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TENDENCIES IN BUTTER PRODUCTION IN THREE BALKAN COUNTRIES

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Abstract

The current article presents the tendencies in the butter production from cow milk in three Balkan countries, members of the European Union - Bulgaria, Greece and Romania. The studied data is provided from the web site of Food and Agriculture Organization of the United Nations. The extracted information for the indicated product has been entered and saved in an xlsx file format. Subsequently, it has been processed, analysed and evaluated.

Trend analysis has been applied to the examined data in this study. The correlation and determination coefficients have also been calculated.

The results show that a decline in the production of the indicated product has been observed over the investigated time interval. The highest value of the considered indicator is registered during the first year of the examined period in Greece and for the other two countries in 1995. Generally, it can be concluded that a decreasing tendency in the production of butter has been established for these Balkan countries in the time interval from 1994 to 2014.

Keywords: trend analysis, butter production from cow milk, Balkan countries members of the EU.

INTRODUCTION

In the present age of information technology, use of Internet is becoming quite popular for accessing information on any topic of your interest. It also provides tremendous opportunities to students, researchers and professionals for getting information on matters related to academic and professional topic (Manjula, Com, 2019).

The World Wide Web is a vast and rapidly growing source of information (Paul, 2015). Most of this information is in the form of unstructured text, making the information hard to query. There are many web sites that have large collections of pages containing structured data, i.e., data having a structure or a template (Krishnan, Balachander, 2012).

Information related to some milk products (butter, cheese) is provided from the web site of Food and Agriculture Organization (FAO) of the United Nations (<http://www.fao.org/faostat/en>). FAO's Food and agriculture database provides free access to food and agriculture statistics for over 245 countries and territories and covers all FAO regional grouping from 1961 to the most recent year available (<http://www.fao.org/statistics/en/>).

Very often, these extracted data from given sources should be analysed (Georgieva, 2015; Blagoeva, 2009) and evaluated. In this connection,

mathematical-statistical methods are applied widely.

Data analysis is a body of methods that help to describe facts, detect patterns, develop explanations, and test hypotheses. It is used in all of the sciences (Levine, 1996). Some of these methods are applied in the current study.

The aim of this article is to present the tendencies in the butter production from cow milk for the period from 1994 to 2014 in three Balkan countries, members of the European Union (Bulgaria, Greece and Romania).

