

## THE TERRITORIAL ANALYSIS OF AGRICULTURAL PRODUCTION STRUCTURE. CASE STUDY: REGION SOUTH-WEST OLTENIA

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### Abstract

*The harmonious development of a region depends to a significant extent by the spatial distribution of natural and human resources, to ensure a balanced land use structures and adapted to the economic needs of each area, according to the principle of sustainable development. In order to calculate and interpret the many aspects of the relationship that forms objectively between efforts and results achieved in agricultural production using a system of technical and economic indicators with which to be able to address specific systemic agriculture activities. Thus, in the research that led to the paper were analyzed technical indicators such as land fund, material and technical basis, area and crop production for conventional agriculture or economic indicators such as agricultural production value structure. They used statistical data for the period 2004-2014 recorded in the South-West Oltenia region.*

**Key words:** agricultural production, crops, indicator, land resources, South-West Oltenia region

### INTRODUCTION

South-West Oltenia region is located in the south-west of Romania, covering 29,212 km<sup>2</sup>, meaning 12.25% of Romania. It has a population of 2,330,792 inhabitants and about 40% of the employed population in the region's economy is represented by population occupied in agriculture. In 2014, this region contributed by about 10% to the regional GDP. From the administrative point of view, it includes 5 counties (Dolj, Gorj, Mehedinti, Olt, Valcea) structured into 40 towns, 408 communes and 2,066 villages.



Fig. 1. Region South-West Oltenia  
Source: www.google.ro

In the Southern region, cereal crops occupy large areas, especially in Olt, Dolj and Mehedinti South. In the hilly areas of Gorj and Valcea counties, orchards occupy important areas. The most cultivated fruit tree species are plum, apple, walnut, peach, apricot and fig which are specific to the warmer south and west region. In mountain areas of the north (in the Northern part of Valcea and Gorj county and the Western part of Mehedinti county) instead of crops are replaced by forests and mountain meadows. In Drăgășani areas, Drăgănești, Segarcea, Strehaia and Dăbuleni vineyards occupy large areas. In Olt meadow area vegetable farming is practiced and in the area of Dăbuleni watermelons are grown.[4]

### MATERIALS AND METHODS

To characterize the evolution of a mass phenomenon in its complexity, in terms of a time series is calculated for a system of statistical, analytical and synthetic indicators.[6] Analysis of agricultural activity

is conditioned as area and depth of the system of indicators used and the information capacity of each indicator, the indicator being a numerical expression of a phenomenon or economic process, defined in space and time, which can be characterized by absolute sizes, relative sizes, medium sizes, indices and weightings.[7]

**a. Indicators expressed in absolute sizes** express the investigated phenomenon condition in a time period or the changes that occurred successively in time.

1) *the individual values of the characteristic* corresponding to the specific conditions of production and reproduction of the watched phenomenon.

$$\{y_t\}_{t=1, T}$$

2) *the aggregate volume of the characteristic*: it must be calculated with caution since not all of the characteristics have values that can be summed.

3) *the absolute change*: express with how many units of measure changed the individual value from one period to another period chosen as a basis of comparison. Depending on the basis of comparison can be used:

- absolute changes fixed base:

$$\Delta y_{t/0} = y_t - y_0, t = \overline{1, T}$$

- absolute changes based chain:

$$\Delta y_{t/t-1} = y_t - y_{t-1}, t = \overline{1, T}$$

**b. Indicators expressed in relative sizes**

Unlike the absolute indicators, they can be used in the comparative analysis of the evolution of several phenomena. They play proportion or gap made of various levels of features in different periods.

Therefore, relative indicators express how many times the value of a variable is greater or smaller than the one chosen as the basis of comparison.

1) *the dynamic index*: it is expressed as a ratio or percentage and means how many times (as percent) feature value has changed compared to the comparison period basis (fixed or mobile). It is calculated based on fixed base or chain:

$$Iy_{t/0} = \frac{y_t}{y_0}, t = \overline{1, T} \quad ; \quad It_{t/t-1} = \frac{y_t}{y_{t-1}}, t = \overline{1, T}$$

2) *the changing rhythm* (increase rate)

expresses with what percent has changed its level of feature analyzed at a certain period compared to the level of the comparison period basis. Is calculated :

- as the ratio between the absolute change (based fixed or mobile) and the size of the term during basis of comparison;

-or as the difference between the dynamics index and 1 (if expressed as a coefficient) or 100 (if expressed in percentages).

