

## Sustainability of wheat crops in organic management systems

Received for publication, September, 20,2017

Accepted, December, 14,2017

**IONICA ONCIOIU<sup>1\*</sup>, CARMEN MIHAELA BOTEANU<sup>1</sup>, DELIA MIOARA POPESCU<sup>2</sup>, MIRCEA CONSTANTIN DUICĂ<sup>2</sup>**

<sup>1</sup>Titu Maiorescu University, Faculty of Banking and Finance, Accountancy and Business Administration, Department of Economics, Bucharest, Romania

<sup>2</sup>Valahia University, Faculty of Economic Sciences, Targoviste, Romania

\*Address correspondence to: Titu Maiorescu University, Department of Economics, 22 Dambovnicului Street, 040051, Bucharest 4th District, Romania.

Tel.: +40744322911; Email: [ionicaoncioiu@yahoo.ro](mailto:ionicaoncioiu@yahoo.ro)

### Abstract

*The growing importance of sustainable agriculture is a real phenomenon and trends over time include healthy eating and ethical consumer's behavior. The purpose of this article is to raise awareness about the trends of organic grain market in Romania, taking into consideration the organic wheat market and individual exploitations. This study used a mathematical model of linear regression with the main purpose being to create a working instrument for the future analyses of the organic wheat producers, retailers, and distributors. The results indicate that the negotiation power of the legal buyers is significantly bigger than the organic wheat individual producers and that this type of buyer benefits by significantly diminished prices. The findings from this research demonstrate that organic wheat can often considered as one the most profitable business in Romania.*

**Keywords:** ecological agriculture, organic farms, organic grain market

### 1. Introduction

The relationship between agriculture and the environment is extremely complex (WATSON [1]). On the one hand agriculture is part of an environment affected by air pollution, climate change and competition with other sectors on land use (CHAECHI [2]). On the other hand, agriculture is one of the major causes of water pollution, erosion and soil pollution, greenhouse gas emissions, habitat destruction and biodiversity loss (FERJANI [3]). These are the results of the intensification, concentration and specialization of agricultural practices in recent decades. From this perspective, organic farming is called upon to provide natural products, free of chemical residues, in other words healthy (AZAMZADEH SHOURAKI & al. [4]).

Under these conditions, ecological agriculture is an opportunity for Romania to achieve generous incomes but also to preserve the environment, the transition to this system of agriculture being easier to achieve than in countries with super intensive agriculture.

ARION and MUREȘAN [5] showed that the loss of the natural resources due to intensive agriculture affect the future production factors and major investments will need to be done to conserve the natural area and productivity. Other research proved that the ecological agriculture could be more profitable than the conventional one, but there are some issues that not permit it's fully development in Romania (LUBIENIECHI [6]). Firstly, not many agricultural producers are entirely aware of the potential of ecological agriculture. Secondly, conditions of certification are not at all easy to comply (in terms of financing, timing, production technology, abilities and know-how).

Producers of organic food products in Romania must register their activity with the National Authority of Organic Products (N.A.O.P.) - Ministry of Agriculture and Rural Development and submit to the control of an accredited inspection and certification body. The number of operators registered in the Ministry of Agriculture and Rural Development organic farming system in 2010 was 3.155 and 14.470 in 2014 ( N.A.O. P. [7]). At a regional level, there are certain attempts at making maps of the ecological farms that produce organic wheat, which are expected to be completed by 2020 by the European Community, since the decision factors have become aware of the fact that ecological agriculture could bring an important added value in the Romanian agricultural economy.

The promotion and development of organic grain market demands the understanding of consumers' behaviours and psychological factors (KALAFATIS [8]). Factors that can impress the consumer's tendency towards organic products should be identified (HAGHJOU & al. [9]). The knowledge, attitude and behaviour studies can also help understand the consumers' behaviour. Previous studies showed that the consumers' attitude can strongly affect their choices (GIL and GRACIA [10]; GHORBANI [11]; VOINEA & al. [12]). Attitude can be viewed as a tendency for a responsibility to an idea or situation towards the conduct of one's own behaviour (PADEL [13]; NARAYANASWAMY [14]; PAUL [15]). Positive attitude leads to affirmative feeling and tendency for buying a product (PETRESCU & al. [16]).

