Main Determinants of Agriculture in Romania during the Implementation of the National Rural Development Programme 2007-2013

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Abstract

Through the measures of the National Rural Development Programme (NRDP), Romania has the chance to develop its agricultural sector. The paper focuses on the results of the implemented National Rural Development Programme 2007-2013, with regard to the development of the agricultural sector from Romania. The data was analysed at the level of the regions of Romania, for the period of implementation of the National Rural Development Programme 2007-2013. The data included indices covering different dimensions of agricultural development in Romania, based on their availability on the website of the National Institute of Statistics in Romania: Land fund; Material and technical base of agriculture; Area and production of crops; Livestock and animal agricultural production; Economic accounts in agriculture; Agri-environment indicators.

Keywords: Agriculture, National Rural Development Programme, Common Agricultural Policy, rural development, sustainability.

JEL Classification: Q10, Q14, Q13

1. Introduction

Through the measures of the National Rural Development Programme (NRDP), Romania had the chance to develop its agricultural sector. The European Agricultural Guarantee Fund finances the measures to regulate and support the agricultural markets and also the direct payments to farmers. The European Agricultural Fund for Rural Development finances the national rural development programmes (AFIR, accessed 01.09.2020).

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The main objectives of the National Rural Development Programme 2007-2013 in Romania were (AFIR accessed 01.09.2020; AFIR PNDR, accessed 01.09.2020):

- Increasing the Competitiveness of the agricultural and forestry sector (Axis 1) by strengthening the potential of large areas of land, suitable for agriculture; renewing the generations of farm managers through education and training; supporting the establishment of producer groups; facilitating the modernization of small enterprises in the agri-food and forestry processing sector, through the following measures: Setting-up of young farmers; Modernization of agricultural holdings; Supporting semi-subsistence farms; Improving and developing infrastructure related to the development and adaptation of agriculture and forestry.
- Improving the environment and rural areas (Axis II) by the sustainable use of natural resources; reducing the risk of abandonment of agricultural activities in disadvantaged agricultural areas; providing financial support to farmers and forest owners for the provision of environmental protection services for the protection of wild flora and fauna, water and soil; providing financial support for the improvement of animal welfare standards in swine farms; diversifying the activities of the farms; rising the information level of farmers in agricultural field, through the following measures: Agri-environment payments; Animal welfare payments.
- Improving the quality of life (Axis III) by raising the attractiveness of the rural areas, through the following measures: Support for the creation and development of micro-enterprises; Encouraging tourism activities; Renovation, development of villages, improvement of basic services for the economy and the rural population and enhancement of the rural heritage.
- Improving local governance and promoting the endogenous potential of rural space (Axis IV), through Local development strategies and Cooperation projects.

Romania also received a supplementary financing through the European Economic Recovery Plan for activities from the National Strategic Plan (AFIR PNDR, accessed 02.09.2020):

- Improving the efficiency of the use of nitrogen fertilizers;
- Improving the support for investments in dairy production and processing;
- Stimulating the use of wastewater treatment and water saving equipment in agricultural holdings;
- Stimulating the processing of agricultural/forestry biomass for renewable energy;
- Maintaining biodiversity and preserving the agricultural lands threatened by abandonment or intensification.

2. Problem Statement

Several researchers analysed the distribution of rural development funds for the field of Common Agricultural Policy (Kiryluk-Dryjska, Beba and Poczta, 2019;

Noack and Schuler, 2020; Balezentis et al., 2020) in relation to several dimensions: spatial implications, ecosystem services, young farmers support. Other researchers tried to measure the relation between expenditures for natural capital and territorial needs (Zasada et al., 2018). Slee and Feliciano (2015) focused on the use of impact indicators related to climate change in the Rural Development Programme 2007-2013.

