0.789$, $p < 0.01$) dimensions of agriculture farms.

Furthermore, subsistence farms (where the farm household consumes more than half of the farm production) represent a real problem for the EU-13 Member States, especially in eight of them where subsistence farms account for more than 50% of the holdings (Romania, Hungary, Latvia, Slovenia, Lithuania, Slovakia, Malta and Cyprus). The maximum value was recorded in Romania, where 93.02% of the total holdings are subsistence holdings. The minimum value (0%) was recorded in nine developed EU countries (Table 1). The results of the correlation analysis indicate a positive relationship between employment in agriculture and subsistence farms ($\rho = +0.536$, $p < 0.01$, Table 2). Subsistence farms are negatively correlated with the physical farm size ($\rho = -0.610$, $p < 0.01$) and the economic size ($\rho = -0.790$, $p < 0.01$). Thus, small size farms, in terms of the average ha UAA/holding and EUR of SO/holding, determine a high propensity to subsistence agriculture.

These results show that in the EU countries with small scale of agricultural holdings and high share of subsistence holdings, the employment in agriculture is higher which confirms *hypothesis H1.*

An additional argument for vulnerability of employment in agriculture is the fact that the vast majority of agricultural employment is self-employment, especially own-account workers and contributing family workers, a positive link between employment in agriculture and self-employment in agriculture

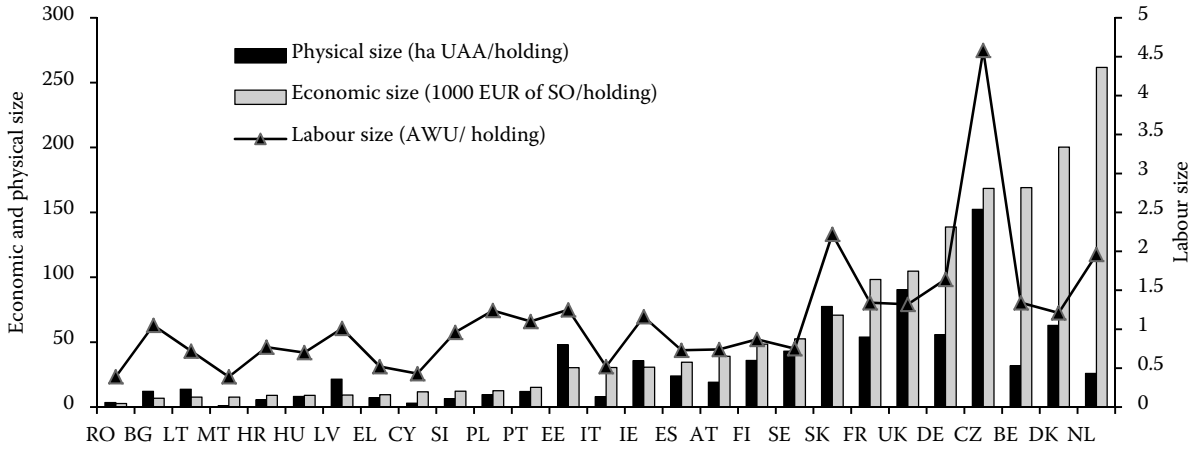

Figure 2. Agricultural holdings, 2010

Source: Eurostat (2015)

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Table 3. Correlation between agriculture indicators and economic development

Spearman rank correlation (ρ)	Land_ prod.	Self_ emp	Agric_ exp.	GDP/ capita	EMP.
EMP.	–0.259	+0.535**	–0.760**	–0.589**	1
LAB_prod.	+0.570**	–0.465*	+0.796**	+0.833**	–0.731**

**$p < 0.01$; *$p < 0.05$

Source: Own calculations based on Eurostat (2015) and WTO database (2015)

(ρ = +0.535, $p < 0.01$) being identified (Table 3). It is alarming that of the 8074.9 thousand non-salaried labour force (AWU) in agriculture at the EU-28 level, in the 2008–2013 period, 1907.9 thousand, 23.62% respectively, worked in Poland and 1557.7 thousand, 19.3% respectively, in Romania (Eurostat 2015). Thus, only two countries of the 28 states together accounted for 43% of the total number of non-salaried labour force in agriculture.