From the point of view of the competition rules, the behaviour of individual producers of organic wheat has certain special characteristics such as: individual organic wheat exploitations are characterized by a low financial power, which increases the degree of dependence on other market participants by implicitly reducing their possibilities of action; the existence of a significant difference between the negotiating power of the purchasers of legal organic products and that of the producers of individual organic products; in the primary market of organic grain marketing, the representatives of the demand are traders and processors, whereas in the later stage of the marketing of these products the demand is expressed exclusively by the processors; it is worth noting that there is a link to the direct proportionality between the surface between the cultivated area and the distance to which the producers are willing to sell their production.

The market of organic wheat (*Triticum aestivum L.*) in Romania comes with several issues to be solved: better collaboration between authorities; more efficient policies for official control because of very complex matrices of organic wheat, more reliable and efficient laboratory methods of testing are necessary (PETRESCU-MAG and DACINIA [17]). Withal, an important statement of agricultural enterprises is that the farms have a problem of anticipation and adaptation to what happens in their environment of existence and functionality (HORALÍKOVÁ and ZUZÁK [18]; NICHOLAS [19]; SALAMA [20]).

On this background, in Romania, there are several questions: To what extent did the price of organic products influence the purchase intention of organic wheat? In which direction is the wind blowing in the organic grain market in Romania? These questions are intertwined with the impact of production quality levels on grain market prices.

This article brings a new look to the actual empirical studies that try to demonstrate the connection between the organization of the organic agriculture sector, the functioning and the mechanisms of this sector. This investigation provides an image of the competition mechanisms and the econometric estimations create a working instrument for the future analyses of the organic wheat producers, retailers, and distributors.

On the other side, the main aim of this study is to deepen and discover a reality which is more or less known at the level of common sense. More importantly, the results of the present study suggest that the more positive attitude of consumers towards organic products will further strengthen the purchasing intentions while the status of a bio consumers' consumption will not affect any change their willingness to purchase organic wheat products.

The rest of the article is organized as follows: Section 2 details the materials and methods development; Section 3 presents our results and discusses our findings; Section 4 provides concludes and suggests same recommendations as possible ways to improve practical implications.

## 2. Materials and Methods

The study was based on a questionnaire for individual organic wheat producers, but in order to allow for some comparisons between the different types of producers, the questionnaire was also applied to a small number of companies exploiting larger land plots.

The survey was performed during the first trimester of 2017. The questionnaires were forwarded to 130 organic wheat producers, retailers, distributors, receiving back a number of 98 responses (75.38%). The sample was established on the basis of the data provided by Organic Farmers Association of Romania Bioterra (BIOTERRA [21]).

The questionnaire is divided into four sections: sections A and B of the questionnaire measured information on the different stages of the organic wheat production process; section C evaluated attitudes and purchase intentions of organic wheat; section D contained items regarding information on sales, transport and storage of organic wheat. All items were measured on a seven-point Likert-scale with one representing "I totally disagree" to seven representing "I totally agree".

Due to the previous mentioned organic grain market characteristics, the organic wheat individual exploitations play the part of the offeror especially, during harvest. In order to estimate the organic wheat demand function, cross-section data (i.e. data recorded from various statistic units which refer to a certain moment of time) were used.

Afterwards, authors wanted to test if the observed difference regarding the selling price occurs randomly or not. In order to do this, we tried to estimate the (reverse) function of the organic wheat demand econometrically, case in which the sellers are represented by the organic field wheat individual producers, and to test the signification degree of the price difference.

Some researchers study the demand function as being the manner in which the demanded quantity of a certain good depends on the price of the respective good and on other factors (LASHGAR ARA [22]; VOON & al. [23]; KOOCHAKI and RAJABZADEH [24]). This type of approach is useful when, for example, one wants to calculate the value of the elasticity coefficients for the demand depending on the price of some replaceable products, in order to obtain the degree of replace ability of the analyzed product.

In our case, as we are interested in the price drivers on the organic field wheat market, we will focus on a second approach. Thus, we take into account the case in which the price variable ( $P$ ) is the dependent variable, explained by the quality variable ( $Q$ ), but also by a binary variable ( $D$ ) which points to the buyer's organizing manner and, implicitly, to the way this organizing manner influences the selling price.

