ANNALS OF THE POLISH ASSOCIATION
OF AGRICULTURAL AND AGRIBUSINESS ECONOMISTS

Received: 11.10.2022
Acceptance: 30.11.2022
Published: 16.12.2022
JEL codes: Q19, C59

Annals PAAAE • 2022 • Vol. XXIV • No. (4)

DOI: 10.5604/01.3001.0016.0946

SYLWIA KIERCZYŃSKA

Poznań University of Live Sciences, Poland

DETERMINANTS OF THE LEVEL AND VOLATILITY OF BLACKCURRANT PURCHASE PRICES IN POLAND

Key words: fruit production, fruit producers, fruits for processing, frozen blackcurrants, producer prices, export prices, COVID-19

ABSTRACT. The aim of the study was to identify the factors which significantly influence the purchase prices of blackcurrants in Poland. The average annual purchase prices of blackcurrants between 2004 and 2021 were the research material. The study was based on the data published by the Institute of Agricultural and Food Economics – National Research Institute in the semi-annual journal "Fruit and Vegetable Market". The relationship between the fruit purchase prices and the selected explanatory variables was analysed with the multiple regression method. Single-equation econometric models were designated as multi-factor functions. The reference publications were used as the basis for the selection of the following set of potential variables explaining the purchase prices of blackcurrants: the area of blackcurrant plantations in Poland, the yields of blackcurrants in Poland, the yields of blackcurrants in Ukraine, the yields of blackcurrants in Germany (the main importer of frozen products and a producer of currants), the volume of frozen blackcurrant exports and the export price of frozen blackcurrants. Apart from that, the qualitative variable COVID-19 was created, which allowed for the greater demand for blackcurrant preserves during the pandemic. In order to determine the factors which significantly influenced the purchase prices of blackcurrants during the period under analysis, the all possible regression method, also known as the best subsets regression, available in the Statistica PL package, was applied. This was a model with two explanatory variables: the export price of frozen blackcurrants and COVID-19. The linear determination coefficient of the estimated econometric model indicated that 90% of the variance of blackcurrant purchase prices was explained by the model.

INTRODUCTION

Vitamins and mineral salts are essential nutrients for normal function of the human body. Although in comparison with other dietary ingredients the consumption of vitamins and mineral salts is low by weight, the lack of vitamins in a human diet prevents body growth and development as well as the use of other nutrients. Fruits are an important source of natural and easily absorbable vitamins and minerals. Blackcurrants are fruits of high dietary significance. According to Dorota Walkowiak-Tomczak [2017], blackcurrants contain a lot of bioactive compounds, including fibre (8%), vitamin C (215 mg%), polyphenols (2.5 g/100 g dry mass as gallic acid). The content of anthocyanins in blackcurrants is as high as 30%. The results of the research by Michał Oczkowski [2021] showed that these compounds significantly counteract the effects of oxidative stress in the body. Therefore, they may reduce the risk of some chronic non-communicable diseases. The consumption of both raw and processed blackcurrants, i.e. juices and products containing fruit extracts, may aid the diet therapy of cardiovascular diseases, some eye diseases and normalise the lipid profile of the blood plasma. Anthony Watson et al. [2015] found that blackcurrant extract positively affected the cognitive functions of the human body.

Blackcurrants are mainly consumed as processed products. The consumption of fresh fruits is less common. Blackcurrants are processed into juices, including concentrated ones, jellies, jams, preserves, wines, liqueurs, tinctures, vodkas, and frozen foods [Walkowiak-Tomczak 2017]. Blackcurrant juice is also used as a natural dye in the food industry [Berryman 2014].