- with fixed base:

$$R_{t/1} = \frac{y_t - y_1}{y_1} \cdot 100$$

- based chain:

$$R_{y/t-1} = \frac{y_t - y_{t-1}}{y_{t-1}} \cdot 100$$

A particular issue for calculation of relative and absolute indicators is the selection of the comparison basis term. This must be subordinated to the requirement for more comparable terms of chronological series, to be requested better regularity of movement while the phenomenon analyzed.

**c. Indicators expressed by the average sizes**

To characterize the central tendency in the time series of absolute and relative terms is necessary to calculate specific indicators: the average level, median absolute change, the average index average rate of change dynamics and relative.

1) *the average level of terms of time series*: calculation of this indicator is justified only if the terms are homogeneous, and the horizon time series shows not very large oscillations. For the time series of intervals, the terms are summed so that average is calculated using the simple arithmetic average:

$$\bar{y} = \frac{\sum_{t=1}^T y_t}{T}$$

2) *the average index* is obtained as a geometric mean of indices based chain.

$$\bar{I} = T - 1 \sqrt[T]{\prod_{t=1}^T Iy_{t/t-1}}$$

The condition of minimum variation of absolute changes with mobile base should be more respected with absolute average change how it calculates on the basis of the relationship between the first and last term time series, without taking into account the

intermediary terms.[3],[9]

## RESULTS AND DISCUSSIONS

### Situation land fund.

Land fund represents all lands no matter of destination, of the title based on which they are owned or of public or private sector to

which they belong.

Agricultural area includes, by use, the lands with agricultural destination, owned by natural or legal persons, classified as follows: arable land, natural pastures and hayfields, vineyards and vine nurseries, orchards and tree nurseries.

Table 1. The evolution of land use categories

Use category	Property form	2004*		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
		Absolute values	%										
Total	Total	2,921,169	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Private	1,807,794	0.0	0.3	0.7	1.0	1.6	2.0	1.6	-0.8	-0.2	0.2	0.4
Agricultural area	Total	1,741,356	0.0	-0.1	-0.2	-0.3	-0.3	-0.3	-0.5	-0.6	-0.7	-0.7	-0.6
	Private	1,256,067	0.0	-0.1	-0.6	-0.4	-0.4	-0.7	-0.7	-3.6	-3.8	-3.8	-3.7
Arable land	Total	1,221,744	0.0	-0.1	-0.1	-0.3	-0.3	-0.3	-0.4	-0.9	-0.5	-0.4	-0.3
	Private	376,931	0.0	-0.1	-0.6	-0.3	-0.4	-0.7	-0.5	-1.7	-1.4	-1.4	-1.3
Pastures	Total	354,688	0.0	0.2	0.1	0.9	0.8	0.6	0.6	0.1	0.3	0.4	0.3
	Private	87,392	0.0	0.1	-0.3	0.4	0.3	0.3	-0.1	-10.1	-9.9	-9.9	-9.7
Hayfields	Total	86,001	0.0	0.7	0.3	0.7	0.7	0.7	0.1	10.8	1.9	2.1	2.0
	Private	40,286	0.0	0.7	0.1	0.5	0.6	0.6	-0.2	0.6	-8.4	-7.8	-7.8
Vineyards and nurseries	Total	37,615	0.0	-1.6	-2.4	-3.8	-2.8	-2.5	-2.1	-5.0	-5.8	-5.6	-5.7
	Private	47,118	0.0	-1.8	-2.8	-3.8	-2.7	-2.9	-2.0	-5.3	-5.4	-5.3	-5.5
Orchards and tree nurseries	Total	41,308	0.0	-1.6	-4.6	-9.2	-8.4	-8.6	-10.8	-14.2	-15.3	-15.6	-15.7
	Private	1,113,375	0.0	-1.8	-5.0	-9.2	-8.3	-8.5	-10.9	-12.7	-13.6	-13.7	-13.7
Total non-agricultural land	Total	372,935	0.0	0.1	0.3	0.5	0.4	0.5	0.8	0.9	1.2	1.1	1.0
	Private	858,458	0.0	2.2	6.6	7.5	11.2	14.3	12.4	12.6	17.0	18.9	19.5
Forests and other forest vegetation lands	Total	265,526	0.0	0.0	0.2	0.2	0.2	0.3	0.4	1.6	0.6	0.4	0.2
	Private	72,696	0.0	2.9	8.8	9.4	14.0	18.0	15.1	15.1	20.0	21.8	22.2
Waters and ponds	Total	8,485	0.0	0.4	0.4	0.9	0.8	0.4	2.8	-13.6	2.9	1.3	2.3
	Private	86,987	0.0	2.1	2.4	5.3	5.6	6.3	6.3	6.3	20.2	18.8	28.3
Construction	Total	64,747	0.0	0.5	0.4	1.1	1.0	1.5	1.3	1.8	1.7	2.2	1.1
	Private	47,304	0.0	0.9	0.9	2.1	4.1	5.2	5.2	4.2	5.3	6.8	6.4
Roads and railways	Total	6,838	0.0	0.3	0.2	0.9	1.0	0.2	-0.2	-0.1	-0.5	-1.3	-0.4
	Private	47,930	0.0	-7.2	-5.2	-1.8	-0.1	3.0	-0.2	-1.0	14.2	13.3	10.7
Degraded and unproductive lands	Total	27,339	0.0	0.1	0.7	2.1	1.6	3.3	5.2	9.4	9.7	12.6	13.8
	Private	2,921,169	0.0	1.4	2.5	4.8	5.4	4.8	8.0	14.0	15.7	20.0	23.6