By construction, the binary variable  $D$  takes the 0 value, when the buyer is a natural person and the 1 value when the buyer is a legal person (that is why, the natural person buyers form the base group). If, as a result of estimating the econometric model, the coefficient attached to the  $D$  variable is negative and statistically significant, then it means

that the price differences noticed in the answers received from the individual producers do not have a random character.

Thus, the studied linear regression model is:

$$P = \beta_1 + \beta_2 x Q + \beta_3 x DUM + \varepsilon \quad (1)$$

in which  $\varepsilon$ , the error of the model, is a random variable having a normal distribution.

Usually, the estimation of this regression will lead to a negative coefficient, of the  $Q$  variable. However, because of the fact that, on a grain market, supply and demand occur simultaneously, the obtained result can't be interpreted as being the demand for that product, but a combination between supply and demand – for further details (Hatirli [25]).

In order to eliminate the effect of simultaneity on the estimated coefficients, authors used the two stages least squares method (2SLS method). This method allows the correct estimation of a linear model in which one or several independent variables have endogenous characteristics (as it is the case with the  $Q$  variable in the present model). Using the 2SLS method implies the identification of a variable which is strongly correlated with the  $Q$  variable, but is not correlated with the  $P$  variable (implicitly, it is not correlated with the  $D$  and  $\varepsilon$  variables). A variable that meets these requirements is the organic field wheat cultivated surface. Naturally, the sold organic wheat quantity depends on the cultivated surface, the data pointing to a 0.65 correlation coefficient in the case of these two series of data, thus the existence of a very strong connection.

Another means of testing the correlation between the  $Q$  and  $S$  variables is to run a regression, using the least squares method (OLS), case in which we will consider  $Q$  as an explained variable, and the explanatory variables will be the exogenous variables in equation (1) ( $DUM$ ), as well as the instrumental variables ( $S$ ):

$$Q = \delta_1 + \delta_2 x DUM + \delta_3 x S + v \quad (2)$$

in which  $v$  is a random variable which has a normal distribution.

This is exactly the equation which Eviews estimates to be first stage in the process of estimating the parameters when using the 2SLS method. The necessary requirement so that the  $S$  variable be used as an instrumental variable is that the value of the  $\delta_1$  parameter be significantly different from 0 (zero).

### 3. Results and Conclusions

A total of 98 respondents (organic wheat producers, retailers, distributors) participated in the study, making a response rate of 75.38 %. About two-thirds (61.8%) were retailers, distributors and 38.2 % of respondent were managers of organic farms. The age between 31 - 45 years old with 47.5 % had most frequency among age group. Table 1 shows the results obtained after estimating the (2) equation:

Table 1. Regression coefficients model for independent variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$C$	4330.3371	15.94609	21.04986	0.0000
$S$	-0.367563	0.160205	-1.789575	0.0185
$DUM$	-49.14121	16.34359	2.345268	0.0026
R-squared	0.146352	Mean dependent var		388.1751
Adjusted R-squared	0.134048	S.D. dependent var		63.70191
S.E. of regression	57.96997	Akaike info criterion		8.95639
Sum squared resid	443765.0	Schwarz criterion		9.01518
Log likelihood	-472.3487	Hannan-Quinn criter.		8.98022
F-statistic	9.27796	Durbin-Watson stat		0.252342

Prob (F-statistic) 0.000018

One can notice that the value of the  $\delta_3$  parameter is -0.36, with the probability associated to the t test less than 5% (1.85%). However, we will check if the value of  $\delta_3$  differs significantly from 0 (zero) using a Wald test (Table 2).

