UNIVERSITY OF BELGRADE
FACULTY OF AGRICULTURE

Book of Proceedings

The Seminar

AGRICULTURE AND RURAL DEVELOPMENT - CHALLENGES OF TRANSITION AND INTEGRATION PROCESSES

50th Anniversary
DEPARTMENT OF AGRICULTURAL ECONOMICS

Belgrade-Zemun, 2013.

Book of Proceedings

The Seminar
Agriculture and Rural Development - Challenges of Transition and Integration Processes

Published by Department of Agricultural Economics, Faculty of Agriculture, University of Belgrade

For the Publisher Prof Milica Petrović, dean
Faculty of Agriculture, University of Belgrade

Edited by Prof Natalija Bogdanov
Prof Simo Stevanović

Prepress Prof Simo Stevanović

ISBN: 978-86-7834-181-6

MAIZE GROSS MARGINS IN DIFFERENT ENVIRONMENTAL CONDITIONS IN 2011 AND 2012[1]

Vedran Tomić[2], Snežana Janković[2], Janja Kuzevski[2], Nikola Ljiljanić[2], Robert Radišić[2]

Summary

Environmental conditions significantly influence agricultural production, i.e. they are one of the main factors that affect its efficiency. Continuous monitoring of economic results makes it possible to identify the basic elements of revenues and expenditures in production of major agricultural crops, and use these data to plan future production – in other words, to choose the right enterprise for respective environmental conditions.

The gross margin is a quick and efficient indicator used to analyse an enterprise when considering economic indicators of different enterprises and choosing the most efficient one in economic terms. In this paper we used the gross margin to compare the two production years with different production conditions, but on the same farms. Therefore, gross margin was used as an adequate indicator that aims to show the difference which is in function of various agro-ecological conditions, price and yield within the period of two years.

The paper used the questionnaire carried out in 2011 and 2012 on a total of 69 chosen leader farms from the territory of 11 stations of the Agricultural Extension Service of Serbia. The questionnaire collected data on revenues and expenditures based on which gross margins for maize were calculated. The main indicator of this calculation is the gross margin, which is the difference between the value of production (value of the primary and the secondary product) and total variable costs that covers seed costs, fertilizer costs, costs of plant protection products, diesel fuels and contracted services (for sowing, harvest and labour).

In these periods climatic conditions differed significantly. In 2012 there was considerably less precipitation with higher air temperatures, which was one of the main reason for reduced yields per area unit. In 2012, yields decreased by 28%,

[1] The paper is a result of the project "Rural labor market and rural economy of Serbia - the diversification of income and poverty reduction "(OI-179028) funded by the Ministry of Education, Science and Technological development of the Republic of Serbia.

[2] Vedran Tomic, Research Associate, vtomic@ipn.bg.ac.rs, Snezana Jankovic, Senior Research Associate, sjankovic@ipn.bg.ac.rs, Janja Kuzevski, Research Associate, jkuzevski@ipn.bg.ac.rs, Nikola Ljiljanic, Research Assistant, nljiljanic@ipn.bg.ac.rs, Robert Radisic, Research Assistant, rradisic@ipn.bg.ac.rs, Institute for Science Application in Agriculture, 68b Blvd. despota Stefana, 00381 11/2751-622,

while price per kilogram of maize increased by about 37%, reducing total value of production by about 1%. It was estimated that total variable costs increased by 6%, while the gross margin was reduced by about 8%.

Key words: *gross margin, chosen leader farm, maize, climatic conditions, value of production, variable costs.*

1. Introduction

In the Republic of Serbia about 5096000 ha of land is under agricultural production. About 62% of this area is under cereal crops, most important of which is maize, cultivated on about 1258437 ha throughout Serbia (Statistical Yearbook for 2012).

Maize is an important crop for many reasons. According to the Ministry of Agriculture, Forestry and Water Management, about 70% of total maize consumption is used in livestock diets, where it is a basic component of livestock feed and thus an irreplaceable input in modern livestock husbandry. About 20% of produced maize is exported, while 3-5% is used for processing and making industrial products.