Currants come from the temperate climate zone. Many species of currants have their natural habitats in Europe and Asia, from northern Spain and western Europe to northern and central Asia [Rejman 1994]. According to Eberhard Makosz [2006], blackcurrants were known in Poland as early as the Middle Ages. However, until the mid-19th century small quantities of blackcurrants were grown only as medicinal plants. Later blackcurrants were also grown in gardens. Only after World War II the commercial production of blackcurrants began. Large scale production started after 1975. The commercial production of blackcurrants is associated with the rapid development of fruit processing and freezing. Moreover, the commercial production of currants is determined not only by natural conditions but also by economic ones. Mechanised fruit harvesting is of considerable importance, too [Rejman 1994].

According to the FAOSTAT data [2022], the global production of currants increased over the years – it doubled from an average 0.3 million tonnes between 1961 and 1970 to an average over 0.6 million tonnes between 2011 and 2020. Currently currants are grown mainly in Europe (98% of world production), Australia and New Zealand (1.4%), and Asia (0.6%). About 84% of the global currant production comes from two countries: the Russian Federation (62%) and Poland (22%). Currant plantations in these two countries cover 81% of the currant plantation area around the world. The Russian Federation

is the world's largest currant producer, with an average amount of about 400,000 tonnes of these fruits harvested per year. According to Eberhard Makosz [2014], the production of blackcurrants in Russia does not have commercial significance, because most of this fruit is produced on small home plantations. Poland is the world's second largest currant producer. In recent years the average total amount of currants harvested in Poland was slightly more than 140,000 tonnes. Another country with a relatively large commercial production of currants was Ukraine. Between 2002 and 2020 it ranged from 20,000 to 30,000 tonnes [FAOSTAT 2022]. The area of the currant plantations in Ukraine was about 4,000 ha. The productivity of the plantations was fairly high, i.e. over 6 tonnes per ha. Between 2002 and 2003 as well as earlier the production of currants in Germany exceeded 100,000 tonnes, but in 2004 it decreased to 60,000 tonnes, whereas in 2005 and the following years it decreased to about a dozen thousand tonnes per year. The decrease resulted from the reduction of the area of the currant plantations in Germany from 18,000 ha between 2002 and 2003 to about 2,000 ha in 2020. The productivity of currant plantations in Germany did not change significantly – it amounted to about 6 tonnes per ha [FAOSTAT 2022].

In Poland blackcurrants are mostly grown commercially (about 70% of production), whereas the total share of red and white currants is about 30% [IERiGŻ-PIB 2005-2022]. The area of blackcurrant plantations in Poland ranged from 30,000 ha in 2004 to 36,500 ha in 2013. Since 2013 on average it decreased by about 500 ha per year. In 2021 the area of blackcurrant plantations was 30,500 ha. The volume of blackcurrant production in Poland ranged from 154,900 tonnes in 2013 to 92,200 tonnes in 2019. In the last four years the average annual volume was 110,000 tonnes, but in the period of time spanning more than a decade a downward trend could be observed. The productivity of blackcurrant plantations was relatively low – between 2004 and 2020 the yield ranged from 3 to 4.6 tonnes per ha, whereas in the last four years the average annual yield was 3.3 tonnes per ha.

Most of the total blackcurrant production volume is processed. According to Eberhard Makosz [2014], about 90% of blackcurrants are processed mainly into frozen preserves and concentrated juices, which are then exported. Poland exports about 90% of blackcurrant preserves, mostly to Germany as well as other countries, mainly in the European Union [Nosecka 2014].

Blackcurrant plantations are a source of income for over 62,000 farms in Poland [GUS 2012], 87% of which are plantations with an area up to 1 ha, whereas 7.5% of these plantations are larger than 2 ha. According to producers, blackcurrant purchase prices have often been too low and have not covered the costs of production and harvesting. This sparked blackcurrant producers' protests. The National Association of Blackcurrant Growers (KSPCP) published letters of protest. Consequently, farmers did not harvest

the fruit and neglected their plantations when the income from the sale of the fruit was insufficient to purchase fertilisers and crop protection products for the next season. Farmers should receive decent income from the production and sale of fruit in order to preserve the traditional regions of blackcurrant production and to secure the raw material for the food industry. Due to the fact that blackcurrant purchase prices significantly affect the profitability of fruit production, it is important to answer the question what factors influence the level of these prices. The aim of the study was to identify the factors which significantly influence the purchase prices of blackcurrants in Poland.