The paper focuses on the results of the National Rural Development Programme 2007-2013 with regard to the development of the agricultural sector in Romania. According to the reports of the Agency for Financing Rural Investments, the percentage of absorption of the European funds was over 86% from EUR 5,72 billion allocated to Romania to finance investment projects, by the European Union, through the National Rural Development Programme 2007-2013 (AFIR PNDR, accessed 01.09.2020).

Agriculture is an important economic factor; the largest part of Romania's land fund is agricultural land. In Romania, the total land fund did not register important variations during the analysed period (2007-2013). Thus, at the level of the year 2013, the total land fund was divided as follows: agricultural land (14,611,883 ha), arable land (9,389,254 ha), total non-agricultural land (9,227,188 ha), forests and other forest vegetation (6,742,056 ha), grazing land (3,273,961 ha), meadow (1,541,854 ha), land with water (835,997 ha), land with construction (758,303 ha), degraded and non-productive land (500,937 ha), communication and railways (389,895 ha), vines and vineyards (210,270 ha), orchards (196,544 ha) (Figure 1).
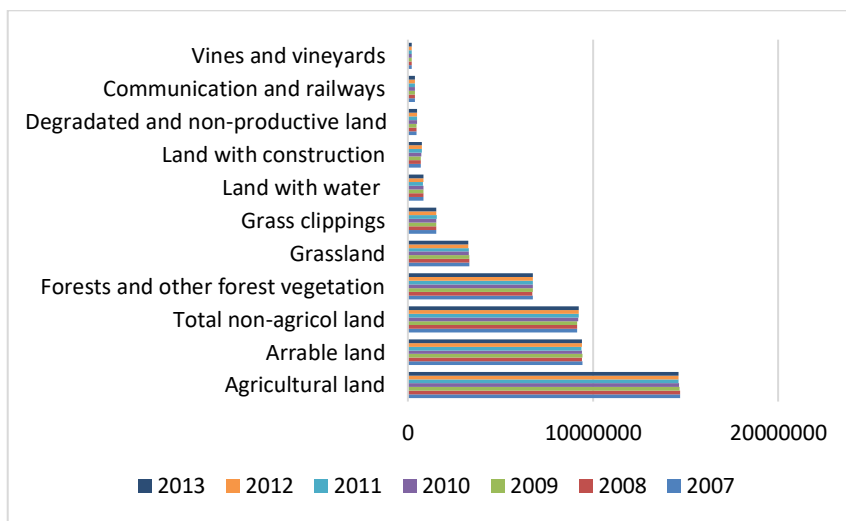

Figure 1. Total land fund (2007-2013)
Source: INSSE, accessed 01.10.2020

The number of persons employed in Agriculture, forestry and fisheries decreased in 2013, compared to 2007. Thus, there were 125,482 persons employed in Agriculture, forestry and fisheries in 2007, compared to 103,813 persons

employed in the same industry in 2013 (Figure 2) Moreover, Romania experiences a decrease in the number of rural population on the one hand and, on the other hand, the remaining population from the rural area is very old, while the qualified youth left the rural areas. The increase in older people is of 2.6% per year, "faster than the annual increase in the total population, which is 1.2% per year" (Cristea et al., 2016). Marcu et al. (2015) also analysed "the duality of employment-unemployment within the dynamics of the Romanian labour market".
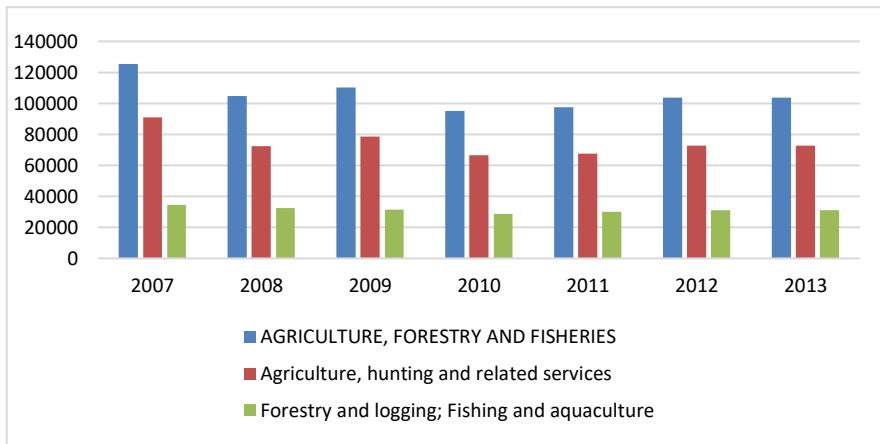
Figure 2. Workforce in Agriculture, forestry and fisheries
Source: INSSE, accessed 01.10.2020

