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Research article

RISK ASSESSMENT OF THE MAIN CROPS FROM THE AGRICULTURAL VEGETABLE
PRODUCTION IN ROMANIA AND IN TELEORMAN COUNTY

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ABSTRACT: Knowledge of the indicators that are characterizing agriculture vegetable production is a factor of risk management at all levels where decisions regarding agriculture are taken. The fourth crops analyzed wheat, barley, corn and sunflower occupies large areas both at country level and at the Teleorman County. The study revealed large oscillations of the medium productions and of the purchase prices of these crops which have a great influence on the economic conditions and the living standards of the population. In order to minimize these effects is highlighted the need to improve the management of these crops through applied technology and crop insurance.

Keywords: square standard deviation, standard deviation, confidence intervals, risk, annual growth rate, amplitude of oscillation

INTRODUCTION

Considering what the world faces, worldwide and even at European level, with many events and special situations of climate changes and the evolution of economic and political relations, the knowledge regarding the indicators evolution characterizing the field crops production, is a factor that may influence the effects of the people's living standards, on social relations, etc. (BUHOCIU Liviu)

In this context, a special place has the agriculture – a domain which is primarily providing food for everyone on the planet, regardless of social position, status and training, age, employment, political beliefs, any time and any place and contributes to jobs creation and economic development.

Studying the influence of natural conditions remains an unknown that is characterizing geographical areas, but differs in terms of our country, on the micro-areas, specific to each agricultural activity in part.

¹The purpose of this paper is to highlight the oscillations of the average productions over a longer period of 11 years, manifested on the main crops in Teleorman County and comparing these indicators with those obtained on national level.

MATERIALS AND METHODS

In this analysis we used the following indicators: mobile arithmetic average, square standard deviation, standard deviation, coefficient of variation, confidence intervals for a given risk, average annual growth rate, amplitude confidence intervals for a given risk towards the average and statistical significance of these indicators. The data were used as source: The Romanian Statistical Yearbook and the Statistical Yearbook of Teleorman County.

The formulas used (3,6):

For the arithmetic average = $\bar{x} = \frac{\sum xi}{n}$, where:

\bar{x} = mobile arithmetic average; Xi = average production values on a number of years (i);
n = number of years considered

For average annual growth rate = $r_{2000-2010} = \sqrt[11]{\prod p1/p0} - 1$, where:
 $r_{2000-2008}$ = average annual growth rate; $\prod p1/p0$ = growth indicators in chain

For standard deviation = $\sigma = \sqrt{\frac{\sum (\bar{x} - xi)^2}{n}}$, where:

σ = standard deviation; xi = average production values on a number of years
n = number of years considered

For the square standard deviation = $\delta x = \sqrt{\frac{\sum(\bar{x} - x_i)^2}{(n-1)}}$, where:

δx = the square standard deviation; confidence intervals for certain levels of risk = $\bar{x} \pm \delta x * tp$, where tp= tabular values based on probability and number of observations (in this case the number of years).

For confidence intervals for a given risk: $X \pm \delta x * tp$, in which:

X= arithmetic average; square standard deviation;

tp= tabular value for the transgression probability (risk)

The oscillation amplitude of the reliable intervals = $((X + \delta x * tp - X - \delta x * tp) / (X)) * 100$

For the coefficient of variation = $C = \frac{\delta}{X} * 100$, in which:

C –coefficient of variation (expressed as percentage)

The coefficient of variation can be: between 0-10% - low variation, between 10-20% - middle variation, over 20% - big variations

RESULTS

In Teleorman County, the agriculture occupies a total area of 475,700 ha. The arable land is 351,909 hectares, meaning 76.88% of the county and 1.19% of the total arable land. From the arable land of the county, the great property has 37,332 hectares, meaning 10.61%, and small property 314,577 hectares, meaning 89.39%. By analyzing table no. 1, in the period 2000-2010 we find that on district level, the wheat occupies 180 000 ha, with a slight growth rate of 0.09%, the barley occupies an area of 25,000 ha with an annual surfaces growth rate of 5.72%, the corn occupies an area of 98,000 ha with surfaces that are decreasing (r = -4.66%), and the sunflower where the average size was 70 000 ha, also decreasing (r = -2.19%)