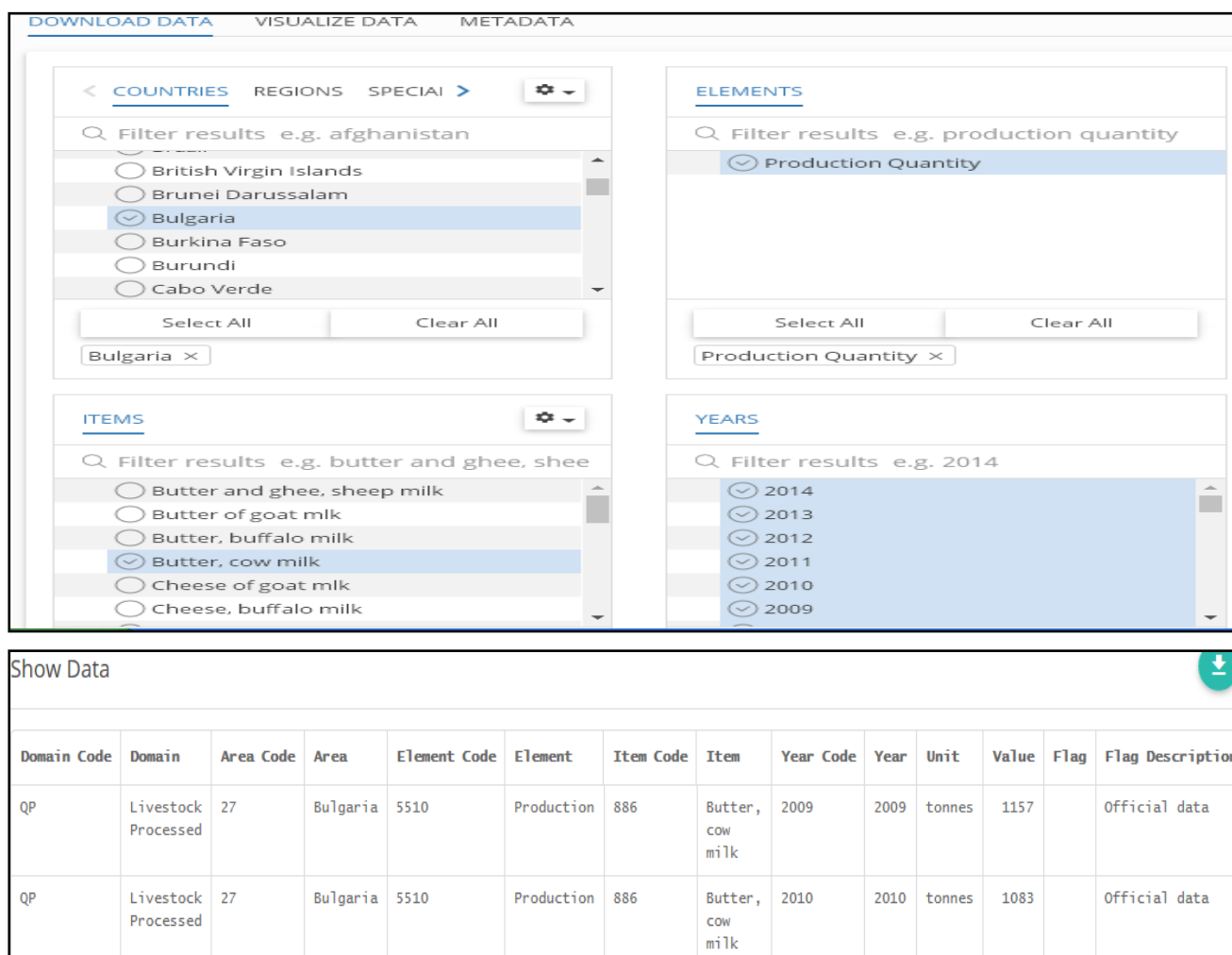
MATERIALS AND METHODS

Data on the production of butter from cow milk (tonnes) are searched in the web site of the FAO (<http://www.fao.org/faostat/en>). When forming the queries, it is necessary to choose the examined country, production quantity and time interval respectively (fig. 1). The users could indicate certain years or the whole period from 1961 to 2014. The surveyed countries in the present work are Bulgaria, Greece and Romania. Greece has been a member of the European Union since 1981, while the other two listed countries have been included in this organization since 2007 (<https://europa.eu/european-union/about-eu>). The extracted information about the examined product for each one of them has been saved in an xlsx file format.

The data related to the production of butter in these three indicated countries have been processed and analysed. The capabilities of the Microsoft Excel software have been used (Mihaylov, 2016) for this purpose. Working with lists of data and applying different filters, users can visualize certain subsets from the studied data. The

coefficients of the regression have been also calculated and the relevant models have been constructed. Trend analysis (Antonopoulos et al., 2001) has been applied to these data for each one of the listed three countries.

The researched time interval in the current survey includes 20 years period from 1994 to 2014.



Source: Food and Agriculture Organization of the United Nations, FAOSTAT

Fig. 1. Visualization of the part of examined data from the web site of the FAO

RESULTS AND DISCUSSION

The considered information about the production of butter from cow milk is presented in a separate Excel file. Worksheets could contain a large amount of data, but generally, it is necessary to work only a part of them. In order to limit the displayed data, filters are created that specify a rule restricting the displayed information (Mihaylov, 2016). In this case, the following data could be

visualized:

- The production of butter only in one of the examined countries for the selected years from the studied interval;
- The production of butter in several selected countries for indicated years or for the whole considered period in the survey;
- The quantities of the examined product, which varied within a certain interval.

