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MODELS OF REGRESSION OFTHE SCOPE OF SOWN AREASAND PURCHASE PRICES OF OIL CROPS IN SERBIA[a]

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By Simo Stevanović[c]

This paper examines the interdependency between the movements of the level of market (purchase) prices and sowed areas under sunflower, soya, and oilseed rape, i.e. between the relative prices of these oil crops and predominant crop-husbandry products (wheat and/or corn), on the one hand, and the areas to be allocated for oil crops cultures. The models of the regression of the scope of sowed areas and purchase prices of oil crops, i.e. the interdependency of these phenomena, are determined by means of reliable statistical methods (the standard error of regression, the coefficient of the trend variation and the determination coefficient). At the same time, the testing of the series has been carried out by means of the mathematical models of functions, whereas the significance of the generated regression dependencies has been estimated by means of the t-test.

Keywords:
Sunflower
Soya
Oilseed rape
Sowed areas
Purchase prices

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I. METHODOLOGICAL FRAMEWORKS

The time period of an extreme liberalization of the agrarian market in Serbia (from 2000 to 2010) and the transfer to a completely free price formation are characterized by an extreme instability of the structure of engaged resources, oscillations of the production volume and, specifically, variations in relative prices of crop-husbandry products, and in particular those of the main oil crops cultures. The competitiveness among crop-husbandry products, and oil crops as well, is observed related to the agricultural land as the basic (naturally limited) resource of production because all crop-husbandry products apply for the same patches of land. By the rule (*ceteris paribus*), the land will "be allocated" to the product in whose production, at a certain period of time, there are the most favorable outlooks for its economic valuation via a parity revenue achieved on the basis of that particular product's parity price.

The series of data which were used for the purpose of this paper originate from published official statistical sources, i.e. from the databases of the Republican Agency for Statistics. They are ten-year series of the data about the sowed areas under sunflower, soya and oilseed rape, then about the production of oil crops, as well as those data related to the purchase prices of these products. Here, we are beginning with an assumption that, in the competition of products for the main resource, the land will, by the rule (*ceteris paribus*) "be allocated" to that product in whose production, at a certain period of time, there are the most favorable outlooks for its economic valuation via a parity revenue achieved on the basis of that particular product's parity price. The interdependency of these phenomena is determined per products belonging to the same agro-technical sowing season (autumn, spring), or, on the other hand, a delayed impact of their interrelations established in one/current year on the orientation of producers and the structure of production in the next year or in years to come.

This work hypothesis of the interdependency of sowing areas and purchase prices or, on the other hand, their parities, will be tested by choosing a regression model. For the estimation of the representativeness of the best model of regression/trend, the following three models have been used:

1. Standard error of regression (trend),

$$SS_E = \left(\frac{\sum_{i=1}^{N} (Y_{\exp_i} - \hat{Y}_{pre_i})^2}{N} \right)^{1/2} \quad (1)$$

2. Coefficient of trend variation $V_{\hat{y}}$

$$V_{\hat{y}} = \frac{SS_E}{\bar{Y}} \cdot 100 \quad (2)$$

3. Coefficient of determination R^2

$$R^2 = 1 - \frac{\mathrm{Re}\,sidual}{CorrectedTotal} \quad (3)$$

The model of regression which has the lowest value of the standard error of regression SS_E and the coefficient of the variation of the trend $V_{\hat{y}}$ is the one that matches best the observed series. The selection of the best model of the series has also been made on the basis of the coefficient of

determination R^2. The higher the value of the coefficient of determination is, the higher is the interdependency of the factors covered by the model.

The testing of the series has been carried out on the following mathematical models of the functions: (a) Linear $y = a + b \cdot x$; (b) Polynomial, up to the 4th degree $y = a + b \cdot x + c \cdot x^2 \ldots$; (c) Logarithmic $y = a + b \cdot \ln x$; (d) Semi-logarithmic $y = a + b \cdot \log x$; (e) Double logarithmic, the so-called Cobb Douglas's $y = a \cdot x^b$ and (f) Exponential $y = a \cdot b^x$.

The evaluation of the reliability (significance) of the generated regression dependencies has been made by means of the Student (t-test) test.

