Understanding Patterns in the Consumption of Agro-Food Products in Romania - An Analysis at Regional Level

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ABSTRACT

The agro-food sector has faced several challenges since the end of World War II. This article performs an analysis of this sector from the consumer perspective. More precisely, it aims to find certain patterns in the consumption of agro-food products. In this respect, quarterly data with regard to the average consumption of the agro-food products at regional level are used. The data are provided by the Romanian National Institute of Statistics. In order to find patterns in the consumers' behaviour, JDemetra+ version 2.2.2 was used to analyse the time series with regard to seasonal patterns and calendar effects (Trading days, Julian Easter). TRAMO-SEATS and X13 were assessed as seasonal adjustment methods for all series that showed significant seasonality. Moreover, only the automatic procedure was used in all cases. The X13 procedure provided the best results in most of the cases.

Keywords: *agro-food products, seasonal adjustment, JDemetra+*
JEL Classification: *Q17*

1. INTRODUCTION

The newest releases of the "EU agricultural outlook for 2018-2030" report published on December 2018 by the European Commission show that France, Germany, the UK and Romania are projected to account for about 55%

of EU main cereal production in 2030. Based on the recent food trends, the consumers are more inclined to have a closer look at the origin, environmental friendliness and organic certification of the food products they select. This aspect has an important economic impact in the overall production chain. Understanding such challenging factors can increase competitiveness and bring the required technologies to drive forward the better suited agro-food products tailored to adjust to the new demanding trends.

After World War II a priority for Europe became the development of economic and commercial relations. Based on historical studies it can be observed that Romania has an experience in exporting various agro-food products. Throughout the last decades, Romania has lost the capacity to sell goods and agro-food products in the context of the great changes from the late 80s. Since joining the European Union in 2007, the main component of the agro-food sector, the agriculture, has taken a slight path approach towards increasing self-consumption (Davidova et al., 2009) and generating new goods with high added value in the market. These are observed in the context of EU capital investments in the agricultural sector and related industries.

Considering the important challenges the agro-food sector is facing especially due to the changes in the consumption patterns, it is crucial for every country to perform an in-depth analysis of this phenomenon.

Romania has high potential in food production (PWC, 2017). However, for potential investors to be able to exploit the knowhow and the natural resources existing in Romania in order to best respond to the consumers' needs, they must understand consumption patterns, as consumers are the main actors of the business environment. Toma and Mirică (2018) show that exploring seasonality at a low disaggregation level is very important for business decision makers to understand business environment. Therefore, this article will explore the seasonal patterns in the consumption of agro-food products in Romania.

2. DATA AND METHODS

In order to achieve the purpose of this section, quarterly data on the average consumption per person for several agro-food products were retrieved from the TEMPO Online Database of the Romanian National Institute of Statistics. Data were retrieved at regional level as this is the lowest level of disaggregation available. Moreover, the available time frame is 2015-2018, which complies with the minimum standards in official statistics with regard to the length of time series for the purpose of seasonal adjustment (Buono et

al. 2018; UNECE, 2012). Also, a time series length of four years is enough for detecting Easter effect (Findley et al., 2005).

In order to explore seasonal patterns of these series, the tools provided by JDemetra+ 2.2.2 will be used. JDemetra+ 2.2.2 is the latest version of the software officially recommended by Eurostat for seasonal adjustment (Eurostat, 2019). This sofware provides an easy to use tool for detecting seasonality, outliers as well as an automatic procedure for seasonal adjustment (Grudkowska, 2017). The automatic procedure of this software is very user friendly and provides high quality results (Mirică et al. 2017). However, for problematic time series, the decomposition method and the ARIMA Model must be choosed manually based on the methodology proposed by Mirică et al. (2016).

In order to assess the presence of seasonality, JDemetra+ offers several tests for the raw series, of which the Autocorrelation at seasonal lags test will be used (Mirică et al. 2017). Series will be seasonally adjusted only if there is a strong evidence of seasonality.

