MONTHLY FLUCTUATIONS IN THE PRICES OF GRAIN IN SERBIA

MESEČNA KOLEBANJA CENA ZRNA U SRBIJI

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ABSTRACT

Determining monthly fluctuations in the prices of wheat and corn in Serbia can indicate economically optimal time for selling wheat or corn.

The paper analyzes monthly movement of the prices of wheat and corn in Serbia in the period from 2005 to 2015. The research included the analysis of the selling prices (i.e. the prices at which agricultural enterprises and cooperatives sell grain) and the purchase prices (i.e. the prices at which farmers sell their grain).

The highest level of the average purchase prices of wheat were reached in March and May, while the average selling prices of wheat were the highest in February. For corn, both the purchase and selling prices reached their peak in July.

Keywords: price of wheat, price of corn, monthly price indices.

REZIME

Promene ponude i tražnje na tržištu žitarica u značajnoj meri određuju i nivo cena pšenice i kukuruza. Tržišna kretanja u Srbiji upućuju na zaključak da je tržište pšenice relativno stabilno, dok je tržište kukuruza daleko nestabilnije zbog uticaja najznačajnije segmenta tražnje na srpskom tržištu, a to je izvoz.

Cilj ovog rada je da se na osnovu analize višegodišnje serije sagledaju mesečna kolebanja cena pšenice i kukuruza u Srbiji. Sagledavajući mesečna kolebanja cena pšenice i kukuruza u Srbiji može se izvući zaključak kada je, sa ekonomskog aspekta optimalno vreme prodaje pšenice, odnosno kukuruza.

U radu je analizirano mesečno kretanje cena pšenice i kukuruza u Srbiji u periodu od 2005. do 2015. godine. Analizirane su prodajne cene (cene po kojim poljoprivredna preduzeća i zadruge prodaju žitarice) i otkupne cene (cene po kojima seljaci prodaju svoje žitarice).

Najviši nivo prosečne otkupne cene pšenice dostižu u martu i maju mesecu, dok su prosečne prodajne cene pšenice najviše u februaru mesecu. Kod kukuruza i otkupne i prodajne cene svoj maksimum dostižu u julu mesecu.

Na osnovu ovih istraživanja može se zaključiti da skladištenje žitarica u našim uslovima samo u pojedinim godinama ima ekonomsku opravdanost, i to onda kada je rod relativno mali. U ostalim godinama skladištenje sopstvenog žita je nužni trošak, koji nema ekonomsku efektivnost u odlaganju prodaje.

Ključne reči: cena pšenice, cena kukuruza, mesečni indeksi cena.

INTRODUCTION

Changes in supply and demand on the grain market significantly influence the level of wheat and corn prices. Market trends in Serbia indicate that the wheat market is relatively stable, while the corn market is far more volatile because of the impact of the most important segment of the demand on the Serbian market, which is export (Mutavdžić *et al.*, 2017).

The aim of this study is to analyze a multi-year series in order to determine monthly fluctuations in wheat and corn prices in Serbia. Since the economics of using silos, and storehouses in general, depends on the difference between the real growth of grain selling prices and the cost of drying, storage and shrinkage of the grain (Novković *et al.*, 2006), the determined price fluctuations can indicate economically optimal time for selling wheat or corn.

MATERIAL AND METHOD

The paper analyzes monthly movements in wheat and corn prices in Vojvodina in the period from 2005 to 2015. The research included the analysis of the purchase prices (the prices at which farmers sell their grains) and selling prices (the prices at which agricultural enterprises and cooperatives sell grains). Statistical analysis was performed for seasonal (monthly) price fluctuations in the studied period, including:

- The monthly rates of price changes on the annual basis,
- The average monthly rate of changes in the studied period,
- Absolute monthly growth (decline) of prices,
- Average monthly growth in the studied period (Čobanović *et al.*, 1996)

- Relative (index) monthly changes of the prices compared to the base month.

The base month is the month of crop arrival. The base month for wheat was July, and the analysis included the months until June of the following year. The base month for corn was October, and the study period was twelve months, ending in September of the following year.

Data for the analysis were taken from official publications of the Statistical Office of the Republic of Serbia. The data were analyzed using the software package for statistical analysis - *Statistica 12*.

RESULTS AND DISCUSSION

The average monthly rates of changes in wheat prices on the annual basis and the average value for the studied period 2005-2015 are given in Table 1.