Table 2. Results using the Wald test

Test Statistic	Value	df	Probability
F-statistic	4.105872	(1.080)	0.0185
Chi-statistic	4.105872	1	0.01700
Null Hypothesis Summary:			
Normalized Restriction (=0)		Value	Std. Err.
$C(2)$		-0.367563	0.160205

The null hypothesis of this test is:  $C(2) = 0$ , case in which  $C(2)$  represents the second parameter in the (2) equation (that is  $\delta_3$ ). Eviews refers to two tests (F, respectively Chi-square) together with the associated probabilities. Because the imposed restriction to  $C(2)$  coefficient is linear, we will focus on F test. The probability associated to this test is less than 5%, which means that the null hypothesis is rejected and, thus, the value of the  $\delta_3$  differs significantly from 0. Table 3 presents the results obtained when estimating equation (1), using the 2SLS method:

Table 3. Results obtained

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$C$	428.1163	10.90838	30.612285	0.0000
$S$	-0.205235	0.074568	-2.146795	0.0054
$DUM$	-44.44481	12.95080	-2.676820	0.0007
R-squared	0.154520	Mean dependent var		388.1751
Adjusted R-squared	0.142376	S.D. dependent var		63.70191
S.E. of regression	57.59539	Sum squared resid		438044.3
F-statistic	9.399132	Durbin-Watson stat		0.265818
Prob (F-statistic)	0.000016	Second Stage SSR		443765.0

Synthesizing the above results, the data show that the equation (1) becomes:

$$P = 428.11 - 0.20 \times Q - 44.44 \times D + \varepsilon \quad (3)$$

It can be noticed that the value of the quantity coefficient is negative, this being in accordance with the economic theory (the demanded quantity is inversely proportionate to the selling price). At the same time, all coefficients are significant from the statistical point of view, the probability associated to the t test for the variables included in the model being less than 0.01, meaning that each of these coefficients is statistical significant even at a 1% level of signification.

The value of the  $\beta_1$  parameter in the (1) equation is 428.11 Ron/to, this value being the medium organic wheat selling price to the base group, for which the binary variable takes the 0 value (thus, the medium selling price for natural persons). The coefficient of  $DUM$  binary variable represents the difference between the price paid by legal person's buyers and the one paid by the natural person's buyers. As the value of this coefficient is - 44.44 Ron/to, it can be said that, on average, legal persons paid 44.44 Ron/to less for a ton of organic wheat than the natural persons paid.

The difference between the prices paid by the natural persons and those paid by legal ones is approximately 25% and the results show that this difference is not caused by some

random factors, but it is explained by the manner in which buyers are organized. The private companies do not contract the natural persons, but buy organic wheat from intermediate traders or small companies. Besides this, the value of the price difference for the two categories of buyers is significant, the probability associated to  $t$  test for the *DUM* binary variable coefficient being 0.001.

It is worth mentioning that Romania was a net importing country of agricultural products between 2007 and 2012 (ARGHIROIU & al. [26]). The organic agriculture producers and processors generally agree that marketing opportunities do exist but there are many problems to be solved and increased government support is clearly needed (DORROUGH & al. [27]). For the wheat production, the price of ecological production is three quarters higher than the price of conventional production, mainly because it is sold, especially abroad.

In conclusion, Romania has a great potential in the field of organic wheat but also in their processing because it is one of the first countries in the EU, in terms of the dynamics of grain market development and consumption of organic products. Increase the organic wheat crops could be an initiative for decoupling negative environmental impacts from the actual economy, especially in ecological agriculture - related areas where the consumers see health benefits.. Moreover, the price of the organic wheat is formed freely on the grain market, as a result of the interaction between supply and demand, without the direct intervention of the state in the price forming mechanism. This happens both in the case of the organic wheat bread field and in the organic wheat depositing services field.

Our findings indicated that knowledge about organic wheat and the tendency towards organic grain market are directly related. This is consistent with the findings of many studies that reported consumers who had the knowledge about organic products buy more (TSAKIRIDOU & al. [28]; ARYAL [29]; CHAKRABARTI [30]; RAJABI and POURATASHI [31]; CĂPUȘNEANU & al. [32]). In Romania, the production process of the organic wheat is unclear. Therefore, the lack of trust in most of the participants and the absence of a special label, known logos and ways to track most of the products sold as organic wheat might have contributed to the reduced consumption. However, the present analysis shows that the negotiation power of the legal person buyers is significantly bigger than that of the organic field wheat individual producers and that this type of buyer benefits by significantly diminished prices.

This superior negotiation power can be the result of a superior economic efficiency, which does not justify the public authorities' intervention. Thus, the intervention could generate inefficiencies and could lead to price increase for end-user.