Next, all the series that show strong seasonal pattern are seasonally adjusted using Tramo-Seats and X13, the two methods incorporated in JDemetra+ 2.2.2. In order to perform the seasonal adjustment, the Romanian Calendar is defined, comprising all the legal holidays in this country including the Julian Easter. For the results to be easy to interpret, the information proposed by Andrei et el. (2019) will be extracted from the output for each series: transformation method, the presence of Easter and Trading Days effects, outliers, the result of the residual seasonality tests, the overall quality and the AIC. The seasonal adjustment method will be chosen taking into account the overall quality of the results of each method. Next, in the case of equal quality, the method with the lowest AIC will prevail. With regard to the AIC, it is important to note that Motulsky and Christopoulos (2004), show that the sign of this indicator is of no practical importance and one should choose the model with the lowest AIC.

3. RESULTS

Firstly, all the series, for each agro-food product and region of Romania are tested for the presence of seasonality. The results of the Autocorrelation at seasonal lags test are displayed in Table 1. As one can observe, the consumption of maize flour, milk, fats, as well as mineral water and soft drinks has no seasonality in all regions. On the other hand, there are agro-food products that are consumed on a seasonally basis in all regions: Vegetables and canned vegetables in fresh vegetable equivalent, Confiture, jam, compote, jellies and Chocolate, sweets, Turkish delight and other sugar confectionery. For fruits

and eggs, there is strong seasonal pattern in consumption in all regions except for Bucharest-Ilfov. The consumption of bread and bakery products presents seasonality only in the North-West region, while the consuption of flour and potatoes presents seasonality only in North-East and the consumption of rice only in the South-Muntenia Region. The consumption of fresh meat has seasonal patterns in South-East and South-West Oltenia while the consumption of meat products in South-East, South-West Oltenia and South-Muntenia. The consumption of cheese and cream presents strong seasonality in the Center, South-West Oltenia and South-Muntenia regions. The consumption of Maize, sunflower and soya oil has seasonal patterns in North – West and South-Muntenia. Sugar is consumed on a seasonal basis in South-East and South-Muntenia. The consumption of alcoholic drinks displays strong seasonal patterns in South-Muntenia and Center.

If we analyse the situation by region, one can observe that Bucharest-Ilfov has the lowest number of series that present seasonal patterns, closely followed by the West region. On the other hand, South-Muntenia has the highest number of such series.

Results of the Autocorrelation at seasonal lags test for series concerning the average consumption per person by agro-food product and region – P values and interpretation, source: designed by the authors using JDemetra+ 2.2.2.

Table 1

	North - West	Center	North - East	South - East	Bucharest - Ilfov	South - Muntenia	South - West Oltenia	West
Bread and bakery products	Seasonality present 0.0025	Seasonality not present 0.2821	Seasonality not present 0.1220	Seasonality not present 0.2531	Seasonality not present 0.9622	Seasonality present 0.0026	Seasonality not present 0.1424	Seasonality not present 0.4537
Maize flour	Seasonality not present 1.0000	Seasonality not present 0.9855	Seasonality not present 0.3150	Seasonality not present 1.0000	Seasonality not present 1.0000	Seasonality perhaps present 0.0282	Seasonality not present 0.9482	Seasonality not present 0.0811
Flour	Seasonality not present 0.2739	Seasonality not present 0.1835	Seasonality present 0.0016	Seasonality not present 0.0886	Seasonality not present 0.9724	Seasonality not present 0.1463	Seasonality not present 1.0000	Seasonality not present 0.4806
Rice	Seasonality not present 0.3387	Seasonality not present 0.1312	Seasonality not present 0.8842	Seasonality not present 1.0000	Seasonality not present 0.0848	Seasonality present 0.0045	Seasonality not present 0.0615	Seasonality not present 1.0000
Fresh meat	Seasonality not present 0.0755	Seasonality not present 0.0535	Seasonality not present 0.0694	Seasonality present 0.0009	Seasonality not present 0.2737	Seasonality not present 0.0612	Seasonality present 0.0019	Seasonality not present 1.0000
Meat products	Seasonality not present 0.8477	Seasonality not present 0.1906	Seasonality perhaps present 0.0136	Seasonality present 0.0010	Seasonality perhaps present 0.0159	Seasonality present 0.0003	Seasonality present 0.0001	Seasonality not present 0.2348
Milk	Seasonality not present 0.7798	Seasonality not present 0.6186	Seasonality not present 0.4785	Seasonality not present 1.0000	Seasonality not present 1.0000	Seasonality not present 0.9972	Seasonality not present 0.0901	Seasonality not present 0.9964