3. Research Questions / Aims of the Research

The data was analysed at the level of the regions of Romania: North-Western Region; Central Region; North-Eastern Region; South-Eastern Region; South-Muntenia Region; Bucharest-Ilfov Region; South-Western Oltenia Region; Western Region, for the period of the implementation of the National Rural Development Programme 2007-2013.

Firstly, the data included indexes covering different dimensions of agricultural development in Romania, based on the available data for the period 2007-2013 on the website of the National Institute of Statistics in Romania (INSSE, accessed 1.09.2020):

- Land fund
- Material and technical base of agriculture;
- Area and production of crops;
- Livestock and animal agricultural production;
- Economic accounts in agriculture;
- Agri-environment indicators.

The uncorrelated variables were deleted, thus 7 independent predictors remaining for our analysis (Table 1).

Table 1. Agricultural development variables

	Variables	Code
Material and technical base of agriculture	Tractors (units)	(V_t)
	Tractor plows (units)	(V_tp)
Area and production of crops	Crops (hectares)	(V_c)
Livestock and animal agricultural production	Animals (units)	(V_a)
	Swine (units)	(V_s)
Agri-environment indicators	Chemical fertilizers (tones 100% active substance)	(V_cf)
	Nitrogenous fertilizers (tones 100% active substance)	(V_nf)

Source: Authors' own interpretation

Secondly, the main items of agriculture in Romania were determined using the factor analysis, for the period of implementation of the National Rural Development Programme 2007-2013.

4. Research Methods

The correlation table (Table 2) reveals that all variables are correlated (Pearson coefficient > 0,45), underlying that they are measuring the same phenomenon: agricultural development.

Table 2. Correlations

	V_t	V_c	V_cf	V_tp	V_s	V_nf	V_a
V_t	1	0.560^{**}	0.740^{**}	0.995^{**}	0.823^{**}	0.703^{**}	0.515^{**}
		0.000	0.000	0.000	0.000	0.000	0.000
		56	56	56	56	56	56
V_c		1	0.770^{**}	0.598^{**}	0.748^{**}	0.813^{**}	0.323^{*}
			0.000	0.000	0.000	0.000	0.015
			56	56	56	56	56
V_cf			1	0.744^{**}	0.750^{**}	0.957^{**}	$.493^{**}$
				.000	.000	.000	.000
				56	56	56	56
V_tp				1	$.834^{**}$	$.716^{**}$	$.524^{**}$
					.000	.000	.000
					56	56	56
V_s					1	$.741^{**}$	$.473^{**}$
						.000	.000
						56	56
V_nf						1	$.403^{**}$
							.002
							56
V_a							1
							56

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' interpretation based on SPSS Software

Factor analysis is used in order to reduce the number of variables to a set of factors representative for agricultural development. The KMO value of 0.764 represents acceptable factor solutions. The KMO test measures the existence of a common variance between the variables. Its value has to be higher than 0.5 (Table 3).