However, between 2015 and 2016, on the organic wheat depositing services field, there were two public interventions in price forming, interventions facilitated by the mechanism of subsidizing the costs corresponding to organic wheat depositing. Our opinion is that these public interventions can cause the alignment of the supply bearers' prices, reason for which we consider that the fact that these interventions were not resumed (in the same form) after 2016, is a positive fact.

Major economies of scale are being marketed on the organic grain market, and economic operators that integrate several types of sector-specific activities benefit from significant competitive advantages due to this diversification of activity. In terms of tariffs on this market, the analysed period seems to be characterized by a slight upward trend.

The novelty of the research is its application allows determining the complex average annual and maximum future demand of specific types of organic wheat with limited official statistics. As the result of the approbation of the econometric estimations, the Romanian

organic wheat has been calculated and the results show that there is the more positive attitude of consumers towards organic grain.

Organic wheat is, has been, and will continue to be an increasingly sought-after topic, which translates into a real business opportunity for those who are prepared to accept the challenges of such a business. It is a stake that needs to be fully exploited. For Romanians especially because of life conditions and environment, the challenges and future directions of organic grain market was sustained by a primordial pattern and continue searches.

Aside from the theoretical and managerial contributions of this study, there are some limitations that ought to be mentioned. The main limitation of the study is that it focuses on a convenience sample of organic wheat producers, retailers, distributors from just one country (Romania), thus rendering our findings highly site-specific and hardly generalizable. The authors suggests repeating the study internationally in order to analyse whether the organic grain market of different nationalities express different perceptions toward the constraints that prevent them from shifting from a positive attitude to actual responsible behaviour., Furthermore, this study does not investigate any variable that could moderate the extent to which each constraint influences behaviour for the organic wheat, due to the governmental instability in supporting the organic farm producers. The future research could address this point by trying to understand, for example, the moderating role that could be played by moral values, consumer personality, cultural background, materialistic or post-materialistic values, etc.

## References

1. C. A. WATSON, R. L. WALKER, E. A. STOCKDALE. Research in organic production systems - past, present and future. *J. Agric. Sci.*, 146:1 (2008).
2. B. CHAECHI. Organic Agriculture, healthy soil, healthy plant, health human. *Livestock, culture and industry*, 117:49 (2008).
3. A. FERJANI, A. ZIMMERMANN, L. REISSIG. Organic agriculture: Why so few farms convert. *Agrarforschung*, 1: 238 (2010).
4. M. AZAMZADEH SHOURAKI, S. KHALILIAN, S. A. MORTAZAVI. Effects of Declining Energy Subsidies on Value Added in Agricultural Sector. *J. Agric. Sci. Technol.*, 15: 423 (2013).
5. F.H. ARION, I.C. MUREŞAN. Economic evaluation of the ecological agriculture in Romania: Study case of wheat and corn. *J. Food, Agric. Environ.*, 11: 1578 (2013).
6. S. A. LUBIENIECHI. Romanian consumers' behaviour regarding organic food. *Brit. Food J.*, 104: 337 (2002).
7. NATIONAL AUTHORITY OF ORGANIC PRODUCTS (N.A.O.P.) - Ministry of Agriculture and Rural Development. <http://www.madr.ro/en/organic-farming.html>
8. S. P. P. M. KALAFATIS. Green Marketing and Ajzen's Theory of Planned Behavior: A Cross-Market Examination. *J. Consum. Mark.*, 16: 441 (1999).
9. M. H. HAGHJOU, B. PISHBAHAR, E. MOHAMMADREZAEI, R. GH. DASHTI. Factors Affecting Consumers' Potential Willingness to Pay for Organic Food Products in Iran: Case Study of Tabriz. *Agric. Sci. Technol.*, 15:191 (2013).
10. J. M. GIL, A. GRACIA, M. SANCHEZ. Market segmentation and willingness to pay for organic products in Spain. *Int. Food Agribus. Man.*, 3: 207 (2000).
11. M. H. S. A GHORBANI. Survey of Affecting on Consumers' Potential Willingness to Pay for Organic Products in Iran (A Case Study). *Trend Agric. Econ.*, 2: 10 (2009).
12. L. VOINEA, D. V. POPESCU, M. T. NEGREA. Good practices in educating and informing the new generation of consumers on organic foodstuffs. *Amfiteatru Econ. J.*, 17: 357 (2015).
13. S. F. C. PADEL. Exploring the gap between attitudes and behavior: Understanding why consumers buy or do not buy organic food. *Brit. Food J.*, 107: 606 (2005).
14. V.S. L. NARAYANASWAMY. From cleaner production to sustainable production and consumption in Australia and New Zealand: Achievements, challenges and opportunities. *J. Clean. Prod.*, 15: 711 (2007).