	North - West	Center	North - East	South - East	Bucharest - Ilfov	South - Muntenia	South - West Oltenia	West
Cheese and cream	Seasonality not present 0.6547	Seasonality present 0.0020	Seasonality not present 0.2355	Seasonality not present 0.2722	Seasonality not present 0.0784	Seasonality present 0.0005	Seasonality present 0.0003	Seasonality not present 1.0000
Eggs	Seasonality present 0.0011	Seasonality present 0.0006	Seasonality present 0.0003	Seasonality present 0.0002	Seasonality perhaps present 0.0323	Seasonality present 0.0023	Seasonality present 0.0006	Seasonality not present 0.3625
Fats	Seasonality perhaps present 0.0372	Seasonality not present 0.5340	Seasonality not present 0.3151	Seasonality not present 0.0893	Seasonality not present 0.8957	Seasonality not present 0.3149	Seasonality not present 0.3877	Seasonality not present 1.0000
Maize, sunflower, soya oil	Seasonality present 0.0043	Seasonality not present 0.2146	Seasonality not present 0.2281	Seasonality not present 0.0721	Seasonality not present 0.1960	Seasonality present 0.0015	Seasonality not present 0.2343	Seasonality not present 1.0000
Fruit	Seasonality present 0.0005	Seasonality present 0.0000	Seasonality present 0.0003	Seasonality present 0.0007	Seasonality perhaps present 0.0174	Seasonality present 0.0001	Seasonality present 0.0009	Seasonality present 0.0014
Potatoes	Seasonality not present 0.0778	Seasonality not present 0.6932	Seasonality present 0.0015	Seasonality not present 0.4988	Seasonality not present 0.0749	Seasonality not present 0.0503	Seasonality not present 0.1593	Seasonality not present 0.7442
Vegetables and canned vegetables in fresh vegetable equivalent	Seasonality present 0.0000	Seasonality present 0.0001	Seasonality present 0.0000	Seasonality present 0.0000	Seasonality present 0.0001	Seasonality present 0.0000	Seasonality present 0.0001	Seasonality present 0.0004
Sugar	Seasonality perhaps present 0.0141	Seasonality not present 0.3574	Seasonality not present 0.1104	Seasonality present 0.0001	Seasonality perhaps present 0.0378	Seasonality present 0.0098	Seasonality not present 0.1057	Seasonality not present 0.7073
Confiture, jam, compote, jellies	Seasonality present 0.0002	Seasonality present 0.0001	Seasonality present 0.0001	Seasonality present 0.0001	Seasonality present 0.0009	Seasonality present 0.0000	Seasonality present 0.0001	Seasonality present 0.0001
Chocolate, sweets, Turkish delight and other sugar confectionery	Seasonality present 0.0070	Seasonality present 0.0022	Seasonality present 0.0000	Seasonality present 0.0001	Seasonality present 0.0057	Seasonality present 0.0009	Seasonality present 0.0001	Seasonality present 0.0026
Mineral water and other soft drinks	Seasonality not present 0.1143	Seasonality not present 0.1610	Seasonality not present 0.4609	Seasonality not present 0.1571	Seasonality not present 0.7285	Seasonality not present 0.4895	Seasonality perhaps present 0.0458	Seasonality not present 0.1050
Alcoholic drinks	Seasonality perhaps present 0.0289	Seasonality present 0.0092	Seasonality not present 0.1117	Seasonality not present 0.4691	Seasonality not present 0.2579	Seasonality present 0.0024	Seasonality not present 0.9090	Seasonality not present 0.0735