II. DYNAMICS OF AREAS AND OIL CROPS PRODUCTION

If we observe the time period of the last decade (from 2000 to 2010) as a time period of an extreme liberalization of the agrarian market in Serbia, which is characterized by the "transition" of the self-governing socialism into a neoliberal capitalism, we may notice that the giving up on a prevailing administrative system (which, however, significantly paid respect to the established market parities) and the transfer to a completely free price formation, were accompanied by an extremely instable scope of engaged resources as well as by oscillations in the production of the main oil crops cultures (Table 1 and Figure 1). *(see Ćurović, Milanović, 2008, Đorović, Milanović, Simić, 2005)*

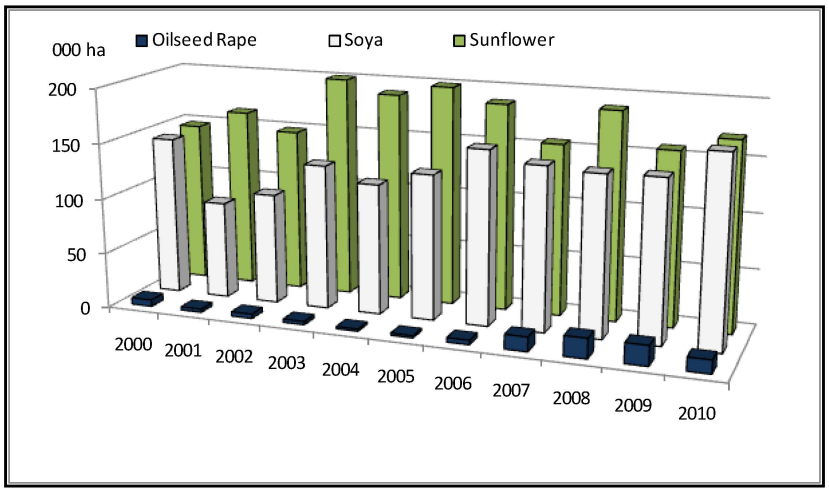

FIGURE 1.1. AREAS

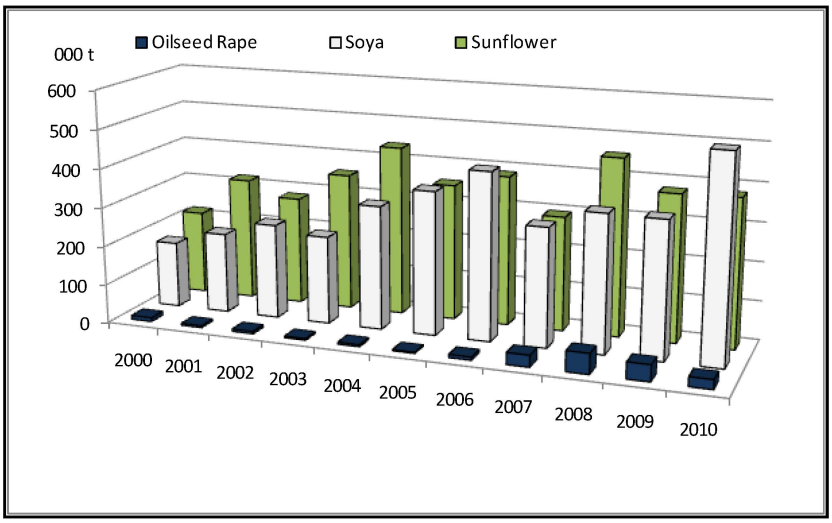

FIGURE 1.2. PRODUCTION

FIGURE 1. AREAS AND PRODUCTION OF MAIN OIL CROPS IN SERBIA, 2000-2010

Source: *http://webrzs.stat.gov.rs*

The total **areas** of the agricultural land which oil crops "applied for" in the last decade vary between 250 and 350 thousand hectares, which accounts for around 8-10% of the total plough land in Serbia. In comparison with the year 2000, the smallest ones were in the year 2002 (Index 85), and the biggest ones were in the year 2010 (Index 119). The areas under sunflower seem to be more stable to some extent (the smallest 147, the biggest 200 thousand hectares), and, mostly, they make the over-50% majority, whereas the other half, including serious annual fluctuations, is accounted for by soya and oilseed rape. With fluctuations from 88 to 170 thousand hectares, soya has – only in recent years – reached again and, we may say, exceeded the scope of the areas as of the end of the past decade, while oilseed rape, although it has demonstrated a significant increase, only accounts for about 5% of the total areas under oil crops. *(see Milanović, Mihajlović, Paraušić, 2009)*

Differently from the structure of the areas, the dynamics of the achieved **production** is more demonstrated with soya than with sunflower. Although the production of **soya** was almost continuously growing, thus reaching its record level (522 thousand tons) in the year 2010, which was three times as much as it had been the case at the end of the previous decade (Index 307), **sunflower** still remained the main raw material in the oil industry, not only for the reason of the scope of production (maximum 454 thousand tons, 2008), but also for the reason of its superior advantage when observing the amount of oil per grain of this particular product (the whole grain about 45%, without the shell up to 60%) compared with soya (about 15%). *(Stevanovic, S., 2009, p. 49-51)*The production of **oilseed rape** demonstrated a highly dynamic increase; however, soya only reached no more than around 50 thousand tons (about 5% of the total production of oil crops). The significance of oilseed rape and its share in the total production of oil crops will probably be increasing in the future as well, first of all because a high level of oil in the grains (up to 45%, an important raw material in the production of biodiesel), but also for its other biological characteristics, the possibility of using it as animal feed (the green mass, silage, by-products oil meal and oil-cake, an important pasture for bees, suitable as a green manure, an ideal culture for

the splitting of a two-field crop rotation (corn – wheat); however, it must be grown in the time rotation of crops (on the same patch of land after 4 to 5 years).