	A	B	C	D	E	F	G
1	Domain	Area	Element	Item	Year	Unit	Value
3	Livestock Processed	Bulgaria	Production	Butter, cow milk	1995	tonnes	2919
4	Livestock Processed	Bulgaria	Production	Butter, cow milk	1996	tonnes	2295
5	Livestock Processed	Bulgaria	Production	Butter, cow milk	1997	tonnes	1732
24	Livestock Processed	Greece	Production	Butter, cow milk	1995	tonnes	3943
25	Livestock Processed	Greece	Production	Butter, cow milk	1996	tonnes	3797
26	Livestock Processed	Greece	Production	Butter, cow milk	1997	tonnes	3535
45	Livestock Processed	Romania	Production	Butter, cow milk	1995	tonnes	16050
46	Livestock Processed	Romania	Production	Butter, cow milk	1996	tonnes	13400
47	Livestock Processed	Romania	Production	Butter, cow milk	1997	tonnes	9200

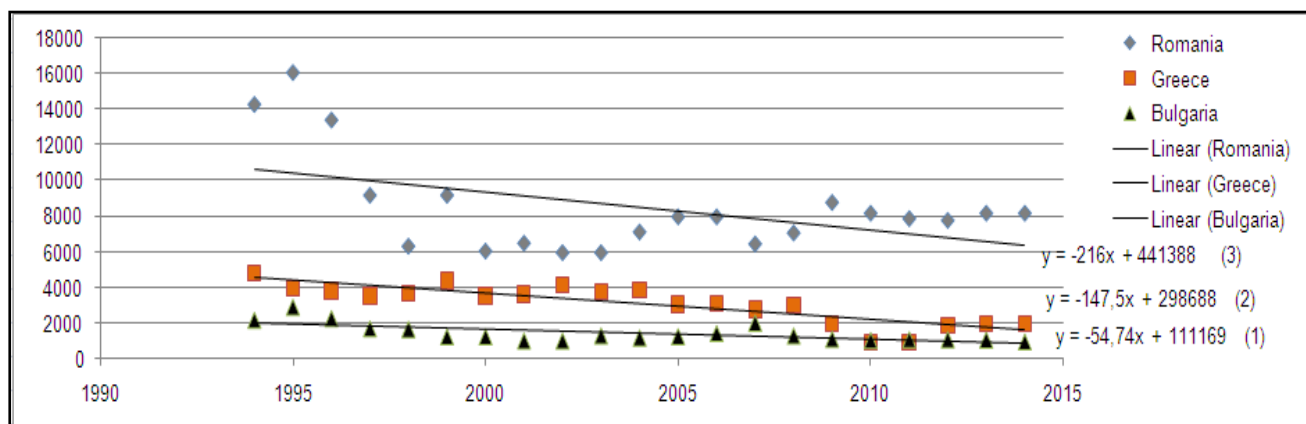
Source: Food and Agriculture Organization of the United Nations, FAOSTAT

Fig. 2. Information about the studied countries for the period 1995-1997

As can be seen from fig. 2, the information about the surveyed product for Bulgaria, Greece and Romania for selected three consecutive years from 1995 until 1997 is presented. Quite naturally, users can choose another time interval different from this one in the examined case.

The considered data for the three Balkan countries have been studied in the 20 years period. Trend analysis has been done through the use of Microsoft Excel (Iliev, Nikolova, 2006). The parameters of the respective linear regression models (Lelek, 2014; Otoo et al., 2015) are estimated.

The direction of dynamic changes in the production of butter in Bulgaria is presented analytically with equation (1), which is given in fig. 3. The evaluation of the parameters of this linear equation shows that they are statistically significant ($P\text{-value} < 0,05$), as can be seen from fig. 4. The presented model is adequate (ANOVA), the significance level of F is less than alpha level ($\alpha=0,05$). The obtained results show a decreasing tendency in the production of butter in Bulgaria during the studied period. A larger decline in the production of the indicated product is observed in the time interval after 2008 (fig. 3).



Source: Own calculations on the basis of data from Food and Agriculture Organization of the United Nations

Fig. 3. Scatter diagram and trend lines

The highest registered value is 2919 and the lowest one 1001 tonnes. Therefore, the calculated decline at the end of the period is about 2,9 times. The value of the regression coefficient (b) is -54,74. This shows that over the period 1994–2014 the production of butter was decreasing

at an average rate of 54,74 tonnes per year. The obtained correlation coefficient between the studied variables is $r = 0,67$. The calculated value of the determination coefficient (R^2) is 0,45. This means that the time explains 45% of the variations in the production of the examined product.