Table no. 1. The evolution of the areas occupied by the main crops, on country total level and in Teleorman County, during 2000-2010

Culture		UM	YEARS						Average/ rhythm*
			2000	2003	2005	2007	2009	2010	
Wheat	Country level	Thousand ha	1940.2	1735.2	2476	1975	2148	2162	2154
		%		0.76	1.08	0.98	1.02	1.01	1.09
	Teleorman County	Thousand ha	153.1	147.9	221.2	188.5	174.9	154.5	180
		%		0.82	1.02	0.99	1.14	0.88	0.09
Barley	Country level	Thousand ha	411.9	329.6	484.6	363.8	517.5	515.8	444
		%		0.57	1.14	1.10	1.31	1.00	2.27
	Teleorman County	Thousand ha	20.3	10.1	27.1	14.6	30.5	35.4	25
		%		0.26	0.94	0.96	1.55	1.16	5.72
Corn	Country level	Thousand ha	3049.4	3199.6	2628.5	2524.7	2338.8	2098.4	2722
		%		1.11	0.80	1.00	0.96	0.90	-3.67
	Teleorman County	Thousand ha	120.7	125.1	89.9	71.6	84.4	74.9	98
		%		1.20	0.74	0.79	1.00	0.89	-4.66
Sunflower	Country level	Thousand ha	876.8	1188	971	835.9	766.1	790.8	902
		%		1.31	0.99	0.84	0.94	1.03	-1.03
	Teleorman County	Thousand ha	80.2	95.4	66.7	61.5	55.2	64.3	70
		%		1.32	0.82	0.80	0.98	1.16	-2.19

Source: The Romanian Statistical Yearbook 2011 (4); the Teleorman County Statistical Yearbook 2011 (5). Analyzing the average productions per analyzed period (table no.2) is found that the wheat crop varied, on country level, between 1429 kg / ha in 2003 and 3403 kg / ha in 2008, with an average annual rate growth of 1.63% and the county level between 719 kg / ha in 2003 and 3510 kg / ha in 2001 with an average annual growth rate of 1.00%. For a probability of 60% (40% risk), the amplitude intervals of confidence is 48.01% of the 11 years analyzed at country level and 63.20% in Teleorman County (table no.3).

Analyzing the average prices of wheat crop procurement (table no.4), it highlights the fact that during 2000-2010, they were between 90.76 USD/t in 2002 and 262.02 USD/t in 2008, with an annual growth rate of 4.40% at country level.

The coefficient of variation of the purchase price is considered high, and the amplitude of the confidence intervals for the probability of 60% is 63.35% (table no. 5).

Table No.2. The evolution of the average production at the main crops on country total level and in Teleorman County - Period 2000-2010

Culture		UM	YEARS						Average/ rhythm*
			2000	2003	2005	2007	2009	2010	
Wheat	Country level	kg/ha	2286	1429	2965	1541	2421	2688	2531
		%		0.74	0.87	0.56	0.71	1.11	1.63
	Teleorman County	kg/ha	2386	719	2603	1166	2276	2636	2444
		%		0.33	0.80	0.42	0.67	1.16	1.00
Barley	Country level	kg/ha	2105	1641	2227	1461	2284	2542	2360
		%		0.82	0.67	0.63	0.74	1.11	1.90
	Teleorman County	kg/ha	3229	967	2351	1154	2549	2733	2670
		%		0.42	0.59	0.48	0.72	1.07	-1.65
Corn	Country level	kg/ha	1603	2993	3952	1526	3409	4309	3180
		%		1.03	0.89	0.43	1.06	1.26	10.39
	Teleorman County	kg/ha	355	1662	3848	618	3899	4948	2886
		%		0.54	0.94	0.18	1.74	1.27	30.14
Sunflower	Country level	kg/ha	821	1268	1381	654	1433	1597	1260
		%		1.15	0.87	0.42	1.00	1.11	6.88
	Teleorman County	kg/ha	450	1001	1345	455	1667	1791	1227
		%		0.93	0.85	0.30	1.42	1.07	14.81

Source: The Romanian Statistical Yearbook 2011 (4); the Teleorman County Statistical Yearbook 2011 (5).