Statistical data from Table 2 and 3 also emphasize that agricultural labour productivity (expressed by the GVA agriculture/AWU) is positively correlated with land productivity (ρ = 0.570, $p < 0.01$), economic farm size (ρ = 0.788, $p < 0.01$), physical farm size (ρ = 0.469, $p < 0.01$), and agricultural product export (ρ = 0.796, $p < 0.01$). During the 2008–2013 period, at the EU-28 level, an average labour productivity in agriculture of 14.7 thousand EUR per 1 AWU was recorded. The lowest labour productivities in the agricultural sector were recorded by Latvia, Bulgaria, Poland and Romania, from 2.97 thousand EUR per 1 AWU for Latvia to 4.17 thousand EUR per 1 AWU for Romania. The highest labour productivity was registered in the Netherlands (56.55 thousand EUR per AWU), being followed by Denmark, Belgium and France.

The results, provided in the Table 3, regarding the relationship between employment in agriculture and economic development, expressed by the GDP per capita, in the EU countries, in the 2008–2013 period, emphasise that there is a moderate negative relationship, statistically significant (ρ = –0.589, $p < 0.01$). The same relationship is set between employment in agriculture and labour productivity in agriculture, but more intense (ρ = –0.731, $p < 0.01$). Thus, in the countries where employment in agriculture is higher, economic development and labour productivity in agriculture is low, and vice versa, the fact which confirms hypothesis H2.

Our empirical results confirm that behind a high level of employment in agriculture, there is a low level of labour productivity and small scale agricultural holdings. This fact can generate a low income of those who work in this sector, and, consequently, a high level of the in-work-poverty risk.

According to the Eurostat (2015), at the EU-28 level, in 2013, the risk of poverty faced by working age adults (18–64 years) without work (not employed persons) is more than three times higher than those in employment (29.2% against 9%), a fact which proves that having a job remains the best protection against poverty and social exclusion. However, for many working poor the solution to escape from poverty is to get a better work, not just more work (Herman 2014). At the EU-28 level, in the 2008–2013 period, 8.7% of the people in employment were living under the poverty threshold, a considerable cross-country variation being recorded in terms of the level of in-work poverty rate (Figure 3). The highest in-work at-risk-of-poverty rate from the EU-28 is recorded in Romania (17.7%), two times higher than the European average (8.7%) and 4.5 times higher than in the Czech Republic, the country with the lowest level of the in-work poverty rate. Values above the EU-28 average are recorded especially by the southern countries (Greece –13.6%, Spain –11.7%, Portugal –10.3% and Italy –10.2%), Poland (11.1%) and the Baltic states (Latvia and Lithuania, of 9.9%).

In analysing the in-work poverty, it is important to distinguish between the employees and the self-employed, taking into consideration, on the one hand, their differing nature, and on the other hand the fact that the self-employment income is normally less reliable than wages and salaries and it is exposed to fluctuations. Data from Figure 3 show that the incidence of working poverty in the EU-28 was much higher for the self-employed relative to employees (23.1% against 6.5 %). In all countries, the self-employed are confronted with a much higher poverty risk than the employees, however, the cross-country differences are very large. For example, in Romania, the in-work poverty risk is 10 times higher for self-employed than for employees, in the Southern countries (Spain, Portugal) more than 4.5 times, in the EU-28 average 3.5 times, as it can be seen in Figure 3.

The results of the correlation analysis (Figure 4) highlight a moderate positive relationship between the in-work poverty rate and employment in agriculture (ρ=+0.569, $p < 0.01$). The same relationship

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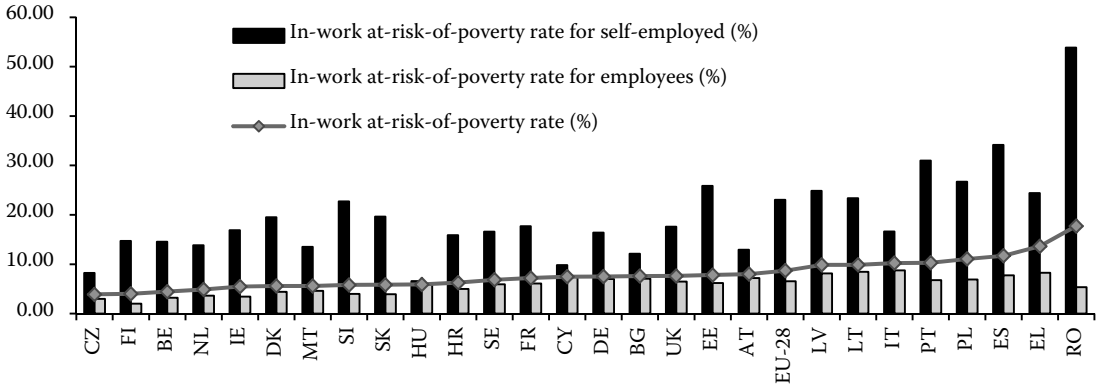

Figure 3. In-work poverty rate (total and by status), 2008–2013

Source: Eurostat (2015)

was also identified between the in-work poverty rate for self-employment and employment in agriculture ($\rho = +0.455$, $p < 0.01$). Also, it is noticed that self-employment in agriculture is positively correlated with employment in agriculture ($\rho = +0.535$, $p < 0.01$, Table 3).