TABLE 1. BASE INDICES OF AREAS AND PRODUCTION OF MAIN OIL CROPS IN SERBIA, 2000-2010 (2000=100)

Year	Total Area	Sunflower		Soya		Oilseed Rape	
		Area	Production	Area	Production	Area	Production
2000	100	100	100	100	100	100	100
2001	86	111	146	61	122	50	50
2002	85	100	129	69	143	66	60
2003	112	136	163	91	133	50	40
2004	104	128	201	82	187	33	50
2005	112	**135**	162	91	216	33	30
2006	117	127	177	109	252	66	80
2007	106	105	135	102	179	217	300
2008	118	128	**209**	100	206	**300**	**520**
2009	108	107	174	100	205	300	420
2010	**119**	116	175	**118**	**307**	200	240

Source: Republican Agency for Statistics, Bulletin 523; Announcement No. 330.
http://webrzs.stat.gov.rs/WebSite/Public/ReportResultView.aspx

However, the manner in which the agricultural land in Serbia will be used and whether the food security of mankind will be endangered in a foreseeable future or not will depend on the manner in which the man's needs for energy will impact the manner in which the agricultural output will be used. Actually, they will depend on the needs and possibilities to use one significant portion of agricultural products, especially oil crops, not for nutrition needs but for energetic needs instead (as biodiesel or bioethanol). However, that will be an ethical issue rather than an agro-economic one or a biotechnological issue the future will be faced with: Will rich people's interest in breathing in the fresher air overpower the right of the poor to be given an existential nutrition minimum?

III. MODELS OF INTERNAL ECONOMIC RELATIONS IN CROP HUSBANDRY AND POSITION OF OIL CROPS

Apart from an extremely high instability and fluctuation of the level(s) of average annual prices of agricultural products (an accelerated growth and reaching peaks in the years 2007 and 2008, only to fall again in the year 2009 and grow in the year 2010), the estimation of the overall state of affairs in production and the agrarian market demands more significantly economic relations which are established in the primary distribution of the factor revenues, which are shown via the achieved level and established relations of the product prices in certain branches/lines of production or production stages *(Milanović, Đorović, 2011, p. 125)*.

TABLE 2. AVERAGE ANNUAL PURCHASE PRICES OF SELECTED PRODUCTS, 2000-2010 (€/kg*)

Year	Wheat	Corn	Sunflower	Soya	Oilseed Rape
2000	0.066	0.078	0.107	0.141	0.103
2001	0.124	0.146	0.199	0.225	0.151
2002	0.112	0.091	0.195	0.212	0.179
2003	0.120	0.100	0.176	0.191	-
2004	0.088	0.114	0.146	0.156	0.146
2005	0.088	0.076	0.173	0.195	0.140
2006	0.116	0.095	0.191	0.202	0.194
2007	0.140	0.154	0.324	0.293	0.221
2008	0.172	0.111	0.264	0.276	0.346
2009	0.102	0.093	0.160	0.267	0.233
2010	0.117	0.128	0.339	0.269	0.248

Source: http://webrzs.stat.gov.rs/axd/poljoprivreda/izbor.php
* http://www.nbs.rs/internet/latinica/80/index.html

Economic relations in soil cultivation can generally be identified if one representative/dominant product (e.g. wheat and/or corn) is taken as a base product, and then the prices of other competing products in the same branch are defined against the price of the base product. The competitiveness among crop-husbandry products, including also oil crops, is observed in relation to the agricultural land as the basic, however naturally limited, production resource because all crop-husbandry products compete/apply for the same areas.

This is particularly true of products of the same agro-technical sowing season (autumn: wheat-oilseed rape; spring: corn-sunflower-soya), or, on the other hand, of a delayed impact of the relations once established in one/current year on the orientation of producers and the structure of production in the next year or in years to come. By the rule (*ceteris paribus*), the land will "be allocated" to the product in whose production, at a certain period of time, there are the most favorable outlooks for its economic valuation via a parity revenue achieved on the basis of that particular product's parity price.