15. J. R. J. PAUL. Consumer behavior and purchase intention for organic food. *J. Consum. Mark.*, 29: 412 (2012).
16. A.G. PETRESCU, I. ONCIOIU, M. PETRESCU. Perception of Organic Food Consumption in Romania. *Foods*, 6: 42 (2017).
17. R. PETRESCU-MAG, P. DACINIA. Organic agriculture as component of sustainable development. Romania's case. *International Journal of the Bioflux Society*, 2: 121 (2010).
18. M. HORALÍKOVÁ, R. ZUZÁK. Role of talents in the development of agribusiness organisations. *Agric. Econ. – Czech*, 51: 265 (2005).
19. P. NICHOLAS, L. NICOLAS, I. JEFFREYS. Effects of European organic farming policies at sectoral level and societal levels. *Asp. Appl. Biol.*, 79,163-166, (2006).
20. H. M. H. SALAMA. Effects of Silver Nanoparticles in Some Crop Plants, Common Bean (*Phaseolus vulgaris* L.) and Corn (*Zea mays* L.). *Int. Res. J. Biotechnol.*, 3: 190 (2012).
21. ORGANIC FARMERS ASSOCIATION OF ROMANIA BIOTERRA. [www.bioterra.org.ro](http://www.bioterra.org.ro)
22. F. A. A. LASHGAR ARA. An analysis of factors influencing Lorestan province's farmers' adoption of sustainable agriculture. *Iranian J. Agric. Sci.*, 39: 97 (2008).
23. J.P. VOON, K.W. NGUI, A. AGARWAL. Determinants of willingness to purchase organic food: An exploratory study using structural equation modelling. *Int. Food Agribus. Man.*, 14: 103 (2011).
24. A. M. KOOCHAKI, H.M. RAJABZADEH. Factors affecting on Consumer' consumption for organic food, A survey study in Mashhad, Iran. *Agric. Econ. Dev.*, 27: 188 (2013).
25. S. A. HATIRLI, B. OZKAN, K. FERT. An econometric analysis of energy input/output in Turkish agriculture. *Renew. Sust. Energ. Rev.*, 9: 608 (2005).
26. G.A. ARGHIROIU, S. CRISTEA, I.N. ALECU. The Romanian External Trade in 2007 – 2013. *Agriculture and Agricultural Science Procedia*, 6:631 (2015).
27. J. DORROUGH, P. A. VESK, J. MOLL. Integrating ecological uncertainty and farm-scale economics when planning restoration. *J. Appl. Ecol.*, 45: 288 (2008).
28. E. B. C. TSAKIRIDOU, Y. ZOTOS, K. MATTAS. Attitudes and behaviour towards organic products: An exploratory study. *International Journal of Retail & Distribution Management*, 36: 158 (2007).
29. K. P. C. ARYAL, P. PANDIT, S. G. SHARMA. Consumers' willingness to pay for organic products: a case from Kathmandu valley. *J. Agr. Environ.*, 10: 12 (2009).
30. S. CHAKRABARTI Factors influencing organic food purchase in India – expert survey insights. *Brit. Food J.*, 112: 902 (2010).
31. A. S. F. RAJABI, M. H. POURATASHI. Investigating adoption component of agricultural organic products from the viewpoints of consumers (A case study in Karaj County). *Food Sci. Tech.*, 10: 33 (2013).
32. S. CĂPUȘNEANU, R. IVAN, D. I. TOPOR, D. M. OPREA, A. MUNTEAN. Environmental Changes and their Influences on Performance of a Company by Using Eco-dashboard. *J. Environ. Prot. Ecol.*, 16: 1091 (2015).