Source: Calculations based on data series TEMPO-ONLINE, years 2004-2014, INS \* 2004 = 100

Analyzing the structure of land fund by use was found that both agricultural area and the arable had a negative trend (in that order, of (-0.6%) respectively (0.3%)), both the total and in the private sector (table 1).

Significant changes occurred in terms of surface area occupied by pastures and meadows (which increased by around 0.3% and 2% respectively in 2014 compared to 2004). Reductions of surfaces in 2014 compared to 2004, vines and vine nurseries

were registered (-5.7%) and orchards and nurseries (-15.7%). This decrease can be attributed to several factors, including the aging of existing plantations and lack of financial resources in the establishment of new plantations. Noted the increase in private sector non-agricultural areas (from + 2.2% in 2005 to + 19.5% in 2014) and land degraded and unproductive (from + 1.4% in 2005 compared to 2004 to + 23.6% in 2014 compared to 2004), as shown in figure 2.

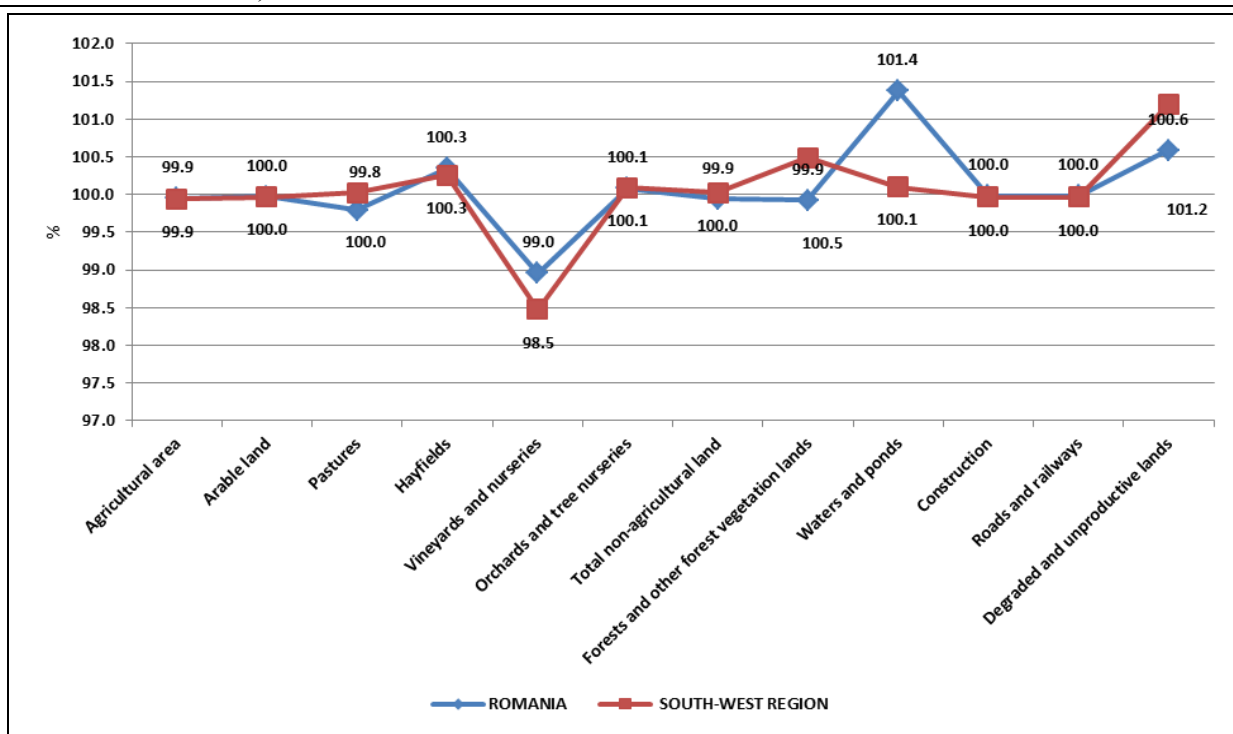


Fig. 2. Total land fund - the average rate of growth, 2004- 2014 (%)

The categories of land that have negative annual rates of growth are: agricultural area (-0.06%/ year), arable land (-0.03%/year), vineyards and vine nurseries (1.69%/year). Rhythms pastures register positive growth (+0.03%/year), meadows (+0.2%/ year), areas occupied by ponds (+1.11%/year), degraded and unproductive (+1.3%/year), etc.

Moreover, the South-West Oltenia region ranks 2 as the area occupied by vineyards and vine nurseries, with 18.10% (38,261 ha) in

total national vineyard surfaces and the area covered with trees and nurseries with 20.60% (40,410 ha) of the total national surface of fruit. In addition, 872,08 ha (12.83%) of the total 6,800,872 hectares of forests, with how much Romania has, are located in the Oltenia region, occupying the 5th place among regions.[10]