A. Divergent Oscillations of Areas, Production and Prices of Oil Crops

The expansion/narrowing and large fluctuations of the horizontal parity ranges of prices in the conditions of the so-called free agrarian market in the post-transitional time period actually highlights an enormous increase in the producer risk and uncertainty in view of their production orientation. That means that the market in this particular case, with so quick and chaotic changes in the economic conditions in a relatively short time period, actually does not perform (with its promised "invisible hand"), nor can it perform – in a just manner – either the selective or an appropriate allocation function. Undoubtedly, this is confirmed by high annual oscillations in the production engagement of the basic resource – sowed areas/patches of land under particular agricultural cultures (Tables 1 and 2). *(see Milanović, 2002, Milanović, Đorović, 2004)*
However, if we observe the market of primary agricultural products, then it is necessary for us to make an insight here into the factors which had an impact on the formation of the prices of oil crops for the duration of the past decade (from 2000 to 2010). A classic market approach means gaining an insight into the relations between the offer, demand and prices of particular products. Let us now elaborate this on the example of sunflower as the most important oil crops product (Table 3).

TABLE 3. CHAIN INDICES OF AREAS, PRODUCTION AND PRICES OF SUNFLOWER, 2000-2020.

	Area (000 ha)	Production (000 t)	Prices (€/kg)**	Indices (Previous Year=100)		
				Area	Production	Price
2000	147	217	0.107	100	100	100
2001	163	318	0.199	111	146	187
2002	148	280	0.195	91	88	98
2003	200	354	0.176	135	126	90
2004	189	437	0.146	94	123	83
2005	199	351	0.173	105	80	119
2006	187	385	0.191	94	110	110
2007	155	294	0.324	83	76	170
2008	188	454	0.264	121	154	82
2009	157	377	0.160	83	83	61
2010	170	380	0.339	108	101	212
2012*	186	421	0.240	100	101	101
2015*	188	435	0.249	100	101	101
2020*	191	455	0.261	100	100	100

Source: Authors' calculation on the basis of the data provided in Tables 1 and 2.
* *trend projection*
** *http://www.nbs.rs/internet/latinica/80/index.html*

On the basis of the data in the previous table, we may see that, in the last decade, there were big oscillations of the sowed areas, achieved production and purchase prices of sunflower, and simultaneously we may notice some unusual and unexpected relations of these categories:

- in the year 2000, the smallest sowed area under sunflower (147 thousand hectares), the smallest amount of sunflower produced (217 thousand tons), and the crops purchased at the lowest price (0.107 €/kg);

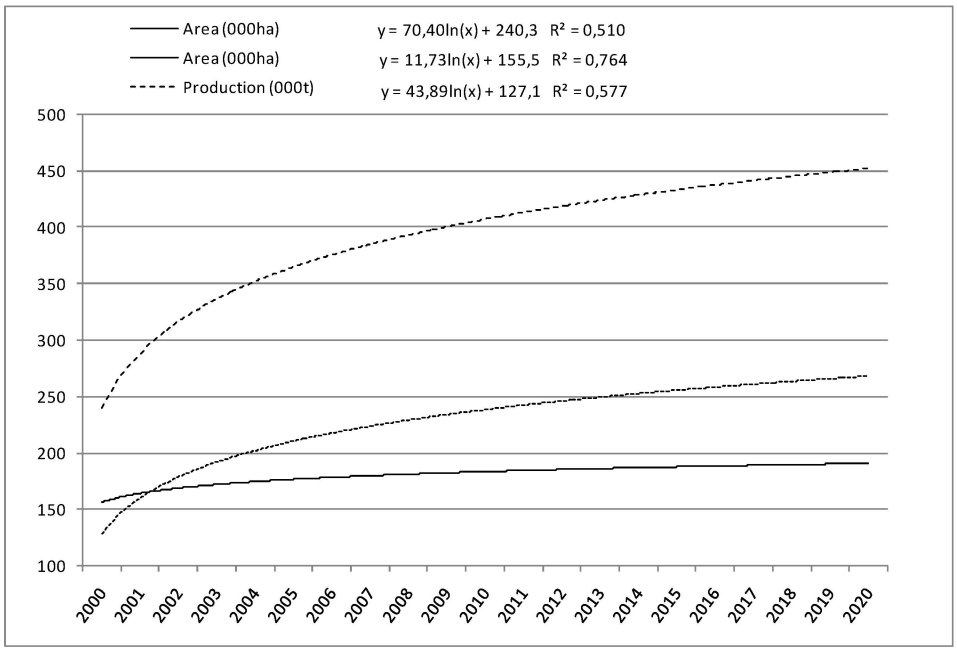

FIGURE 2. TRENDS OF AREAS, PRODUCTION AND PURCHASE PRICE OF SUNFLOWER, 2000-2020.

Source: Table 3.