Fluctuations in the grain prices in the studied period, which were determined based on the average monthly rate of change, indicate that the purchase price of wheat achieved the sharpest increase in the production year 2010/11, at a rate of 4.75 %. In the same production year, the selling price of wheat also achieved the sharpest increase, but at a much higher rate (7.24 %). The sharpest decline in the purchase prices of wheat was in the production year 2008/09, at a rate of -2.88 %.

The only decline in the sales prices of wheat in the analyzed period 2005-2015 was recorded also in the production year 2008/09, at a rate of -2.94 %. In the studied period 2005-2015, the selling prices of wheat achieved slightly faster growth (at a monthly rate of 1.56 %).

Table 1. Average monthly rates of changes in wheat prices (%)

Period *	Changes of farm price (%)	Changes of selling price (%)
2005-2006	1,82	2,68
2006-2007	1,30	1,63
2007-2008	2,84	3,69
2008-2009	-2,88	-2,94
2009-2010	1,57	0,88
2010-2011	4,75	7,24
2011-2012	1,94	0,51
2012-2013	-1,04	0,09
2013-2014	1,07	0,93
2014-2015	-0,03	0,89
2005-2015	1,13	1,56

*July-June

Fluctuations in the monthly prices of wheat were determined also on the basis of the absolute monthly changes in prices in the studied period. Tables 2 and 3 show the absolute monthly changes in prices and the absolute annual growth in the purchase and selling prices of wheat. The tendencies in the absolute monthly changes of the purchase and selling prices of wheat in most of the years of the studied period were the same, except that there were differences in monthly price fluctuations. The highest nominal annual growth of the purchase prices was recorded in 2010/11, amounting to 8,135 rsd/t, while the sharpest decline in the purchase prices of wheat was in the production year 2008/09. In the same production years, the selling prices of wheat also experienced the highest nominal growth and decline. Table 4 presents the medium values of the monthly indices of wheat purchase and selling prices, the extreme values and

the coefficients of variation. The highest average value of the monthly indices of wheat purchase prices were recorded in March and May, while the maximal value of the indices of the purchase prices was determined in March. The greatest variability of the average monthly indices of wheat purchase prices was recorded in April. The average value of the indices of wheat selling prices was the highest in the period from February to May, while the maximal value was recorded in March. The greatest variability of the selling prices of wheat is typical for the month of April. Based on the values in the Table, it can be seen that the coefficients of variation of monthly indices for wheat selling prices were slightly higher than for the purchase prices. This indicates a higher level of risk for selling wheat to the end users. The graph (Figure 1) shows the average monthly indices of the purchase and selling prices of wheat in the period 2005-15. The nominal monthly purchase and selling prices of wheat increase almost linearly until March of the following year, while in April there is a small decline in the prices, and in May the prices return to the level of March. In June, there is a significant decline in both the purchase and selling prices of wheat compared to May. The average monthly rates of changes in corn prices, both annually and averagely for the studied period (2005-15), are given in Table 5. The highest rate of the average monthly growth of corn purchase prices was recorded in 2006 and 2009, when corn selling prices experienced the sharpest increase. The decline of both the purchase and selling prices of corn was determined in 2007 and 2012. In the studied period, the growth of corn selling prices was higher (2%) compared to the purchase prices (1.57 %). Also, the growth in the corn prices in the studied period was higher compared to the growth in the wheat prices.

Table 2. Absolute monthly changes in purchase prices of wheat (rsd/t)

Month	Changes of purchase price (rsd/t)									
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
VII	561	-39	602	-67	-1.411	388	-3.093	1.083	-3.431	-683
VIII	-125	-179	606	-579	128	166	239	2.822	-69	-97
IX	349	210	556	-309	-296	763	869	478	112	5
X	-25	76	2.550	934	-193	354	-1.321	1.457	366	680
XI	55	525	350	-1.816	353	5.768	-282	-176	1.409	2.037
XII	85	5	984	-541	1.424	1.214	443	-921	1.413	1.159
I	574	486	557	-891	-303	845	873	783	-2.245	-350
II	-38	381	2.085	-191	169	3.508	1.290	-1.161	2.740	-5
III	622	-29	531	-168	55	1.850	916	-1.351	-277	-524
IV	65	-171	-597	-805	-521	-1.069	-2.185	-570	-948	-209
V	-28	148	1.201	626	180	-529	3.007	130	3.294	-183
VI	108	-67	-4.274	-382	776	-5.123	-25	-3.797	-3.882	-2.559
VII-VI	2.203	1.346	5.151	-4.189	361	8.135	731	-1.223	-1.518	-729