RESEARCH MATERIAL AND METHODOLOGY

The average annual purchase prices of blackcurrants between 2004 and 2021 were the research material. The study was based on the data published by the Institute of Agricultural and Food Economics – National Research Institute in the semi-annual "Fruit and Vegetable Market" [IERiGŻ-PIB 2005-2022]. The data on the amount of fruit harvested and the area of plantations in individual countries were taken from the FAOSTAT database. The data on the amount of fruit harvested in Poland came from the statistical yearbooks published by the Central Statistical Office and from the semi-annual "Fruit and Vegetable Market". The data on exports came from the EUROTAT database.

The aim of the analysis was to identify the determinants of blackcurrant purchase prices in Poland. The blackcurrant purchase prices were the dependent variable. The potential explanatory variables were determined on the basis of reports in the reference publications. The relationship between the fruit purchase prices and the selected explanatory variables was analysed with the multiple regression method. Single-equation econometric models were designated as multi-factor functions. The estimators of the structural parameters of the model were estimated with the least squares method. The Statistica PL ver. 13.3 package was used for the statistical analysis.

The econometric models were subjected to formal and statistical verification. The coefficient of determination (R^2), the coefficient of random variation (ve), the standard error of the model estimate (S_e), and the mean absolute percentage error (MAPE) were used to assess the fit of the model to the empirical data. The lack of collinearity between the explanatory variables was verified with the variance inflation factor (VIF). The significance of the structural parameters of the model was assessed with Student's t-test. The significance of the entire model was assessed with Fisher-Snedecor F-test. The properties of the random component were checked for residual randomness (Run test), autocorrelation (Durbin-Watson test), symmetry and normality of distribution (Shapiro-Wilk test), and homogeneity of variance (White's test) [Maddala 2001, Stańko 2013].

RESULTS

BLACKCURRANT PURCHASE PRICES IN POLAND

Between 2004 and 2021 blackcurrant purchase prices in Poland ranged from 0.35 PLN per kg in 2004 to 4.70 PLN per kg in 2021. However, the increase in the prices was not linear (Figure 1). In the initial years of the period under analysis blackcurrant purchase prices followed the pattern suggested by Jan Świetlik [2004]. For a maximum of two years buyers paid very high prices for blackcurrants. This trend stimulated the establishment of new plantations. In consequence, the blackcurrant production potential in Poland increased and it was greater in the following years when the fruit purchase prices were very low. This situation could be observed between 2002 and 2014. In 2002 the blackcurrant purchase price was 1.70 PLN per kg, in 2003 – 1.20 PLN per kg, but between 2004 and 2006 they were very low, i.e. 0.35-0.65 PLN per kg. The blackcurrant purchase price increased considerably in 2007 (3.75 PLN per kg), but in the following three years the price decreased to about 2.00 PLN per kg. The price increased considerably in 2011 (4.10 PLN per kg), but in the following years the price tended to decrease to reach the level of about 0.60 PLN per kg in the next three years, i.e. 2014-2016. In 2014 *de minimis* aid