- as soon as in the very next year (the year 2001), in the conditions of expanded areas (Index 111) and a 50% higher production (Index 146), and also significant initial stocks (30,000 tons), we were witnesses of a twice as high (!) purchase price of sunflower in comparison with the year previous to that year (Index 187);
- contrary to expectations, such a high increase in the purchase price did not have an increase in the sowed areas in the following year 2002 as the consequence; they were even reduced (Index 91);
- in the three consecutive years (2002-2004), at the record level of sowed areas (2003, 200 thousand hectares), almost record current production (2004, 437 thousand tons) and big transitional stocks (50-60 thousand tons), the purchase prices of sunflower were reduced 25% (2002, 0.195€/kg; 2004, 0.146€/kg)
- in the year 2007, the areas were reduced to 155 thousand hectares (Index 83), there was a significant fall in production, too, to 294 thousand tons (Index 76); however, the highest annual growth of the sunflower purchase price(Index 170) was reached;
- the increase in the sunflower purchase price by 70% in the year 2007 (0.324€/kg) had an impact on sowing in the year 2008, when a record purchase of 454 thousand tons (index 154) was achieved on the area of 188 thousand hectares (index 121). The offer in the year 2008 forced down the purchase price in the year 2009 (0.160€/kg) by almost 40% (index 61). However, that is not the lowest (2000, 0.107€/kg) purchase price in the observed time period for two reasons: firstly, for the reason of the fact that the contracted price was already a high one at the time period of sowing (the price of sunflower in the world market was also high); secondly, for the reason of the fact that, together with the other ones and a pressure from the public, the non-

contracted portion of the crops (around 40%) was paid for at higher (contracted) prices *(see Milanović, Đorović, 2011, p. 4);*

- in the year 2009, both the sowing areas and the production were decreased by around 17%; however, the purchase price was also, and contrary to expectations again, moving towards the same direction, i.e. apart from the decreased offer, the price fell by even about 39% in comparison with the level in the previous year;
- ultimately, in the year 2010, the areas were just slightly expanded (Index 108), unexpectedly again, because in the previous year, the prices fell by 39%, the production still remained at the level of the preceding year; however, and also unexpectedly, the purchase prices had been faced with an unprecedented annual growth and they enormously increased by even 112% (!).

B. Models of Regression of Amount of Purchase Prices and Sown Areas

By means of the model analysis of purchase prices (Table 2) and sown areas under sunflower, soya and oilseed rape (Table 1), by modeling regression (standard error, variation, determination) and by testing the functions through the mathematical models, a fact has been established that there is a statistically significant (p-level < 0.95) interdependency between the purchase prices in the current year and the sowed areas in the next economic year,[d] especially in the case of sunflower and oilseed rape (Table 4).

TABLE 4. INTERDEPENDENCY BETWEEN PURCHASE PRICES AND SOWN AREAS OF SUNFLOWER, SOYA AND OILSEED RAPE

	Estimate	Standard error	t-value df=3	p-level	Lo. Conf Limit	Up. Conf Limit
			Sunflower*			
a	346.7790	132.4333	2.61852	0.039665	22.7264	670.8315
b	-19.7023	15.6659	-1.25766	0.255247	-58.0353	18.6307
c	0.5158	0.4232	1.21881	0.268656	-0.5198	1.5514
			Soya**			
a	91.26938	19.32861	4.721984	0.002153	45.56449	136.9743
b	2.67311	1.05930	2.523473	0.039609	0.16827	5.1779
			Oilseed Rape*			
a	-3.99530	3.598851	-1.11016	0.303605	-12.5052	4.514636
b	0,79600	0.212310	3.74924	0.007175	0.2940	1.298036

[d] *In the same manner, a fact has been established that – when it comes to sunflower and oilseed rape – there is a very high (p-level < 0,99**) dependency between the current prices and sown areas even after two years. In Authors' opinion, apart from the level of the purchase prices in the second preceding year, the scope of the sown areas under oil crops was also under the impact of not only the purchase price in the previous year but also under the impact of other market factors, so, for that reason, that particular multiple interdependency has not been accounted for in this particular paper.*