One of important characteristics of agriculture production in Serbia is that it is conducted on family farms. Most of production is conducted at plots of maximum 3 ha of size (60%) (Muncan & Bozic, 2006).

Apart from the specificities of agro-industry, the authors agreed upon several main problems that can result in improvements if addressed properly, also pointed out by Pejanovic & Kosanovic (2010). Those are: adverse owning structure and a lack of farmers' organization, non-regulated market of agricultural products, a lack of competitiveness and a demographic problem of the farming population.

In every area of production, it is the achieved economic effect that comes as the universal indicator of efficiency. It is important for farmers to be introduced to these results since the economic effect of a certain production most often has the predominant role when choosing a certain enterprise. In this regard, gross margin is a quick and efficient indicator for comparing different enterprises and choosing the most economic one. The previous study (Jankovic et al., 2006) shows it is maize production that gives the highest gross margin value per hectare of all field crops.

The objective of this research was to show economic effects in maize enterprises in the Republic of Serbia, based on the analysis of environmental conditions in two consecutive years.

2. Materials and Methods

In this paper, gross margin was used as an indicator of economic effects of maize grain production (Andjelic et al., 2010). Data for gross margin calculations were collected through the questionnaire from the same farms in the both respective years. The sample comprised 69 farms from the territory of the following regional offices of the Agricultural Extension Service of Serbia (PSSS): Valjevo, Smederevo, Pozarevac, Sabac, Prokuplje, Kraljevo, Cacak, Loznica, Leskovac, Nis and Zajecar. The research on economic effects of enterprises from farms in the Republic of Serbia in 2011 and 2012 was conducted by the Institute for Science Application in Agriculture in collaboration with the PSSS.

The following data were used for calculating the basic elements of a maize gross margin: data on yield and price; by-product price; value of seed; quantity and value of fertilizers, pesticides, and fuel; and costs of contracted services. Based on starting data for each farm for the both years, indicators for the value of production, total variable costs and gross margin were calculated. For processing data on farm enterprise calculations and calculating the average gross margin for maize, elements of revenue and expenditures, the *Microsoft Excel* was used. The programme was adjusted to calculate the average value of each element of the calculation.

Important elements that had the predominant effect on maize yields in the both years and especially in 2012, were precipitation amount and mean monthly temperatures in the period April - September on the territories covered by the PSSS. The precipitation amount was compared with the optimal amount of precipitation for the vegetation period and some discrepancies were shown, while the mean monthly temperatures were compared in their absolute values.

Based on the comparative analysis, the effect of the investigated environmental and economic conditions on the final value of gross margin was determined. The final indicator was the share of total variable costs and gross margin in the total value of production in the both years. Moreover, the analysis determined the structure of variable costs, which is the share of seed costs, fertilizer costs, fuel costs and costs of contracted services in the total variable costs.

3. Results and Discussion

Analysing the collected data for maize gross margin calculations it was determined that the yield in 2011 ranged from 3500 kg/ha to 12000 kg/ha, while in 2012 the yield ranged from 2000 kg/ha to 10000 kg/ha. The price of maize grain in 2011 ranged from 14.00 RSD/kg to 25.00 RSD/kg, while a significant rise in price was determined in 2012 - from 22.00 RSD/kg to 30.00 RSD/kg. When compared the obtained maize yields and the prices in the respective years, a slight decrease in the

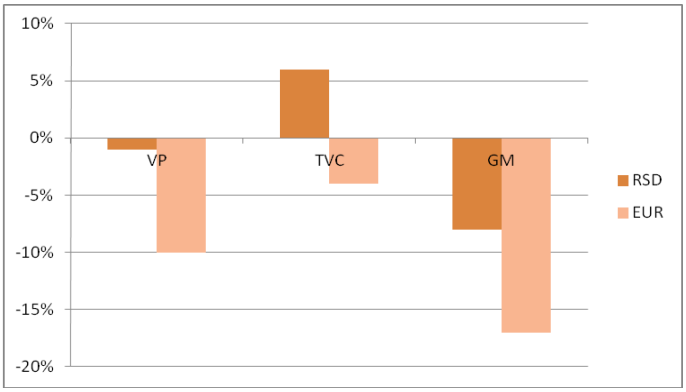
value of production can be seen in 2012, which came a direct result of a higher price, although the yield was significantly lower. The decrease in the gross margin value was also affected by the variable costs being on average higher by around 3500.00 RSD/ha in 2012 (Table 1).