On barley crop in the analyzed period, the country has achieved average production ranging from 1461 kg / ha in 2007 and 3312 kg / ha in 2004, registering an annual average growth rate of 1.9%.

In Teleorman County, the average production of barley showed oscillations between 967 kg / ha in 2003 and 4139 kg / ha in 2001, with a decreasing average annual rate of -1.65% (table no.2). For a probability of 60% (risk of 40%) confidence intervals on the average amplitude of the analyzed period is 43.77% on country level and 68.24% in Teleorman (table no. 3). The analysis of the average prices on purchases per total country during 2000-2010 (table no.4) reveals that they ranged between 78.66 USD/t in 2002 and 265.99 USD/ t in 2008, recording an annual growth rate of 1.91%. The coefficient of variation of the purchase price, in terms of meaning, is considered high, and the amplitude of the confidence intervals for the probability of 60% (40% risk) is of 71.70% (table no. 5).

On the corn crop, the average productions obtained on country level during 2000-2010, showed oscillations between 1526 kg/ha in 2007 and 4441 in 2004, with an average annual growth rate of 10.39% (Table no.2).

In Teleorman County level, the average corn production achieved ranged between 355 kg/ha in 2000 and 4948 kg/ha in 2010, registering the average annual growth rate of 30.14%. Taking into account a probability of 60% (40% risk), it follows that the analyzed average period, the amplitude intervals is 53.07% reliable in the country and 91.20% for Teleorman County. The analysis of the average purchase price during 2000-2010 (table no. 4), it is noted that they ranged from 84.71 USD/t in 2002 and 285.84 USD/t in 2008, with an annual increase of 4.45%. In terms of coefficient of variation of the purchase price (table no. 5), it is considered high, and the amplitude of the confidence intervals for the probability of 60% (40% risk) is 70.47%.

On the sunflower crop, the analysis of the average production during the analyzed period (table no. 2), shows that on country level, they showed oscillations between 654 kg/ha in 2007 and 1597 kg/ha in 2010, recording a average annual growth rate of 6.88%. In Teleorman County, the average production per hectares ranged from 450 kg/ha in 2000 and 1791 kg/ha in 2010, with an average annual rate of 14.81%. Taking into account a probability of 60% (40% risk), it highlights the fact that the amplitude intervals of confidence in the studied period is 45.01% for the country and 65.85% for Teleorman County (Table No. 3).

In terms of average purchase prices, it follows that the total country, they have ranged between 161.34 USD/t in 2000 and 444.64 USD/t in 2008, with an annual growth rate of 8.71% (table no. 4). The coefficient of variation of the purchase price, in terms of meaning, is considered high (table no. 5), and the amplitude of the confidence intervals for the probability of 60% is 62.38%.

Table 3. The coefficient of variation and amplitude (risk 40%) average productions achieved at the major crops in the country total level and Teleorman County-Period 2000-2010

Culture		Average	Standard Deviation	The coefficient of variation		Intervals		Amplitude towards
		on years				p=60%, risk 40%		
		2000-2010				minimum	maximum	
		kg/ha	kg/ha	%	semmif	thousand head	thousand head	average(%)
Wheat	Country Level	2531	651.72	25.75	big	1924	3139	48.01
	Teleorman County	2444	828.24	33.89	big	1672	3216	63.20
Barley	Country Level	2360	554.08	23.47	big	1844	2877	43.77
	Teleorman County	2670	977.07	36.60	big	1759	3581	68.24
Corn	Country Level	3180	905.06	28.46	big	2336	4024	53.07
	Teleorman County	2886	1411.30	48.91	big	1570	4202	91.20
Sunflower	Country Level	1260	304.14	24.14	big	976	1544	45.01
	Teleorman County	1227	433.28	35.31	big	823	1631	65.85

Source: The Romanian Statistical Yearbook 2011 (4); the Teleorman County Statistical Yearbook 2011 (5).