Next, the automatic procedure used for TRAMO-SEATS and X13 was applied to seasonally adjust the time series that present strong evidence of seasonality. The results are displayed in Table 2. For most of the series, the X13 method is more suitable for seasonal adjustment. However, there are some

series where one can't decide between the two methods: the consumption of fresh meat in South – East, meat products in South – Muntenia; the consumption of eggs in North – West and South – East, respectively; the consumption of fruits in North – West; the consumption of vegetables and canned vegetables in fresh vegetable equivalent North – West; the consumption of confiture, jam, compote, jellies North – West. Moreover, there were some cases when TRAMO-SEATS provided better results: the consumption of fruit Center, South – Muntenia and South – East, respectively; the consumption of potatoes North – East; the consumption of vegetables and canned vegetables in fresh vegetable equivalent in South – East and Bucharest – Ilfov; the consumption of Chocolate, sweets, Turkish delight and other sugar confectionery in North – East; South - West Oltenia and West, respectively.

With regard to the calendar effect, interesting results were obtained. Firstly, threre is no trading days effect, meaning that the consumption of agro-food products is not influenced by the day of the week. Secondly, for some products there is a significant negative Easter effect of various lenghts: for the consumption of Cheese and cream in South – Muntenia the effect lasts for 15 days while in South - West Oltenia for 8 days; for the consumption of Eggs the effect lasts for 15 days in North – East as well as South – Muntenia; for the consumption of Meat products the effect lasts for 8 days in South – East; for the consumption of Maize, sunflower, soya oil the effect lasts for 8 days in South – Muntenia; for the consumption of Fruit the effect lasts for 15 days both in North – East and South – Muntenia; for the consumption of Vegetables and canned vegetables in fresh vegetable equivalent the effect lasts for 8 days in the Center as well as South - West Oltenia; for the consumption of Alcoholic drinks the effect lasts for 15 days in the Center region. The results are in line with the ones obtained in the scientific literature. For example, analysing US data, McElroy et al. (2018) also obtained a negative pre-Easter effect for groceries.

The results of the seasonal adjustment process for the series concerning the average consumption per person of various agro-food products using TRAMO-SEATS and X13 with national calendar

Table 2

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
	Bread and bakery products North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	1	yes	severe	-5.3859
X13 RSA5c	log-transformed	no	no	no	no	good	-0.1254
	Flour North – East						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-36.8021
X13 RSA5c	log-transformed	no	no	no	no	good	-44.1579
	Rice South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-88.34243
X13 RSA5c	log-transformed	no	no	no	no	good	-96.4454
	Fresh meat South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-16.8829
X13 RSA5c	log-transformed	no	no	no	no	good	-16.8829
	Fresh meat South - West Oltenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-6.6265
X13 RSA5c	log-transformed	no	no	no	no	good	-16.6115
	Meat products South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-33.4772
X13 RSA5c	log-transformed	no	no	no	no	good	-33.4772
	Meat products South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-17.1068

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
X13 RSA5c	log-transformed	Yes, 8 days, coef. -0.66	no	no	no	good	-25.0815
	Meat products South - West Oltenia						
TRAMO-SEATS RSA full	log-transformed	no	no	1	no	good	-41.6206
X13 RSA5c	log-transformed	no	no	1	no	good	-50.4455
	Cheese and cream South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-31.2457
X13 RSA5c	log-transformed	Yes, 15 days, coef. -0.09	no	no	no	good	-45.3041
	Cheese and cream Center						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-29.53659
X13 RSA5c	log-transformed	no	no	no	no	good	-36.8126
	Cheese and cream South - West Oltenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-37.1563
X13 RSA5c	log-transformed	Yes, 8 days, coef. -0.1829	no	no	no	good	-51.9694
	Eggs North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	24.5093
X13 RSA5c	log-transformed	no	no	no	no	good	24.0148
	Eggs Center						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	15.9171
X13 RSA5c	log-transformed	no	no	no	no	good	16.9665

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
	Eggs North – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	20.3638
X13 RSA5c	log-transformed	Yes, 15 days, coef. -0.1	no	no	no	good	12.4254
	Eggs South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	24.8740
X13 RSA5c	log-transformed	no	no	no	no	good	24.8740
	Eggs South – Muntenia						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	30.4485
X13 RSA5c	log-transformed	Yes, 15 days, coef. -0.14	no	no	no	good	21.1764
	Eggs South - West Oltenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	23.5356
X13 RSA5c	log-transformed	no	no	no	no	good	20.1071
	Maize, sunflower, soya oil North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-41.7316
X13 RSA5c	log-transformed	no	no	no	no	good	-42.2766
	Maize, sunflower, soya oil South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-53.5028
X13 RSA5c	log-transformed	Yes, 8 days, coef. -0.22	no	no	no	good	-69.7247
	Fruit North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	3.6303