Table 1: Basic indicators of the maize gross margins (ha) for the surveyed farms in 2011 and 2012

Indicator	Year				2012/2011 index	
	Value in RSD		Value in EUR			
	2011	2012	2011*	2012**	RSD	EUR
Yield (kg)	6336.00	4572.00	-	-	72	72
Price (1 kg)	19.28	26.46	0.19	0.23	137	124
Value of production (VP)	121558.00	120840.00	1192.33	1068.15	99	90
Total variable costs (TVC)	55086.00	58489.00	54032	51701	106	96
Gros margin (GM)	70241.00	64257.00	688.97	567.99	92	83

Source: Authors' calculation
** 1 EUR= 101.95 RSD*
*** 1 EUR= 113.13 RSD*

When compared to 2011, despite higher variable costs and a significantly lower yield, a higher price per kilogram in 2012 resulted in a slightly lower value of the gross margin – for about 8% or 16% if the figure is expressed in Euro (Graph 1).



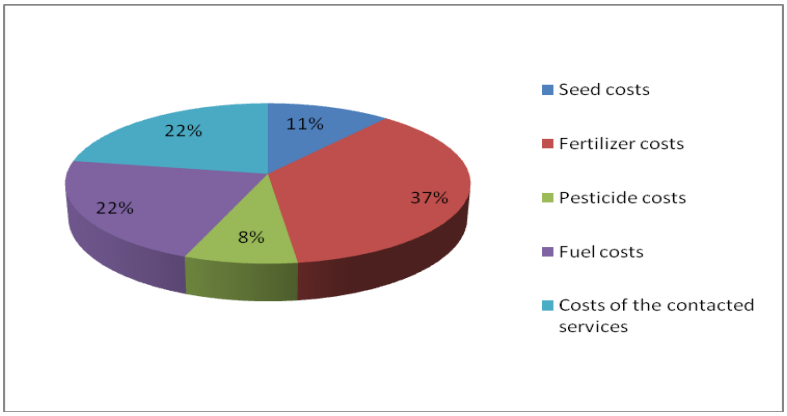
Graph 1 Review of the percentage decrease of the variable costs and the gross margin and increase of the total variable costs in 2012, when compared to 2011 (Indicators calculated in RSD and EUR)

A more detailed analysis of fertilizer costs determined that more-less the same amounts of fertilizers were used in the respective years. However, higher fertilizer costs were affected by a higher price of fertilizer of about five RSD per kg. The analysis of the share of the other elements of variable costs determined that the share of seed in 2012 was slightly higher than in 2011 (0.26%), the share of pesticides and fuel was lower (0.50% and 0.95%, respectively), while the share of the contracted services was twice as lower (10%) (Graphs 2 and 3).

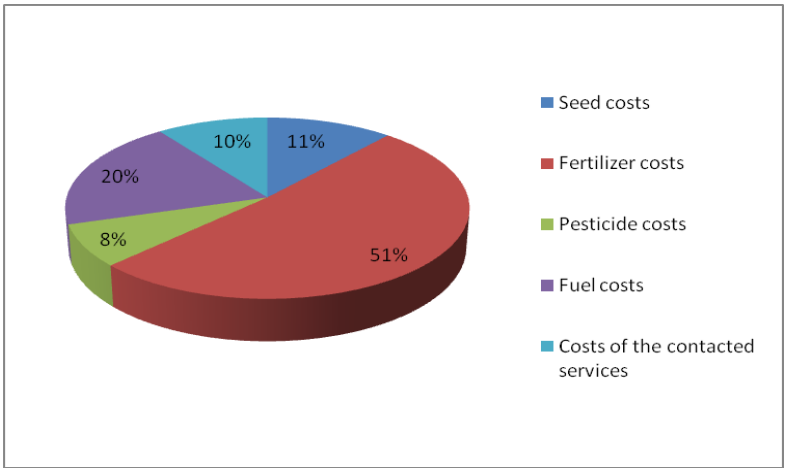
Table 2: Structure of the variable costs in the maize production on the surveyed localities in 2011 and 2012