Taking into account the global picture provided by Figure 1 and 4, together with the results of the correlation analysis, our starting *hypothesis (H3*), which states that work in agriculture, especially as own-account workers and unpaid family workers, implies a higher risk to be income poor, is confirmed and supported by other specialised empirical results (Bodea and Herman 2014; Lewandowski and Kaminska 2015). There is a positive link between working poverty and vulnerable employment (agriculture employment and self-employment), in the EU countries, in the 2008–2013 period.

By using a simple regression of the in-work poverty rate in relation to employment in agriculture (Figure 4), it turns out that the value of R^2 is medium ($R^2 = 0.589$), which implies that the incidence of working poverty in the EU countries can be explained by the existence of high employment in agriculture, but only 58.9% of it. These results reveal the action of other factors that can influence the level of working poverty in the EU countries.

In the light of these data, in order to test *hypothesis H4,* we estimated the influence of the agricultural sector on working poverty, using the multiple regression analysis employing a dataset that includes eight selected indicators (see Table 4). We find that working poverty (in-work at-risk-of-poverty rate) is positively correlated with employment in agriculture ($r = 0.731$, $p < 0.01$) and negatively correlated with the economic farm size ($r = -0.447$, $p < 0.01$), the physical farm size

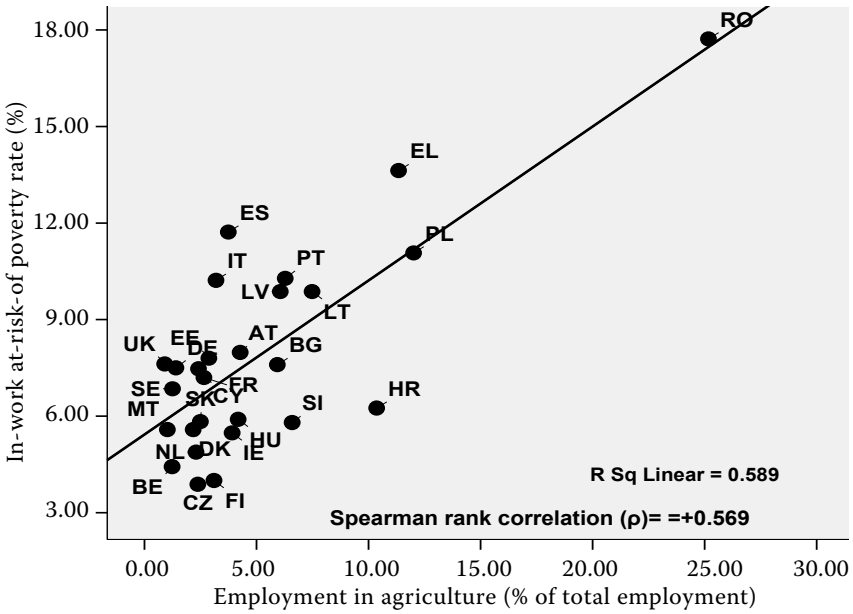

Figure 4. In-work poverty rate and employment in agriculture, 2008–2013 average

Source: Own calculations based on the Eurostat (2015)

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Table 4. The results of the stepwise regression analysis (Model Summary)

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate	Predictors	*F* (sig.)
1	0.903	0.815	0.733	1.631	Ph_size, POP_PR, EXP_agric., EMP., SUB_farm , LAND_prod., LAB_prod, Ec_size	9.936.000
2	0.903	0.815	0.747	1.588	POP_PR, EXP_agric., EMP., SUB_farm, LAND_prod., LAB_prod, Ec_size	11.986.000
3	0.902	0.814	0.759	1.551	POP_PR, EXP_agric., EMP., LAND_prod., LAB_prod, Ec_size	14.624.000
4	0.894	0.800	0.752	1.573	POP_PR, EMP., LAND_prod., LAB_prod, Ec_size	16.751.000

Dependent Variable: Working poverty (in-work at-risk-of-poverty rate – %)

Source: Own calculations based on Eurostat (2015) and WTO database (2015)

($r = -0.414$, $p < 0.01$) and the agricultural products export/AWU ($r = -0.407$, $p < 0.01$). The correlations between the explanatory variables show that none of the correlations exceeded 0.9, which indicates that multicollinearity was unlikely to be an issue for the regression analyses (Mooi and Sarstedt 2011).