Table 3. Absolute annual monthly changes in selling prices of wheat (rsd/t)

Month	Changes selling price (rsd/t)									
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
VII	-1.260	-792	124	-1.246	-789	752	-4.323	198	-5.406	-1.059
VIII	340	130	2.176	-834	-178	2.166	-3.028	2.549	-385	478
IX	445	244	414	-710	330	1.783	406	582	-109	-689
X	-6	-340	3474	308	-581	1.728	-676	898	923	1.070
XI	-196	255	1130	50	302	2.753	826	720	1.433	1.031
XII	328	1.597	-410	-817	3778	1.500	535	-327	723	1.501
I	499	271	1.632	-859	-1.299	2.295	825	-994	1.254	626
II	411	192	1.370	243	-927	3.077	1.431	418	-1.201	128
III	714	185	-346	-511	337	1.906	132	-3.118	1.066	-1.040
IV	-201	-412	1.681	-1.565	-255	-1.475	-502	1.018	928	-586
V	-8	317	295	2.072	-146	-1.444	770	-271	-139	-593
VI	79	-730	-6.202	-1.471	-375	-1.006	446	-1.262	-2.718	-32
VII-VI	1.633	917	5.338	-5.340	-1.123	14.035	-3.158	5.711	-3.631	835

Table 4. Average monthly index of wheat farm and selling price (2005-15)

Month	Purchase price				Selling price			
	X	Min	Max	C _v (%)	X	Min	Max	C _v (%)
VII	100	100	100	0	100	100	100	0
VIII	101	96	113	4,75	104	85	120	10,62
IX	104	94	116	6,41	106	87	134	14,04
X	107	96	134	11,11	112	84	157	21,58
XI	114	88	161	18,76	118	88	174	25,37
XII	119	85	171	20,45	126	86	187	24,47
I	120	79	178	22,66	129	80	207	28,88
II	127	77	209	28,20	134	82	233	33,54
III	129	76	224	31,32	134	79	250	36,81
IV	124	71	215	31,70	133	68	237	37,64
V	129	75	211	29,55	134	82	225	34,37
VI	116	73	167	22,23	123	72	216	31,33

Fig. 1. Average monthly indices of purchase and selling prices of wheat in the period 2005-15

Table 5. Average monthly rates of changes in corn prices (%)

Period *	Changes of purchase price	Changes of selling price
2005-2006	2,36	2,89
2006-2007	6,57	5,86
2007-2008	-4,69	-4,30
2008-2009	0,84	1,11
2009-2010	6,81	6,81
2010-2011	1,16	2,22
2011-2012	4,78	4,31
2012-2013	-5,00	-5,26
2013-2014	0,60	0,02
2014-2015	2,26	2,31
2005-2015	1,57	2,00

*October – September

Table 6. Absolut monthly changes in corn purchase prices (rsd/t)

Month	Changes of purchase price (rsd)									
	2005/ 06	2006/ 07	2007/ 08	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15
X	-632	-1.119	2.161	-1.929	73	-1.844	-1576	-124	-733	-2.607
XI	-449	487	-773	450	404	181	356	-777	333	228
XII	212	1263	-513	-181	528	570	-476	-43	731	668
I	932	1276	1.737	-665	1.299	2.091	798	-432	118	926
II	-317	118	-2.019	1.509	214	409	632	-1.141	-82	860
III	376	-287	636	-465	-207	-603	1433	-1.563	1.181	-231
IV	-92	160	-127	539	575	1.662	-715	1.247	799	591
V	915	899	-731	2.245	711	737	2214	-2.117	565	-19
VI	357	221	1.443	581	603	647	74	-702	-559	253
VII	-159	381	-76	-779	1698	573	1704	-1.103	-666	501
VIII	41	3.022	-3.115	-1.469	-3.220	-310	3746	-4.219	-779	1.036
IX	-61	-815	-2.827	-1.072	5.889	-3.968	351	45	-714	-1.520
X-IX	636	5.606	-4.204	-1.236	8.567	145	8.550	-10.929	194	686

The absolute monthly changes in the corn prices in the studied period (Tables 6 and 7) reveal important differences in monthly price fluctuations, including both purchase and selling prices. In most of the analyzed years, there was a nominal increase in corn purchase prices in October compared to the same month of the previous years. The exceptions were 2007, 2008 and 2012, when corn purchase prices in October nominally (rsd/t) decreased compared to the same month of the previous year.