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
X13 RSA5c	log-transformed	no	no	no	no	good	3.6303
	Fruit Center						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-9.1804
X13 RSA5c	log-transformed	no	no	no	no	good	-8.8778
	Fruit North – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	2.7937
X13 RSA5c	log-transformed	Yes, 15 days, coef. -0.11	no	no	no	good	0.5475
	Fruit South – East						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	6.7519
X13 RSA5c	log-transformed	no	no	no	no	good	10.5440
	Fruit South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	2.19170
X13 RSA5c	log-transformed	Yes, 1 day, coef -130.4	no	no	no	good	2.8940
	Fruit South - West Oltenia						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	2.3428
X13 RSA5c	log-transformed	Yes, 1 day but coef. aprox. 0	no	no	no	good	-3.1467
	Fruit West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	16.7622
X13 RSA5c	log-transformed	no	no	no	no	good	16.7622
	Potatoes North – East						

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
TRAMO-SEATS RSA full	log-transformed	no	no	1	no	good	-4.2044
X13 RSA5c	preprocessing: failed						
	Vegetables and canned vegetables in fresh vegetable equivalent North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	9.9716
X13 RSA5c	log-transformed	no	no	no	no	good	9.9716
	Vegetables and canned vegetables in fresh vegetable equivalent Center						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	14.9162
X13 RSA5c	log-transformed	Yes, 8 days, coef. -0.57	no	no	no	good	6.7268
	Vegetables and canned vegetables in fresh vegetable equivalent North – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	11.5725
X13 RSA5c	log-transformed	no	no	1	no	good	3.6528
	Vegetables and canned vegetables in fresh vegetable equivalent South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	15.1868
X13 RSA5c	log-transformed	no	no	no	no	good	17.9460
	Vegetables and canned vegetables in fresh vegetable equivalent Bucharest – Ilfov						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	24.0226
X13 RSA5c	log-transformed	no	no	no	no	good	26.7319
	Vegetables and canned vegetables in fresh vegetable equivalent South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	10.0872
X13 RSA5c	log-transformed	no	no	no	no	good	9.6269

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
	Vegetables and canned vegetables in fresh vegetable equivalent South - West Oltenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	26.9600
X13 RSA5c	log-transformed	Yes, 8 days, coef. -0.44	no	no	no	good	19.8792
	Vegetables and canned vegetables in fresh vegetable equivalent West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	30.5993
X13 RSA5c	log-transformed	no	no	no	no	good	30.5759
	Sugar South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-40.0591
X13 RSA5c	log-transformed	no	no	1	no	uncertain	-62.1106
	Sugar South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-45.7166
X13 RSA5c	log-transformed	no	no	no	no	good	-58.6181
	Confiture, jam, compote, jellies North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-23.8896
X13 RSA5c	log-transformed	no	no	no	no	good	-23.8896
	Confiture, jam, compote, jellies Center						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-36.5782
X13 RSA5c	log-transformed	no	no	2	no	severe	-53.0063
	Confiture, jam, compote, jellies North – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-28.5528
X13 RSA5c	log-transformed	no	no	no	no	good	-33.1440

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
	Confiture, jam, compote, jellies South – East						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-34.2008
X13 RSA5c	log-transformed	no	no	no	no	good	-43.3323
	Confiture, jam, compote, jellies Bucharest – Ilfov						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-38.4625
X13 RSA5c	log-transformed	no	no	no	no	good	-41.7283
	Confiture, jam, compote, jellies South – Muntenia						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-34.8264
X13 RSA5c	log-transformed	no	no	no	no	good	-38.8469
	Confiture, jam, compote, jellies South - West Oltenia						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-37.8559
X13 RSA5c	log-transformed	no	no	1	no	good	-55.4987
	Confiture, jam, compote, jellies West						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-28.5876
X13 RSA5c	log-transformed	no	no	no	no	good	-28.0057
	Chocolate, sweets, Turkish delight and other sugar confectionery North – West						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-39.8765
X13 RSA5c	log-transformed	no	no	no	no	good	-60.5710
	Chocolate, sweets, Turkish delight and other sugar confectionery Center						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-53.4022
X13 RSA5c	log-transformed	no	no	1	no	good	-71.9031
	Chocolate, sweets, Turkish delight and other sugar confectionery North – East						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-56.0022