Categories of variable costs	**2011**				**2012**			
	kg (l/ha)	**RSD/ kg(l)**	**RSD/ ha**	**% of TVC***	**kg (l/ha)**	**RSD/ kg(l)**	**RSD/ ha**	**% of TVC***
Seed costs	-	-	6763.00	11.08	-	-	6633.00	11.34
NPK	299.70	41.69	12559.00	-	284.43	48.08	13575.00	-
Urea	139.29	42.07	5879.00	-	178.24	45.24	8018.00	-
KAN	225.51	29.58	6605.00	-	243.72	31.98	7801.00	-
AN	233.33	34.00	7900.00	-	202.31	42.31	8536.00	-
Fertilizer costs – total	-	-	22470.00	36.81	-	-	30036.00	51.35
Pesticide costs	-	-	4936.19	8.09	-	-	4438.03	7.59
Fuel costs	-	-	13225.90	21.67	-	-	11534.84	19.72
Costs of the contacted services	-	-	13643.00	22.35	-	-	5848.00	10.00
TVC	-	-	55086.00	100.00	-	-	58489.00	100.00

Source: Authors' calculation
** TVC – Total variable costs*



Graph 2 Structure of the TVC in 2011



Graph 3 Structure of the TVC in 2012

The beginning of vegetation period in the both respective years was characterised by dry and warm weather, with a higher amount of precipitation in 2012, higher than the optimum amount for that period of year. In 2011, as in 2012, the accumulation of winter moisture in the ground was sufficient for sowing, germination and sprouting, due to a lot of precipitation during January and February.

May was a favourable month for maize growth and development because of the amount of precipitation that was slightly lower than the optimum in 2011 but

significantly higher than the optimum in 2012, and favourable temperatures in the both years with almost equal mean monthly temperatures.

Early June was favourable in the both years, due to a sufficient amount of precipitation in May; yet this situation lasted only until high temperatures occurred after the 20th of June. Year 2012 was characterised by high temperatures and a lower amount of precipitation, significantly lower than the optimum amount needed for the development of maize in this part of year.

A negative trend of high temperatures and lower amounts of precipitation continued in July, and it was more expressed in 2012. High temperatures and the lack of precipitation caused strong/extreme droughts in 2012 at the time when maize was in its most sensitive generative growth phases. The maximum temperatures went up to 40˚C.

Very warm weather with the minimum amounts of precipitation continued through August and September of the both years, although the weather was slightly more favourable in 2011, due to the absence of extremely high temperatures of air, characteristic for 2012.

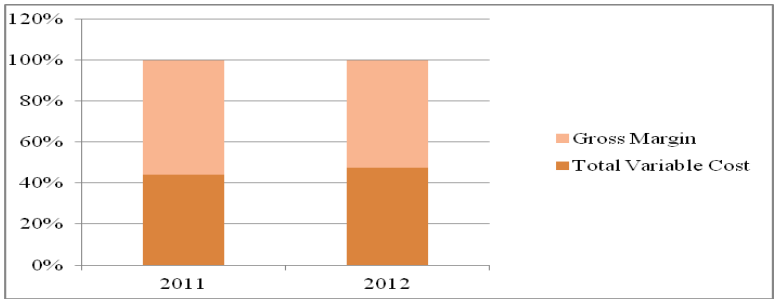
Due to worsening of environmental conditions in 2012, there was a decrease in the yield for about 1800.00 kg/ha on average on the respective farms, when compared to 2011.