Table 2. Park of tractors and agricultural machinery

Categories of equipment	2004*		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Absolute values	%										
Physical agricultural tractors	21,777	0.0	1.7	2.6	1.3	0.8	3.8	7.0	8.5	8.1	14.2	16.2
Tractor-drawn ploughs	18,932	0.0	-1.9	0.5	-0.4	-0.6	-1.0	0.8	5.8	9.6	7.7	8.0
Mechanical cultivators	3,582	0.0	0.9	0.7	0.6	0.2	-2.8	-2.9	-2.8	-9.9	-8.5	-9.7
Mechanical seeders	10,930	0.0	2.0	4.5	2.7	2.3	2.7	4.3	6.5	8.1	10.4	17.0
Mechanical sprayers and dusters	421	0.0	-34.2	-36.6	-51.5	-58.0	-24.9	-30.9	-28.0	-46.1	-41.3	-49.9
Self-propelled combines for cereals harvesting	4,335	0.0	3.9	5.5	0.4	-0.8	-0.1	-0.8	2.2	-2.6	3.0	-12.8
Self-propelled combines for fodder harvesting	46	0.0	-4.3	-2.2	-2.2	-8.7	-28.3	-30.4	-23.9	-54.3	-45.7	-28.3
Combines and machines for potatoes harvesting	14	0.0	-85.7	-85.7	-85.7	-78.6	-57.1	-57.1	-57.1	-71.4	-64.3	-35.7
Straw and hay packing presses	315	0.0	-2.9	-23.8	-8.3	-7.6	35.2	55.2	95.9	62.9	88.9	121.0
Vindrovers for fodder harvesting	118	0.0	20.3	11.9	9.3	5.1	-3.4	-3.4	0.0	6.8	7.6	0.8

Source: Calculations based on data series TEMPO-ONLINE, years 2004-2014, INS \* 2004 = 100

**Material and technical basis of agriculture.**  
 Between 2004-2014 an increase was registered in farm tractors (from 1.7% in 2005 to 16.2%), in mechanical seeders (from 2% to 17%), while starting from 2009 the bale

presses occupy a significant percentage in the farming machinery endowment structure at the South West region level (from 35.2% to 121%). Rise in purchase of bale presses is due to the growing areas for grazing and hay.