Fig. 2. Average monthly indices of corn purchase and selling prices for the period 2005-15.

Growth in corn selling prices from October to September in most of the studied years (2005-15) indicates that the storage of corn is a sensible decision, i.e. it is economically justified. The exceptions were 2007 and 2012, when the selling prices of corn decreased during the period before a new harvest (October-September). Table 8 presents the medium values of the monthly indices of corn purchase and selling prices, the extreme values and the coefficients of variation. The highest average value of the monthly indices of the purchase prices was recorded in July. The highest average index value of corn selling prices was determined also in July. Variability of corn purchase and selling prices is similar, as indicated by the values of the determined coefficients of variation. In the first two months after the harvest they are lower (November and December), while in January they significantly increase to a level of about 14 % of variation and constantly increase until September, when the highest variability of the price of corn was determined. The graph (Figure 2) shows the average monthly indices of corn purchase and selling prices for the period 2005-15. Graphical presentation of movements of the average monthly indices of corn prices during a year from one harvest to another indicates a constant growth of the corn prices from the harvest (October) until July, when the prices reach the highest value. In August and September there is a decline in both the purchase and selling prices of corn.

Table 7. Absolut monthly growth of selling prices of corn (rsd/t)

Month	Changes of selling price									
	2005/ 06	2006/ 07	2007/ 08	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15
X	-1.450	-704	563	-897	-255	-3.545	-1.132	5	277	-1.438
XI	101	820	1.004	23	521	886	35	490	380	374
XII	199	847	270	178	1.207	2.077	-142	-1.022	1.335	1.206
I	747	1.295	1.157	-307	1.008	1.121	2.350	-1.946	519	764
II	624	439	-54	1.046	-18	2.022	294	967	250	274
III	406	-166	-391	189	21	780	317	-2.076	503	120
IV	-327	-192	-199	373	766	671	531	1.254	178	683
V	65	666	287	1.780	131	158	960	-1.701	669	-325
VI	541	61	-324	-82	614	-838	-28	-857	-471	31
VII	-835	992	-616	380	2.753	2.031	2.078	-1.147	-239	624
VIII	810	514	-3.194	-1.858	1.630	-2.496	2.986	-3.321	-1.366	942
IX	-395	696	-3.078	-774	-55	-2.844	-224	-1.698	-1.729	-1.129
X-IX	486	5.268	-4.575	51	8.323	23	8.025	-11.052	306	2.126

Table 8. Average monthly index of corn farm and selling price (2005-15)

Month	Purchase price				Selling price			
	X	Min	Max	C _v (%)	X	Min	Max	C _v (%)
X	100	100	100	0	100	100	100	0
XI	101	93	107	4,62	104	100	112	3,61
XII	105	92	126	9,33	111	98	127	9,21
I	113	95	147	14,02	118	90	143	13,26
II	114	90	147	15,46	124	94	150	13,45
III	115	84	143	14,41	125	85	153	15,55
IV	118	89	146	15,01	128	91	158	14,68
V	126	81	159	19,49	132	84	159	16,46
VI	130	78	162	19,99	132	80	155	17,65
VII	132	74	173	22,76	138	76	187	23,61
VIII	129	57	214	33,61	136	62	207	31,35
IX	128	57	206	40,12	128	55	206	38,16

CONCLUSION

By analyzing the movements of the monthly prices of wheat and corn in a ten-year period (2005-15), the study determined significant seasonal price fluctuations.

The determined characteristics of price fluctuations indicate economically optimal time for selling and purchasing wheat and corn. The optimal time for realization of wheat is the period from February to May, while for corn it is July.

Based on the results of these studies, it can be concluded that the storage of grain in our conditions is economically justified only in certain years, when the yield is relatively small. In other years, the storage of one's own grain is necessary expenditure, and there is no economic effectiveness in delaying sales (Novković and Mutavdžić, 2007).

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