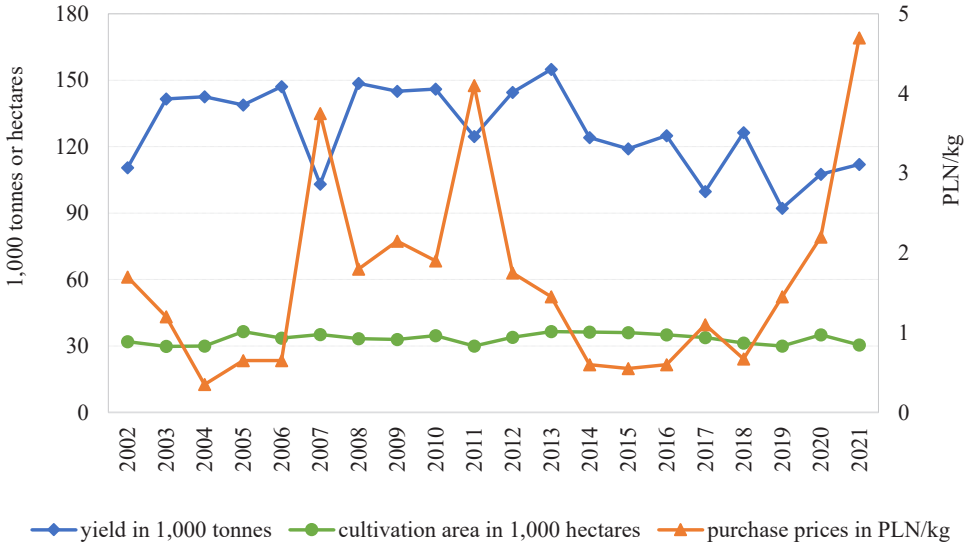

Figure 1. Yield, cultivation area and purchase prices of blackcurrants in Poland between 2002 and 2021

Source: own calculations based on GUS and IERiGŻ-PIB data

for the production of blackcurrants was introduced. As a result, the producers did not liquidate their plantations despite the low purchase prices of these fruits. This could have been the reason why the prices remained low in the following years [Gwara 2015]. Since 2019 blackcurrant purchase prices were increasing successively. In 2021 the price reached a record-breaking level of 4.70 PLN per kg because of the COVID-19 pandemic, which stimulated the demand for blackcurrant preserves due to their health-promoting properties. According to the data from purchase centres [SadyOgrody.pl 2022], in 2022 blackcurrant purchase prices reached an unprecedented level of 8-10 PLN per kg at the end of the purchase campaign. There are justified concerns that this situation will contribute to the establishment of new blackcurrant plantations and increase the production potential of this fruit in Poland [Nosecka 2022], as Piotr Baryła observed [2017].

DETERMINANTS OF BLACKCURRANT PURCHASE PRICES

The high yield of blackcurrants and the resulting large supply of fruits are considered to be decisive determinants of blackcurrant purchase prices [Smoleński 2004, ROiW 2004, Makosz 2014, Nosecka 2017]. On the other hand, Sylwia Kierczyńska [2019] research indicates that the correlation between blackcurrant purchase prices and yield was at a relatively weak level and statistically insignificant. Moreover, according to Bożena Nosecka and Łukasz Zaremba [2010], the export prices of primary processed products, i.e. frozen blackcurrants, also influence the purchase prices of these fruits. Among the factors shaping the purchase prices of fruits, they mention: stocks of frozen blackcurrants and stable demand for these fruits in EU countries, mainly Germany [Nosecka 2014]. According to Bożena Nosecka [2022] and Paweł Kraciński [2022], the coronavirus pandemic increased the demand for blackcurrant preserves, which may have contributed to the higher purchase prices of this fruit.

The reference publications were used as the basis for the selection of the following set of potential variables explaining the purchase prices of blackcurrants: the area of blackcurrant plantations in Poland, the yields of blackcurrants in Poland, the yields of blackcurrants in Ukraine, the yields of blackcurrants in Germany (the main importer of frozen products and a producer of currants), the volume of frozen blackcurrant exports and the export price of frozen blackcurrants. Explanatory variables allowing for the time shift were also created for the area of blackcurrant plantations, the yield, export price and export volume of blackcurrants (Table 1). Apart from that, the qualitative variable COVID-19 was created, which allowed for the greater demand for blackcurrant preserves during the pandemic (2020 and 2021), where 1 – the occurrence of the pandemic, 0 – the other years.