Table 4. Average purchase price evolution on the main crop products nationwide and in Teleorman County during 2000-2011

Culture	UM	YEARS						Average/rhythm*
		2000	2003	2005	2007	2009	2010	
Wheat	USD/to	119.85	153.61	123.55	250.17	160.41	184.38	158
	%		1.69	0.73	2.07	0.61	1.15	4.40
Barley	USD/to	106.02	144.58	120.12	241.97	150.17	128.13	147
	%		1.84	0.74	1.89	0.56	0.85	1.91
Corn	USD/to	115.24	138.55	106.39	225.57	163.82	178.13	153
	%		1.64	0.63	2.11	0.57	1.09	4.45
Sunflower	USD/to	161.34	180.72	247.11	344.50	293.52	371.88	263
	%		0.91	1.05	1.38	0.66	1.27	8.71

Source: The Romanian Statistical Yearbook 2011 (4); the Teleorman County Statistical Yearbook 2011 (5).

Table 5. The coefficient and amplitude variation (risk 40%) of the average purchase price main crop products nationwide and in Teleorman County during 2000-2010

Culture	Average	Standard Deviation	Coefficient of variation		Intervals		Amplitude towards	
	Of the years				p=60%, risk 40%			
	2000-2010				minim	maxim		
		USD/to	USD/to	%	semmif	USD/to	USD/to	The average (%)
Wheat	157.96	53.66	33.97	var big	107.92	207.99		63.35
Barley	146.57	56.35	38.45	var big	94.02	199.11		71.70
Corn	152.75	57.72	37.79	var big	98.93	206.57		70.47
Sunflower	262.75	87.89	33.45	var big	180.80	344.69		62.38

Source: The Romanian Statistical Yearbook 2011 (4); the Teleorman County Statistical Yearbook 2011 (5).

CONCLUSIONS

From the analysis of statistical data at the country level and experimental data on average production obtained over a period of 11 years in four major crops in Romania, results the following:

1. The corn crop, the oscillations of the average production on county level and in Teleorman County, represented by the coefficient of variation, are considered high, showing a rate of 25.75% and 33.89% for the Teleorman County. Also, prices oscillations were high and their amplitude, for a probability of 60% was 63.35%.
2. On barley crop, the variations of the averages productions at country level and in Teleorman County are considered high based on the coefficient of variation, and amplitude to the average production for the entire period of analysis is 43.77% on country level and 68.24% in Teleorman County. And the purchase prices recorded large oscillations, their amplitude for the probability of 60% being of 71.70%.
3. On corn crop, also stands high oscillations of the average productions both on country level and Teleorman County, expressed as the coefficient of variation; the amplitude toward the average production is 53.07% at the country level and of 91.20% for the Teleorman County.
4. Oscillations of the average purchase prices were high, so that for a probability of 60% (40% risk), their amplitude was 70.47%.
5. On sunflower crop is highlighted the differences between the smaller productions on country and county level. The coefficient of variation is considered high, and the amplitude is 45.01% on country level and 65.85% on county level.
6. In terms of average purchase prices, their variations were high and their amplitude on the entire period of analysis was at 62.38% for the probability of 60%. Because in the Law 381/2002 on agricultural insurance is specified a limit of 30% from production that covers the damage, it results that the amplitude for the lower limit of 60% probability (risk 40%) of the average productions for 2000 -2010, that I analyzed, are, in Teleorman County of 1672 kg/ha of wheat, of 1759 kg/ha for barley, of 1570 kg/ha for corn and 823 kg/ha for sunflower. It follows that the risk of 40%, for the limit of 30% would mean annual compensations of the insured amounts at these cultures.
7. To remove the large production differences from one year to another, we believe that these indicators can be calculated for mobile averages of 4 or 5 years. The elimination of very big productions or very low ones would diminish the results analyzed. Such indicators are needed to assess risks in the analyzed crops both at producers and the insurer's level.

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