Table 3. KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.764
Bartlett's Test of Sphericity	Approx. Chi-Square	577,620
	df	15
	Sig.	0.000

Source: Authors' interpretation based on SPSS Software

According to the data from Table 4, the retained variables are part of the final factor solution (AFIR PNDR, accessed 10.10.2020):

- Tractors (0.806) and Tractor plows (0,827). Romania's smaller farms could improve the acquisition of new and performant equipment.
- Crops (0.688). Romania has important land fund that could be transformed in agricultural land, favourable for crop planting and also diversification of crops.
- Swine (0.827). Romania could improve the technological measures for animal welfare, favourable to environment improvement and farm development.
- Chemical fertilizers (0.850). Due to the modernization of agricultural holdings and the important demand in agriculture, chemical fertilizers were used and sometimes, they were used in excess (increased pesticide consumption). In the Axis II there were measures for reducing the usage of chemical substances in agriculture (eliminating chemical fertilizers, moving towards an ecological agriculture).
- Nitrogen fertilizers (0.838). Romania could improve the efficiency in the use of nitrogen fertilizers, by the best practices in agricultural holdings management, with positive effects on the environment.

Table 4. Communalities

	Initial	Extraction
Tractors (units)	1.000	0.806
Crops (hectares)	1.000	0.688
Chemical fertilizers (tones 100% active substance)	1.000	0.850
Tractor plows (units)	1.000	0.827
Swine (units)	1.000	0.827
Nitrogenous fertilizers (tones 100% active substance)	1.000	0.838

Extraction Method: Principal Component Analysis.

Source: Authors' interpretation based on SPSS Software

The retained factor solution explains 80.605% of the total variance (Table 5).

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.836	80.605	80.605	4.836	80.605	80.605
2	.680	11.335	91.941			
3	.309	5.157	97.097			
4	.132	2.198	99.295			
5	.039	.656	99.951			
6	.003	.049	100.000			
Extraction Method: Principal Component Analysis.						

Source: Authors' interpretation based on SPSS Software

Cronbach's Alpha coefficient is 0.533, which is above the requested minimum limit of 0.5. The model has an acceptable internal coherence (Table 6).
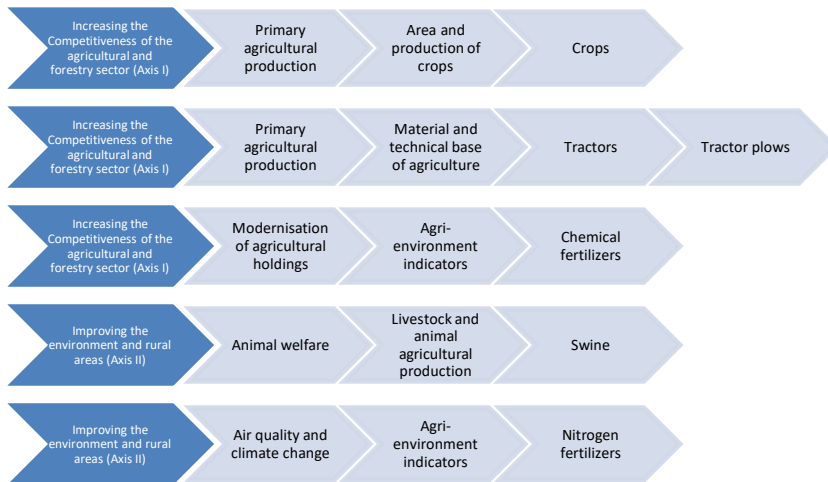
Table 6. Reliability Statistics

Cronbach's Alpha	N of Items
0.533	6

Source: Authors' interpretation based on SPSS Software

5. Conclusion

With the use of factor analysis, we determined five main items of agriculture development in Romania for the analysed period (2007-2013) (Figure 3):

Figure 3. Items of agriculture development in Romania
Source: Adapted by the authors

To ensure continuity in the development of agricultural sector, the Common Agricultural Policy (CAP) 2021-2027 has the following objectives: "increase competitiveness"; "ensure fair income"; "protect food and health quality"; "vibrant rural areas"; "support generational renewal"'; "preserve landscapes and biodiversity"; "environmental care"; "climate change action"; "rebalance power in food chain". (CAP, accessed 20.08.2020)

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