All eight variables were used in a stepwise- multiple regression analysis to predict working poverty. We have used the Backward method in the linear regression procedure for eliminating variables that do not significantly enter the regression equation. This method starts with the full model with an R^2 of 0.815, Adjusted R^2 of 0.733 and Std. Error of the Estimate of 1.631 (Table 4). The final prediction model contained five of the eight predictors and was reached in four steps with no variables removed. Each step resulted in a statistically significant model (Table 4).

The final model (model 4) was statistically significant [$F(5, 21) = 16.751$, $p < 0.001$] and accounted for over 75% of the variance of working poverty (R^2 =0.800, Adjusted R^2 = 0.752). Std. Error of the Estimate of 1.573 is lower than in the initial model. The difference between R^2 *and* Adjusted R^2 is due to the fact that a relatively small number of observations are being predicted with a relatively large number of variables. The highest VIF found was 4.67 and the tolerance value for all the dimensions was more than 0.1 (Table 5), which proves that our results do not seem to be affected by multicollinearity. Hence the independent assumption of multiple regression analysis is met.

Data from Table 5 reveal that all independent variables are statistically significant ($p < 0.05$). As it can be seen by examining the beta weights (β), based on which the relative importance of each independent variable is compared (Carver and Nash 2011), employment in agriculture received the strongest weight in the model (β = 0.837), followed by the economic size farm (β = –0.552), labour productivity (β = 0.466) and population in predominantly rural regions (β = –0.415), implying that employment in agriculture has a greater impact on working poverty.

Employment in agriculture positively influences the working poverty meaning that a 1 percentage point (p.p.) increase in employment in agriculture increases working poverty by 0.521 p.p. (Table 5). This means

Table 5. Stepwise regression results (Final model)

Dependent variable[1]	Unstandardized coefficients		Standardized coefficients	*t*-statistics	Sig.	Collinearity statistics	
	B	Std. Error	Beta			tolerance	VIF
EMP.	0.521	0.071	0.836	7.308	0.000	0.729	1.372
LAB_prod	0.103	0.046	0.466	2.212	0.038	0.216	4.640
LAND_prod	–0.001	0.000	–0.298	–2.379	0.027	0.607	1.649
Ec_size	–0.026	0.008	–0.586	–3.132	0.005	0.273	3.662
POP_PR	–0.068	0.024	–0.415	–2.904	0.008	0.468	2.135

[1] Working poverty; $R^2 = 0.800$, Adjusted R^2 =0.752, $F(5, 21) = 16.751$, $p < 0.001$

Source: Own calculations based on Eurostat (2015) and WTO database (2015)

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that the countries that have a higher share of workers in agricultural activities result in the statistically significant higher working poverty. It also implies that for reducing working poverty, it is necessary to increase the income for the agricultural worker.

The regression coefficients for the economic size farm and land productivity are statistically significantly negative as suggested by theory and confirmed by the data plotted in Table 5. Thus, an increase by 1 unit in the economic size of farm determines a reduction in the in-work poverty risk by 0.025 unit. Land productivity has a weakly negative influence on the dependent variable, which highlights that an increase in land productivity will determine a reduction in working poverty. Moreover, the share of population in predominantly rural regions (POP_PR) negatively influences working poverty, but with a lower intensity.

Surprisingly, the agricultural labour productivity positively influences working poverty, a fact which suggests that poor EU agricultural workers do not benefit significantly from the gains in labour productivity. According to Schneider and Gugerty (2011), the ability of the poorest to participate in the gains from agricultural productivity growth depends on the variety of contextual factors including the initial asset endowments, barriers to technology adoption and constraints to market access.

Although the characteristics of agricultural holdings such as the physical size and subsistence farms have been eliminated from the model, our results show that the level of economic size is positively correlated with the physical farm size and negatively correlated with subsistence farms. It can be noticed that, in terms of farm dimension, a low level of the in-work poverty risk is determined by the existence of a large physical size of holdings (ha UAA/holding) and a small share of subsistence farms in the total farms. Furthermore, eliminating the independent variable – agricultural products export/ AWU from the model reflects the export's inability to reduce working poverty, taking into account that the effect of agricultural export depends on the extent to which smallholders and poor households participate in production (Schneider and Gugerty 2011; WTO 2014).

It is clear that the risk of in-work poverty is significantly influenced by the performance of agriculture. In the EU countries, in the 2008–2013 period, a higher performance of agriculture determined a low risk of working poverty fact which confirms *hypothesis H4.*

The low intensity of the relationship between productivity of agriculture (labour and land) and working poverty emphasises the necessity to implement, at the EU level, some national and European actions that should enhance the impact of increasing productivity of agriculture on reducing working poverty. A special attention needs to be paid to the specific situation in the individual countries.