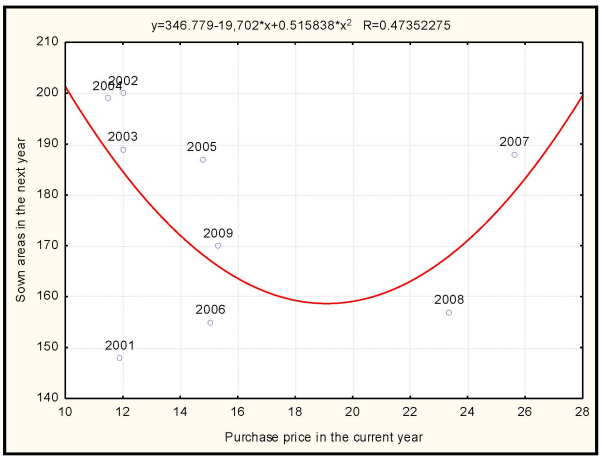

FIGURE 3.1. SUNFLOWER

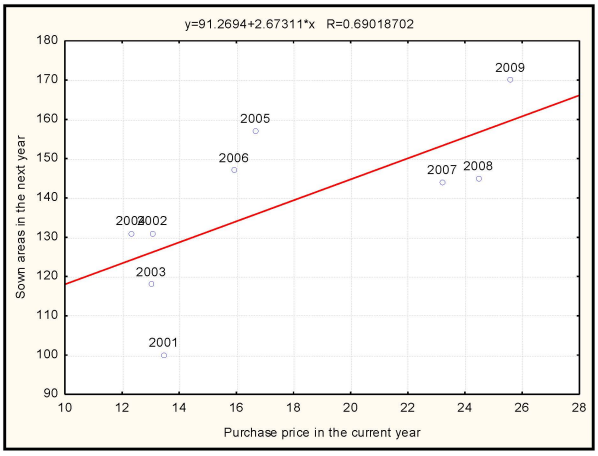

FIGURE 3.2. SOYA

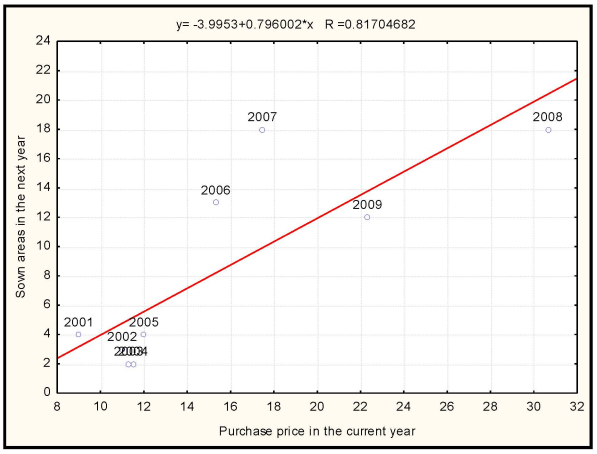

FIGURE 3.3. OILSEED RAPE

The values accounted for in Table 4 and Figure 3.1. to 3.3. show that the amount of the purchase price in the current year will greatly impact the scope of the areas which will be sown, under sunflower and oilseed rape in the following economic year. Moreover, when it concerns soya, there is an even substantially high (p-level < 0.99**) impact of the purchase prices on sowed areas in the next year (Table 4, Figure 3.2.).

C. Models of Regression of Parities of Purchase Prices and Sown Areas

If the economic position of the production of oil crops is viewed from the context of the tillage as a whole, assuming equal or very similar general conditions of the internal environment, we may notice significant changes and variations in their horizontal (raw-material) price parities (Table 5):

- the price of sunflower moved within a very wide and instable parity range, starting from once both systemically typical and market-typical about 250 (around the middle of the previous decade, 1995), falling down to the lowest level of 147 (around the middle of the last decade, 2003), up to the highest parity of even 290 (at the end of the period, 2010); so, in different years, it ranged from only around 50% up to nearly three times as high if compared with the purchase price of wheat;

TABLE 5. PARITIES OF PURCHASE PRICES OF OIL CROPS ACCORDING TO PRICE OF WHEAT AND CORN, 2000-2010

Year	Sunflower		Soya		Oilseed Rape (Wheat=100)
	Wheat =100	Corn =100	Wheat =100	Corn =100	
2000	161	137	212	181	155
2001	161	137	182	155	121
2002	175	216	190	234	160
2003	147	176	159	191	-
2004	165	127	177	136	165
2005	197	229	222	258	160
2006	165	202	174	213	168
2007	232	209	210	190	158
2008	154	238	161	249	201
2009	156	172	261	287	228
2010	290	265	230	211	212

Source: http://webrzs.stat.gov.rs/axd/poljoprivreda/izbor.php; Authors' calculation.

- soya, which was favored against sunflower as early as in the system of protected prices, still kept such a parity position it had had, in that its price also moved within a wide and instable parity range from 159 (2003) to 293 (1995), so, in different years, it was higher than the price of wheat by around 60% up to 2.6 times as high as the price of wheat;
- the purchase prices of oilseed rape, as a product with certainly the smallest but increasing share in the oil crops production structure, mainly followed the movements and relations in the sunflower and soya markets.

Here, we have analyzed, by means of a model analysis, the interdependency of the parities of the purchase prices of oil crops and the main competitive crop-husbandry products[e], on the one hand (Table 5), and, on the other hand, the movements of the sown areas under oil crops (Table 1). By means of the analysis of the regression model (Table 6), and when it concerns sunflower and soya, we have not established a fact of the existence of a statistically significant (p-level > 0.05) interdependency between these phenomena. That means that the amount of the parity of the achieved purchase price in the current year has no statistically significant impact on the areas where sunflower and soya will be sown in the next economic year. However, when it concerns oilseed rape, there is a very high dependency (p-level <0,01) between the parity of the purchase price and sown areas in the next year (Table 6 and Figure 4.2.).