The value of the Pearson linear correlation coefficient was used as the basis for the calculation of the level of strength and direction of the relationship between the dependent variable and each of the potential explanatory variables (quantitative). The variables which

Table 1. Explained variable and potential explanatory variables explaining blackcurrants purchase prices

Variable	Description	Mean	SD	Correlation coefficient with dependent variable and (p)
BC_PRICE	Purchase price of blackcurrants [PLN/kg]	1.69	1.30	-
PROD_PL	Blackcurrants yield in Poland [1,000 tonnes]	127.85	19.13	-0.2735 (0.272)
PROD_PL_1	Blackcurrants yield in yesteryear in Poland [1,000 tonnes]	129.49	18.96	-0.0469 (0.853)
AREA_PL	Blackcurrant cultivation area in Poland [1,000 hectares]	33.60	2.34	-0.3350 (0.174)
AREA_PL_1	Blackcurrant cultivation area in yesteryear in Poland [1,000 hectares]	33.56	2.40	0.0175 (0.945)
AREA_PL_2	Blackcurrant cultivation area two years before [1,000 hectares]	33.39	2.40	-0.1135 (0.654)
PRICE_EX	Export price of frozen blackcurrants [EUR/kg]	0.76	0.31	0.9389 (0.000)
PRICE_EX_1	Export price of frozen blackcurrants yesteryear [EUR/kg]	0.73	0.29	0.3995 (0.101)
UKR_PROD	Blackcurrants yield in Ukraine [1,000 tonnes]	25.60	1.49	0.0002 (0.999)
GER_PROD	Blackcurrants yield in Germany [1,000 tonnes]	14.74	11.4	-0.3185 (0.198)
EX_MROŻ	Export quantity of frozen blackcurrants [1,000 tonnes]	27.86	9.41	-0.1579 (0.531)
EX_MROŻ_1	Export quantityof frozen blackcurrants yesteryear [1,000 tonnes]	27.11	9.35	-0.0781 (0.758)
COVID-19	Occurance of the pandemic COVID-19	-.	-	0.4778 (0.050)*

* Spearman's correlation

Source: own calculations based on FAOSTAT and IERiGŻ-PIB data

were very weakly correlated with the dependent variable (weak correlation < 0.1) were eliminated from the analysis. These were: the yield of blackcurrants in Ukraine, and the variables with a one-year time shift: the plantation area, yield, and exports of blackcurrants. The other variables were included in the initial set of explanatory variables.

ESTIMATION AND EVALUATION OF ECONOMETRIC MODELS

Multiple regression analysis was applied in order to determine the factors which significantly influenced the purchase prices of blackcurrants during the period under analysis. The all possible regression method, also known as the best subsets regression, available in the Statistica PL package, was applied. The analysis gave a set of twenty best models, arranged according to the adopted criterion – Mallows's Cp statistics[1]. The model with the lowest level of the aforementioned statistics was selected from the estimated models. This was a model with two explanatory variables: PRICE_EX (the export price of frozen blackcurrants) and COVID_19 (Table 2).

Table 2. Structural parameters of blackcurrant purchase price model

Explained variable	Explanatory variables	Coefficient	Standard error	t-Student	p
BC_PRICE	Intercept	-0.8387	0.3538	-2.3707	0.0316
	PRICE_EX	3.6973	0.3550	10.4149	0.0000
	COVID_19	-0.3511*	0.1691	-2.0756	0.0555

* For the effect level – zero
Source: own calculations based on IERiGŻ-PIB data

The analysis of the structural parameters of the model showed that the dependent variable PRICE_EX was statistically significant at the significance level $p < 0.05$, whereas the COVID_19 variable was statistically insignificant at $p < 0.05$. However, the latter variable was statistically significant at a slightly higher level, i.e. $p < 0.06$. Therefore, this variable was left in the model. The Fisher-Snedecor F test showed that the entire set of the explanatory variables as well as the obtained regression coefficients were statistically significant determinants (Table 3). The obtained model underwent substantive verification. The positive

[1] This statistic is an estimator of the measure of the difference between the area determined by the full model and the area determined by the reduced model in the following form $y = b_0 + b_1x_1 + b_2x_2 + \ldots + bpx$ [Stanisz 2000].