CONCLUSIONS AND IMPLICATIONS

This study has shed light on the influence of agricultural performance on working poverty in the EU countries, in the recent economic crisis and recovery period (2008–2013).

The incidence of working poverty at the EU level demonstrates that employment does not always escape the poverty trap, being known that an employed person becomes a "working poor" as a consequence of both the working status and the income of the household the worker lives in. The research results show that employment in agriculture represents an important determinant behind the high level of working poverty in the EU countries in the period analysed.

The high level of employment in agriculture in some EU countries (Romania, Poland, Greece, Croatia, Lithuania etc.) can be explained, on the one hand, by the small scale agriculture, both in terms of the physical and economic size holdings, and on the other hand, by the high share of subsistence holdings. Employment in agriculture is positively correlated with self-employment (own-account workers and contributing family workers) in agriculture. Furthermore, our empirical results show that in the European countries where employment in agriculture poverty is higher, the level of labour productivity of agriculture and economic development is low and vice versa.

The results of the multiple regression analysis for the 2008–2013 period highlight that working poverty at the EU level is influenced positively by employment in agriculture, and it is influenced negatively by the economic size farm and land productivity. Moreover, large cross-country differences regarding the link between agricultural performance and working poverty are identified. This fact emphasizes the need to take specific actions to improve the efficiency of the EU agriculture sector for reducing working poverty.

A real challenge of the EU agriculture (especially in Romania, Poland, Lithuania and Latvia) is the high level of unproductive employment. Thus, it is necessary to create favourable conditions for turning unproductive into productive employment as

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"employment yielding sufficient returns to labour to permit the worker and her/his dependents a level of consumption above the poverty line" (ILO 2012b).

Romania, according to the analysed indicators, has the highest employment in agriculture and the in-work poverty rate. Romanian agriculture is characterized by a very low labour and land productivity, a very small size of holdings in terms of the economic, physical and labour force, and the highest share of subsistence holdings. In the case of Poland, the high values recorded in both employment in agriculture (the second place in the EU-28) and working poverty (the fourth place in the EU-28), can be mainly explained by the highest level of the non-salaried labour force in agriculture (Romania ranking second) and the small scale agriculture which implies a very low agricultural labour productivity (26th place).

The Baltic States (Lithuania and Latvia) achieve a very low level in both land and labour productivity (Latvia is ranked last in the EU-28) and higher values than the EU-28 average in-work poverty rate and employment in agriculture, ranked among the first eight member states. All these issues require multiple measures so that the agricultural sector reduces working poverty.

Taking into account that working poverty can be reduced through a high level of income of those who work in the agricultural sector, it is important that these countries improve the performance of this sector. Labour and land productivity can be increased through public and private investments, especially, in agricultural technology, rural infrastructure, and, last but not least, in human capital. It is very important for the poverty reduction to make sure that agricultural workers and their households, respectively small farmers, benefit from the improvements in productivity through an increase in real incomes.

In other new member states (for instance, the Czech Republic), a higher agricultural performance, characterized by bigger farms in terms of the economic size, by agricultural incomes higher than the average wages in the whole economy related to the labour productivity, go hand in hand with ensuring earnings and job security. The Czech Republic recorded, in the 2008–2013 period, the lowest in-work poverty rate in the EU, fact which can also be explained by the highly distributive effects of its welfare system (EU 2012; Herman 2014).

Greece needs to improve the effect of agricultural performance on reducing working poverty, occupying the worst position within the Southern European countries, as a result of a very high level of the in-work poverty rate and employment in agriculture (the second place in the EU-28) and a high share of small-holders. In these countries, and not only there, it is necessary to improve the capability and capacity of small-holders in order to increase the scale or the value of agricultural production, making smallholder farming more competitive and sustainable, consequently the gains in productivity can raise incomes to a level that escapes farming households out of poverty.

Strategic investments in the EU agriculture can have transformative effects (UNDP 2013), generating new jobs, but not any kind of jobs, but decent and productive jobs, in the agricultural sector as well as in other sectors.

For the agricultural sector to contribute to the achievement of Europe 2020 Strategy objectives (EC 2010) in terms of employment and poverty (a 75% employment rate for 20–64 years-old and at least 20 million fewer people in or at risk of poverty and social exclusion by 2020), we consider that the financial support given by the EU through the CAP should ensure a decent and productive employment in the context of a sustainable development of agriculture.

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