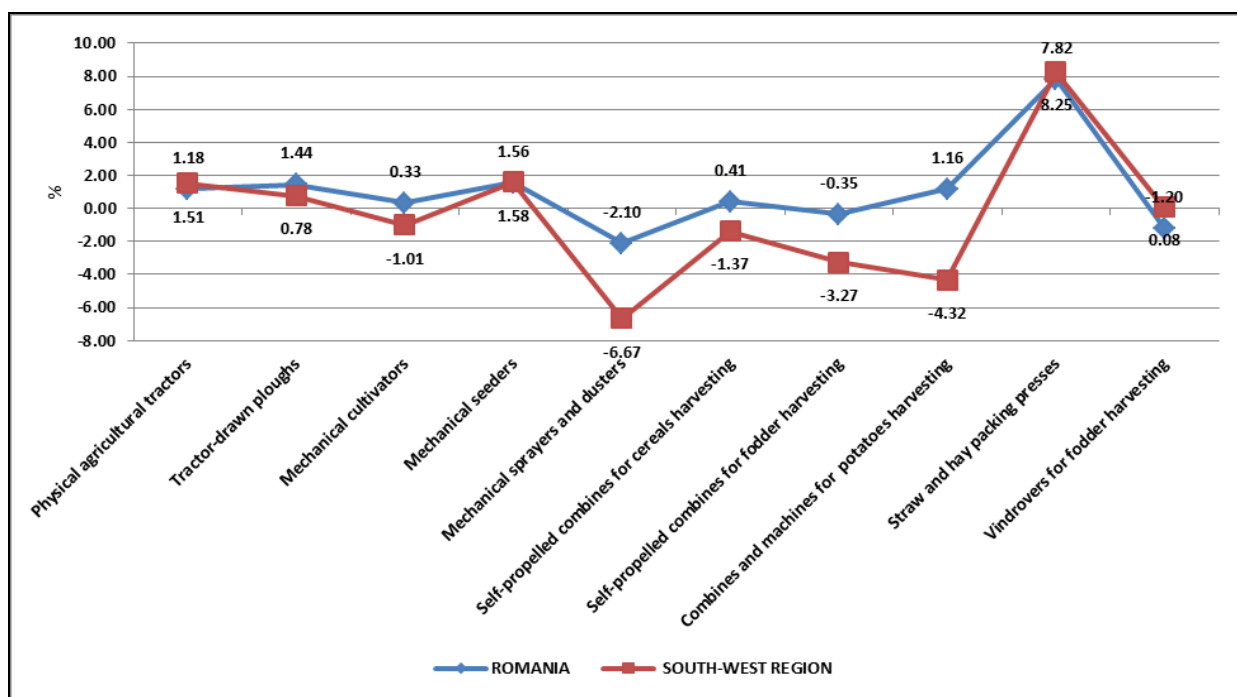


Fig. 3. Technical equipment - annual growth rate, 2004-2014 (%)  
 Source: Own calculation.

From the equipment point of view, in the South West region, the arable surface per tractor was 42 hectares in 2014 (compared to only 38 ha in the country) this not being an

advantage in the context of escalating fragmentation of agricultural land than in other regions and in comparison with other European countries.[5]

Table 3. The loading on agricultural machines (ha/tractor/agricultural machine)

Specification	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Physical agricultural tractors	55	52	47	45	47	46	44	44	44	43	42
Tractor-drawn ploughs	63	62	56	52	55	55	54	52	50	52	52
Mechanical cultivators	334	319	293	272	288	297	294	302	322	326	328
Mechanical seeders	110	104	92	87	92	92	90	90	88	88	83
Mechanical sprayers and dusters	2,844	4,168	3,954	4,812	5,829	3,271	3,517	3,466	4,576	4,318	5,031
Self-propelled combines for cereals harvesting	231	215	189	184	189	190	174	179	187	184	216
Combines and machines for potatoes harvesting	761	8,308	8,406	3,954	6,025	3,153	3,023	3,096	3,778	2,818	1,452
Vindrovers for fodder harvesting	277	288	365	305	302	207	179	157	174	150	128