TABLE 6. INTERDEPENDENCY OF PARITY OF PURCHASE PRICES AND SOWN AREAS UNDER SUNFLOWER, SOYA AND OILSEED RAPE

	Estimate	Standard error	t-value df=3	p-level	Lo. Conf Limit	Up. Conf Limit
			Sunflower			
a	-101.506	164.4022	-0.61742	0.559642	-503.784	300.7716
b	2.766	1.5993	1.72945	0.134458	-1.147	6.6792
c	-0.006	0.0037	-1.76398	0.128188	-0.015	0.0025
			Soya			
a	0.0018	0.0084	0.219251	0.833723	-0.019	0.022
b	-0.5302	3.4786	-0.152413	0.883857	-9.042	7.982
c	159.7062	352.1027	0.453579	0.666075	-701.858	1021.270
			Oilseed Rape**			
a	0.2497	0.022581	11.05703	0.000011	0.1963	0.3031
b	-37.3590	4.091746	-9.13034	0.000039	-47.0345	-27.6836

Source: Authors' calculation.

[e] *The parities of the total prices of sunflower and soya are calculated against the price of corn, and the prices of oilseed rape are calculated against the price of wheat, according to the categorization of the product(s) into the same agro-ecological season.*

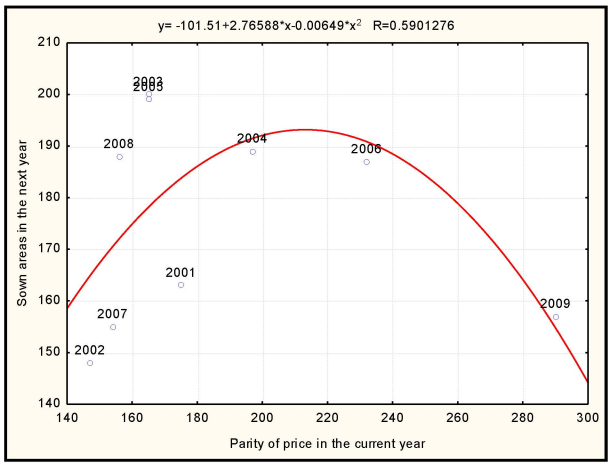

FIGURE 4.1. SUNFLOWER

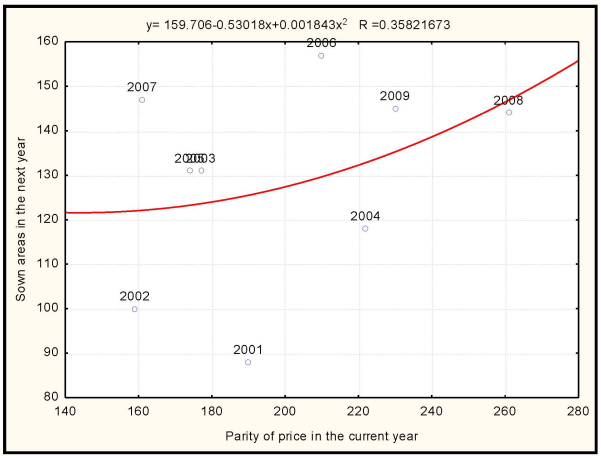

FIGURE 4.2. SOYA

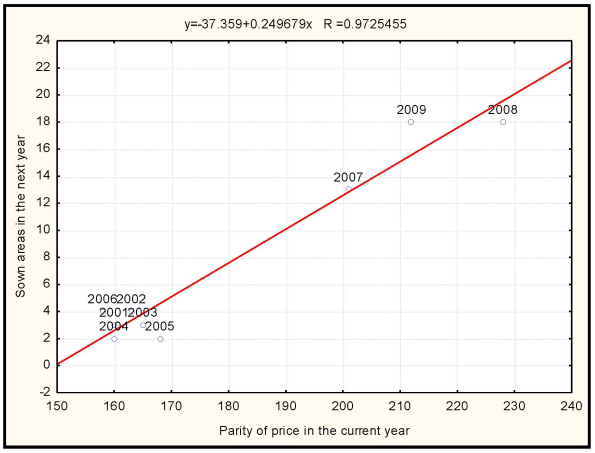

FIGURE 4.3. OILSEED RAPE

IV. CONCLUSIONS

The demonstrated series of the annual data about the sown areas and about the movements of the purchase prices of oil crops (sunflower, soya and oilseed rape) lead us to a conclusion that the offer of these products from the current production did not significantly impact the formation of their purchase price in the harvest time period for the duration of the last decade. After their upward trends in the first half of the observed decade, and also after major annual oscillations, the sown areas under oil crops, especially those under sunflower, show instability and a falling tendency in the years to come, whereas their purchase prices have a tendency of an almost stable growth. On the other hand, the movement of their purchase prices did not essentially affect the expansion/reduction of the sown areas and the design of the offer, neither, the offer being, in that time period, an inelastic one from the point of view of the price. Since we cannot find the explanation for unexpected changes, nor can we find one for the enormous increase in the purchase prices, on the side of the basic raw material offer, then we can only look for those explanations on the other side, i.e. on the side of the final products demand, first of all in the domestic and exporting demand for edible oil.

By means of the model analysis of the interdependency of the level of the purchase prices and scope of the sown areas under oil crops, by modeling regression and by testing the functions by means of mathematical models, a fact has been established that there is a statistically significant interdependency between the purchase prices in the current year and sown areas in the next economic year. However, by modeling the interdependency of the parities of the oil crops' purchase prices and their main competitive crop-husbandry products, on the one hand, and the movement of the sown areas under oil crops, on the other hand, no fact has been established that there is a statistically significant interdependency between these phenomena, except in the case of oilseed rape, where we have established a very high dependency between the parity of the purchase price in the current year and sowed areas in the next year. The demonstrated model-based examination of the interdependency of these variables enables us to predict changes in the structure of sown areas under the influence of changes in the prices of oil crops as an explanatory variable.