Table 3: Precipitation amounts and mean monthly temperatures in the period April – September on the surveyed localities in 2011 and 2012

Month	**Mean precipitation (mm)***		**Optimum distribution of precipitation during vegetation (mm)****	**Difference in precipitation amounts when compared to the minimum (mm)**		**Mean monthly temperatures of air (˚C)***	
	2011	**2012**		**2011**	**2012**	**2011**	**2012**
April	23.13	80.55	50	-26.87	30.55	12.34	12.73
May	70.08	124.35	75	-4.92	49.35	16.07	16.2
June	48.04	22.37	90	-41.96	-67.63	20.67	22.86
July	70.68	62.9	100	-29.32	-37.1	22.53	25.38
August	6.61	2.18	95	-88.39	-92.82	22.96	23.82
September	29.05	15.14	80	-50.95	-64.86	20.3	19.71

*Source: * Authors' calculation based on the report by the Republic Hydrometeorological Service of Serbia for 2011 and 2012*
***taken from: Menadzment ratarske proizvodnje (Field Crop Management) (Petar Muncan & Dragic Zivkovic), Belgrade, 2006, pp. 127*

After analysing the share of total variable costs and gross margin value of production and analysing climatic factors, their effects on maize production were shown for the both years. The share of variable costs was higher than in 2011 and it accounted for 47.65%, while the share of gross margin decreased to 52.34% of the value of production, which implies that both economic and environmental conditions were more favourable in 2011 (Graph 4).



Graph 4 Share of the TVC and the GM in the maize VP in 2011 and 2012

4. Conclusions

Based on the analysis of gross margin indicators for farms in the Republic of Serbia, it was determined that the value of production and the gross margin for maize in 2012 were lower than in 2011, while the total variable costs were higher. Approximately the same value of production in 2012 was entirely due to a higher price, despite a significantly lower yield in 2012, which was a direct result of more adverse environmental conditions of production. The environmental conditions in 2012 were characterised by a severe drought. Prices of inputs were higher in 2012, which led to higher expenditures on inputs. When compared to 2011, the share of variable costs in the total value of production was larger in 2012, that is, the value of gross margin decreased for about eight per cent. In the both production years farmers spent most on purchase of fertilizers and fuel, and for the contracted services.

References

1. Andjelic, B., Jankovic, S. & Tomic, V. (2010). *Uticaj strukture ratarske proizvodnje na bruto marzu porodicnih gazdinstava*. Poljoprivredne aktuelnosti, Institut za primenu nauke u poljoprivredi, Beograd, 1-2, 92-104.
2. Jankovic, S., Goss, S., Pusic, M., Jovanovic, R., Todorovic, G., Tolimir, N., Ivkov, I., Andjelic, B. & Dalton, G. (2007). *Poslovanje poljoprivrednih*

gazdinstava u Srbiji 2006. Prirucnik, Institut za primenu nauke u poljoprivredi, Beograd, 26-27.

3. Muncan, P. & Zivkovic, D. (2006). *Menadzment ratarske proizvodnje*, Beograd, 127.
4. Muncan, P., Bozic, D. & Bogdanov, N. (2010). *Ekonomska efikasnost proizvodnje ratarskih kultura na porodicnim gazdinstvima u AP Vojvodini*. Ekonomika poljoprivrede, Beograd, 1/2010, 15-23.
5. Pejanovic, R. & Kosanovic, N. (2010). *Ekonomska kriza poljoprivrede Republike Srbije*. Poljoprivredne aktuelnosti, Institut za primenu nauke u poljoprivredi, Beograd, 1-2, 78-91.
6. http://pod2.stat.gov.rs/ObjavljenePublikacije/G2012/pdf/G20122007.pdf
7. hhtp://www.hidmet.gov.rs/podaci/meteorologija/ciril/2011.pdf
8. hhtp://www.hidmet.gov.rs/podaci/meteorologija/ciril/2012.pdf
9. http://www.mpt.gov.rs/postavljen/129/Bilans%20za%20sajt-februar.xls