Source: Calculations based on data series TEMPO-ONLINE, years 2004-2014, INS

### The situation crop production

In the South-West Oltenia region the natural resources constitutes, along with agricultural resources, an undeniable potential that cannot be delocalized, but which is showing different

degrees of vulnerability to climate change and environmental issues.[1] Soil fertility is affected to a greater or lesser extent by different harmful causes such as: erosion, low



content of humus, compaction, acidity, deficiency or excess of water and nutrients, salinity, excessive texture (sand or clay) chemical pollution.[2]

Table 4. Areas planted with main crops plant

Specification	2004*		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Absolute values (ha)	%										
GRAIN	1,000,706	0.0	-3.4	-13.8	-19.9	-18.8	-17.6	-25.3	-20.9	-21.2	-18.1	-18.4
Wheat	492,590	0.0	7.1	-5.9	-20.0	-23.0	-22.5	-18.0	-28.9	-36.8	-21.4	-22.4
Barley and two-row barley	25,266	0.0	59.1	11.0	-1.2	-6.9	29.1	40.0	-2.4	11.8	63.8	74.0
Maize	458,731	0.0	-18.2	-24.1	-22.6	-16.7	-16.7	-39.7	-15.8	-9.7	-24.4	-23.9
Rice	0	0.0	0.0	0.0	0.0	184.2	462.0	516.5	472.9	207.5	-90.7	192.0
Oleaginous	103,403	0.0	-27.0	-20.4	-7.0	11.1	2.2	51.3	34.4	27.6	43.3	41.7
Sunflower	90,617	0.0	-23.0	-18.5	-25.3	-11.4	-24.5	1.6	13.0	27.4	45.9	36.2
Rapeseed	4,445	0.0	0.7	50.6	513.5	641.0	700.8	1326.2	715.0	249.6	239.5	381.8
Soybeans	5,901	0.0	-80.9	-77.3	-84.9	-95.6	-99.4	-97.4	-99.0	-97.3	-98.6	-95.3
Sugar beet	351	0.0	122.5	355.3	-26.8	-100.0	-100.0	-100.0	-100.0	-97.2	-100.0	-84.6
Potatoes- total	10,659	0.0	55.9	57.7	-25.8	69.6	77.5	70.1	74.2	41.8	32.2	22.6
Textile plants	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tobacco	2,236	0.0	-34.1	-84.2	-81.3	-83.1	-100.0	-99.1	-94.0	-92.8	-93.6	-93.9

Source: Calculations based on data series TEMPO-ONLINE, years 2004-2014, INS \* 2004 = 100

The analysis of the cultivated areas revealed that the surfaces used for a large number of vegetable crops decreased, with significant values for soybeans, sugar beet, tobacco, and but also for grain cereals (eg. maize and wheat). An increase in acreage was registered in the case of rapeseed, rice (except for 2013) and potato, while hemp crop cultivated area has not changed much compared to 2004, considered as a base.

Values for cultivated areas are closely related to the current state of soil quality. This is determined both by the natural conditions which the soils are in, and by the managing methods that do not always ensure the necessary arrangements, the proper way of use, a full and correct implementation of the most appropriate zonal agricultural systems and proper culture technologies.[8]