REFERENCES

Đorović, Milutin, Milan Milanović and Jeremija Simić. 2005. "Specific Aspects of Food Market Research", *Marketing*, 36(2), Belgrade.

Milanović, Milan. 2002. "*SR Yugoslavia's Food Industry Between 1980 and 2000*". (Monograph). Belgrade: DAEJ and IEP.

Milanović, Milan and Milutin Đorović. 2004. "*The Market and Policy of Prices of Agro-industrial Products*". (Thematic Collection of Papers). Belgrade: IEP and Economics of Agriculture Magazine.

Milanović, Milan, Milutin Đorović. 2011. "*The Market of Agricultural Products in Serbia Prior to and After Transition*". (Monograph). Belgrade: Institute of Agricultural Economics.

Milanović, Milan, Branko Mihailović and Vesna Paraušić. 2009. "Elements of Competition and Structural Typologies of the Agrarian Market in Serbia". *Economics of Agriculture.* 56(4): 519-534.

Stevanović, Simo. 2009.*Development of Market Production in Agriculture of Republic of Serbia*, (Monograph). Serbian Association of Agricultural Economists and Faculty of Agriculture University of Belgrade, Belgrade.

http://portal.zzbaco.com/mojo_baco/rastrzrs.aspx

Ćurović, Olga, Milan Milanović. 2008. "*The Market and the Price – the Main Indicators of the Movements in the Production of Oil crops*". Collection of Papers, 49th Advisory Session with International Participation: "Oil crops Production and Processing". Herceg-Novi.

Act on the Protection of Competition 2005, 2009. "*The Official Gazette of the Republic of Serbia*". No. 79/05. No. 51/09

http://webrzs.stat.gov.rs/axd/poljoprivreda/izbor.php

http://pod2.stat.gov.rs/ObjavljenePublikacije/

http://www.mpt.gov.rs/bilansi/suncokret.pdf

http://www.ebrd.com/pubs/econo/tr08p.pdf

http://www.kzk.org.rs/?link=104&lang=0

http://www.nbs.rs/internet/latinica/80/index.html

MODELI REGRESIJE RASPROSTRANJENOSTI ZASIJANIH POVRŠINA I CIJENA OTKUPA ULJANIH KULTURA U SRBIJI[f]

Sažetak: Ovaj rad istražuje međuovisnost kretanja tržišnih (otkupnih) cijena i površina zasijanih suncokretom, sojom i uljanom repicom, odnosno, ovisnost između relativnih cijena ovih uljanih kultura i prevladavajućih poljoprivrednih proizvoda (pšenice i/ili kukuruza) s jedne strane, i površina koje treba dodijeliti uljanim kulturama. Modeli regresije raširenosti zasijanih površina i cijena otkupa uljanih kultura, odnosno međuovisnost ovih pojava, određuje se pomoću pouzdanih statističkih metoda (standardnom greškom regresije, koeficijentom varijacije trenda i koeficijentom determinacije). Istovremeno, testiranje serije je izvedeno pomoću matematičkih modela funkcija, dok je značaj generiranih regresijskih ovisnosti procijenjen pomoću t-testa.

Ključne riječi: suncokret, soja, uljana repica, zasijane površine, cijene otkupa

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