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
X13 RSA5c	log-transformed	no	no	no	no	good	-52.4192
	Chocolate, sweets, Turkish delight and other sugar confectionery South – East						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-59.79847
X13 RSA5c	log-transformed	no	no	no	no	good	-69.0889
	Chocolate, sweets, Turkish delight and other sugar confectionery Bucharest – Ilfov						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-34.5570
X13 RSA5c	log-transformed	no	no	no	no	good	-35.54072
	Chocolate, sweets, Turkish delight and other sugar confectionery South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-58.54067
X13 RSA5c	log-transformed	no	no	no	no	good	-70.6273
	Chocolate, sweets, Turkish delight and other sugar confectionery South - West Oltenia						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-53.7011
X13 RSA5c	log-transformed	no	no	no	no	good	-46.5465
	Chocolate, sweets, Turkish delight and other sugar confectionery West						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	-40.5711
X13 RSA5c	log-transformed	no	no	no	no	good	-34.8893
	Alcoholic drinks Center						
TRAMO-SEATS RSA full	No transformation	no	no	no	no	good	0.6393
X13 RSA5c	log-transformed	Yes, 15 days, coef. -0.16	no	no	no	good	-1.2334
	Alcoholic drinks South – Muntenia						
TRAMO-SEATS RSA full	log-transformed	no	no	no	no	good	-14.7629

	Series transformation	Easter Effect	Trading days effect	Outlier detected and corrected	Residual seasonality	Overall quality	AIC
X13 RSA5c	log-transformed	no	no	no	no	good	-24.7765

4. CONCLUSIONS

Understanding the consumption patterns of agro-food products is a necessary step in the fast changing economy that may contribute to sustainable business growth in this economic sector. Currently, the focus on the origin traceability and quality of products is seen as a consumer behavior change that has occurred on the agro-food product market (Opara, 2003).

In the present research, using the most recent quarterly data from the National Institute of Statistics Romania, we explore seasonal patterns on the consumption of agro-food products at regional level.

The results reveal that the consumption of some agro-food products has no seasonality in all regions. However, there are products like vegetables and canned vegetables in fresh vegetable equivalent, Confiture, jam, compote, jellies and Chocolate, sweets, Turkish delight and other sugar confectionery that are consumed on a seasonally basis in all regions.

Also, the analysis shows that seasonal patterns in consumption for fruits and eggs persist in all regions except for Bucharest-Ilfov. South-West Oltenia and South-East Regions present seasonal patterns in the consumption of fresh meat and meat products. South-Muntenia Region has seasonal patterns in the consumption of rice, meat, cheese and cream, maize, sunflower and soya oil, sugar products.

The consumption of alcoholic drinks shows a strong seasonal pattern in South-Muntenia and Center Regions. The North-East Region presents seasonality only in the consumption of flour and potatoes, while the North – West Region for bread and bakery products and maize, sunflower and soya oil.

The situation by region shows that Bucharest-Ilfov West region have the lowest number of series that present seasonal patterns, compared to South-Muntenia that has the highest number of such series.

When the automatic procedure TRAMO-SEATS and X13 was applied to seasonally adjust the time series, X13 procedure obtained the best results. Even so, there were some circumstances when TRAMO-SEATS provided better results and some cases where one can’t decide between the two methods.

When the series are checked by the calendar effect it is observed no trading days effect, meaning that the consumption of agro-food products is not influenced by the day of the week. Also, the results are showing a negative pre-Easter effect of various lengths for some products and regions. Furthermore they reveal that unobserved factors may contribute to the current trends in the consumption patterns of agro-food products. The study of such unobserved effects need to be addressed by using other decision criteria.

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