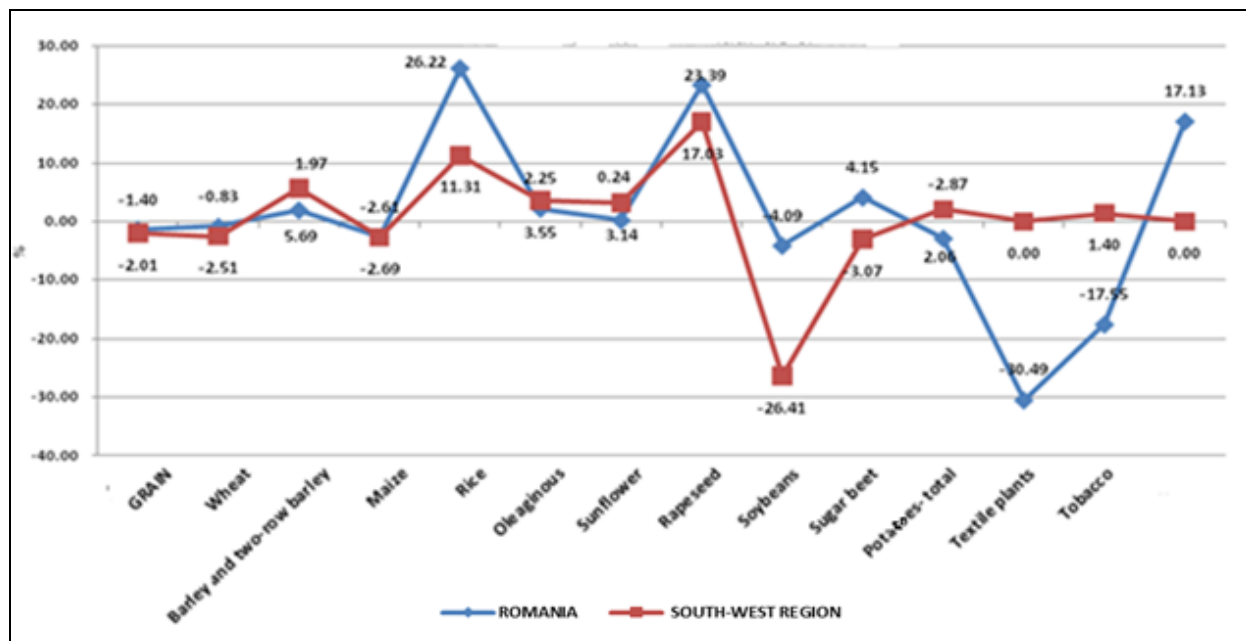


Fig. 4. Dynamics of the vegetable crop areas, 2004-2014 (%)

Source: Own calculation.

The value of crop production has a relevant share in the structure of agricultural production value, ranging from 64.2% (due to

floods) in 2005 to 74.9% in 2013 (due to higher yields obtained).

Table 5. Average crop production

Specification	2004*		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Absolute values (to)	%										
GRAIN	3,719	0.0	-10.2	-23.7	-77.6	-21.7	-15.5	-15.6	-3.7	-49.5	-8.8	-4.3
Wheat	3,308	0.0	-10.8	-27.6	-76.1	-7.7	-21.2	-25.1	-2.7	-27.6	-14.4	-3.4
Barley and two-row barley	3,536	0.0	-26.2	-39.1	-79.5	-19.5	-22.3	-29.0	-20.2	-37.4	-27.4	-13.4
Maize	4,231	0.0	-4.4	-15.9	-79.0	-32.8	-10.2	1.7	-4.0	-65.5	0.6	-2.2
Rice	0	0.0	0.0	0.0	0.0	82.6	106.3	52.8	95.5	54.8	-34.9	49.0
Oleaginous	2,987	0.0	82.6	106.3	52.8	95.5	54.8	-34.9	49.0	0.0	82.6	106.3
Sunflower	1,014	0.0	60.4	36.5	-33.8	78.3	40.1	69.8	65.8	28.9	25.2	137.2
Rapeseed	1,788	0.0	76.6	-39.1	-86.1	-18.6	-50.7	-13.3	5.3	-70.5	0.0	16.7
Soybeans	15,325	0.0	102.0	32.2	-31.6	-100.0	-100.0	-100.0	-100.0	-32.1	-100.0	-47.3
Sugar beet	14,050	0.0	-21.1	-19.3	-20.0	-20.7	3.4	-1.7	-3.2	-23.1	-4.5	-5.2
Potatoes- total	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Textile plants	1,220	0.0	-25.6	-10.6	-56.9	46.8	-100.0	2.5	21.1	-65.1	-24.3	-15.0
Tobacco	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Calculations based on data series TEMPO-ONLINE, years 2004-2014, INS \* 2004 = 100

Table 5 presents the changes in the average yields values of the main vegetable crops in the South-West Oltenia region corresponding to time frame 2005 to 2014 compared with 2004 which considered as a basis. Oilseeds and sunflower showed significant increases of production values, in counterbalances with

cereals, soybeans and textile plants which still display a relative increase in 2014. About potato and tobacco it can be said that there were no changes in production values, these values being superior to the national values, as it can be seen in figure 5.