Regression Statistics	
Multiple R	0,670987618
R Square	0,450224384
Adjusted R Square	0,421288825
Standard Error	385,0823793
Observations	21

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	2307301,948	2307301,948	15,55955384	0,000869636
Residual	19	2817480,338	148288,4388		
Total	20	5124782,286			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	111169,1948	27810,44791	3,997389583	0,000770775	52961,25848	169377,1311	52961,25848	169377,1311
Year	-54,74025974	13,87740567	-3,944560032	0,000869636	-83,7860036	-25,69451593	-83,78600355	-25,69451593

Source: Own calculations on the basis of data from Food and Agriculture Organization of the United Nations

Fig. 4. Presentation of the obtained result for Bulgaria

The intensity and the main direction of the dynamic changes of the butter production in Greece are presented by equation (2), depicted in fig. 3. The parameters of the indicated regression equation are statistically significant at the 5% level. In this case, the described model is adequate, as can be seen from fig. 5. The obtained regression coefficient is -147,5. Over the period 1994–2014, the production of butter in Greece decreased at a rate of 147,5 tonnes per year. Therefore, a decreasing tendency is observed for this indicated time interval, as can be seen from the trend line

shown in fig. 3.

The calculated difference between the highest and the lowest value is 3767 tonnes, as the decline of the production of butter in the years between 1994 and 2011 is over 4,7 times.

The value of the determination coefficient is 0,735. This means that 73,5% of the variation of dependent variable y can be explained by the variation of independent variable x. The found correlation coefficient between these two indicators is 0,86.

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	16752607,5	16752607,5	52,92392681	6,67061E-07
Residual	19	6014284,308	316541,2794		
Total	20	22766891,81			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	298688,3645	40632,12294	7,351040086	5,75066E-07	213644,354	383732,375	213644,354	383732,375
Year	-147,5012987	20,27541789	-7,274883285	6,67061E-07	-189,938236	-105,0643614	-189,938236	-105,0643614

Source: Own calculations on the basis of data from Food and Agriculture Organization of the United Nations

Fig. 5. The results from the analysis of the studied data for Greece

The dynamic changes in the production of butter in Romania are presented analytically by equation (3), indicated in fig. 3. The assessment of

the coefficients of this linear equation shows that they are statistically significant. The presented regression model is adequate at 5% level of

significance (fig. 6).

The obtained results also showed a decreasing tendency in the production of butter in Romania for the examined time interval. The difference D between the largest and the lowest value of the surveyed data is 10050 tonnes. Consequently, in the first half of the surveyed period, the decline is over 2,6 times.

The regression coefficient (b) is -216, indicating that during the considered period, the production of the studied product in Romania decreased at an average rate of 216 tonnes per year. The calculated correlation coefficient (r) is 0,49. The obtained value of the determination coefficient is 0,24. This means that 24% of the variation of y can be explained by the variation of x.

ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	35925552	35925552	5,896890635	0,025267161			
Residual	19	115753459	6092287,313					
Total	20	151679011						

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	441387,555	178256,1513	2,476142068	0,022860018	68293,14332	814481,9666	68293,14332	814481,9666
Year	-216,001299	88,94976923	-2,428351423	0,025267161	-402,1753049	-29,8272925	-402,1753049	-29,82729248

Source: Own calculations on the basis of data from Food and Agriculture Organization of the United Nations

Fig. 6. Visualization of the results for Romania

CONCLUSIONS

1. Data related to the production of butter in three Balkan countries - Bulgaria, Greece and Romania have been studied in the current work. They have been extracted from the FAO web site and subsequently have been stored in an xlsx file. Regression models have been applied to describe the change of the production of butter from cow milk in the listed countries by years.

2. The obtained linear regression equations are adequate and their coefficients are statistically significant at 5% significance level.

3. The results show that there has been a certain decline in the production of butter in the studied countries. In this connection, the differences between the highest and the lowest values of the studied indicator in these countries have been calculated.

4. As a whole, it can be concluded that a decreasing tendency in the production of butter for each one of the listed Balkan countries has been obtained in the time interval between 1994 and 2014.

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