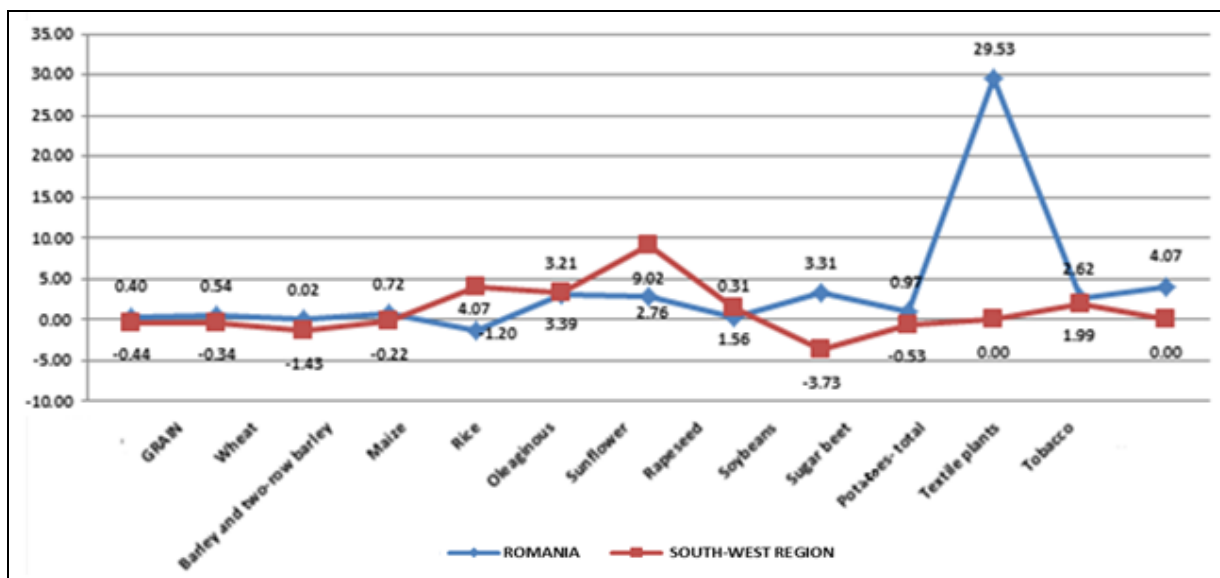


Fig. 5. The average annual production at the main vegetable crops - annual growth pace, 2004-2014 (%)  
 Source: Own calculation.

## CONCLUSIONS

The rural economy of South-West Oltenia, almost totally dependent on agriculture, has become a "subsistence economy", her only role is to provide basic necessities for most of the population.

It is a rural area with a high share of employment in agriculture and low profitability of farming activities due to land

fragmentation, small productive units, low mechanization etc. The current state of soil quality is determined both by the natural conditions which the soils are in, and by the managing methods that do not always ensure the necessary arrangements, the proper way of use, a full and correct implementation of the most appropriate zonal agricultural systems and proper culture technologies.

Regarding agricultural area, the South-West

Oltenia region ranks 7th among the other regions of the country (1,797,633 hectares) with 12.32% of the national agricultural area. South-West Oltenia region is the balanced agricultural type, with higher percentages of cereal and oily plant crops. The value of crop production has a relevant share in the structure of agricultural production value, ranging from 64.2% (due to floods) in 2005 to 74.9% in 2014 (due to higher yields obtained). Improvement of the agricultural production structure should meet the requirements of consumer demand and product quality. The dominant extensive character of the agricultural production is determined by the low level of factors allocated (fertilizers, irrigation, seed variety, etc.) that influence the yields and by the decrease of the areas with intensive crops (hemp, tobacco, sugar beet) in favor of cereals and oil plants which have lower yields and lower prices. The reduced level of intensification and diversification of agricultural production maintain low productivity gaps in Romania in the period 2004-2014.

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