Table 3. The assessment of structural parameters of the model

Item	Symbol	Model
Coefficient of determination	R^2	0.9079
Adjusted R^2	Adj.R^2	0.8957
Standard error	Se	0.4203
The Fisher-Snedecor F-test (p)	F	73.961 (0.0000)
Variation estimator	ve	0.2487
Mean Absolute Percentage Error	MAPE	0.3856
Variance Inflation Factor	VIF	1.1515
The Durbin-Watson test	d	2.3963
	dL dU	1.0461 1.5353
The White's test	R^2	0.7208
The Shapiro-Wilk test	W	0.9231
Run test	K_e	12
	K_1 K_2	5 14

Source: own calculations based on IERiGŻ-PIB data

sign of the PRICE_EX variable estimator means that the increase in the export prices of frozen blackcurrants by 0.10 EUR/kg was accompanied by the increase in the blackcurrant purchase prices by 0.37 PLN per kg. In the years without the COVID-19 pandemic the purchase prices of blackcurrants were 0.35 PLN per kg lower than in the pandemic period.

The linear determination coefficient of the estimated econometric model indicated that 90% of the variance of blackcurrant purchase prices was explained by the model. The remaining 10% of the variance could have been affected by random fluctuations or factors not included in the model. The deviations of the actual blackcurrant purchase prices from the theoretical values estimated with the model amounted to 0.42 PLN per kg, which indicates a quite high error of the model. The average deviation of the model residuals was 0.25%, and the mean absolute percentage error (MAPE) was 39%. The level of the inflation variance factor showed that there was no collinearity between the explanatory variables. The evaluation of the properties of the random component of the model showed that it was characterised by correct parameters, i.e. the normal distribution of residuals, the correct analytical form of the model, the lack of autocorrelation of the random component. White's test indicates the heteroskedasticity of the residues, suggesting that the estimators are not effective.

SUMMARY AND CONCLUSIONS

The estimated econometric model explained 90% of the purchase prices of blackcurrants in Poland between 2004 and 2021. The export prices of frozen blackcurrants and the COVID-19 pandemic significantly influenced the purchase prices of this fruit. The high purchase prices of blackcurrants during the coronavirus pandemic were caused by the increased demand for preserved products made from this fruit due to their high content of vitamins and polyphenols, and their health-promoting effect on the human body.

The dependence of blackcurrant purchase prices on the expected level of export prices of processed blackcurrant products results from the fact that most of the processed blackcurrant products are exported. Therefore, a question arises – if Poland is one of the world's largest blackcurrant producers and the largest exporter of processed blackcurrant products, can it dictate the prices of processed blackcurrant products on markets around the world? According to Bożena Nosecka [2017], one's position on the world market of industrial fruit is determined almost exclusively by lower prices than those offered by other exporters. Other important aspects are meeting the expectations of consumers of preserved fruit products in importing countries and the proximity of suppliers to major markets (location rent). In view of the fact that in market economy prices are determined by the law of supply and demand [Mankiv, Taylor 2016], and blackcurrant is not an irreplaceable and vital product, fruit processing plants need to take the demand for preserved blackcurrant products into account in their pricing policy. Therefore, it is most likely that the demand for processed fruit on foreign markets as well as the demand for concentrated juice and frozen products in importing countries determine the level of export prices for processed blackcurrant products. Due to the fact that the demand may be influenced by various factors, further research on the export prices of frozen blackcurrants should be conducted. Our analysis led to the following conclusions:

1. The prospect of high export prices for frozen blackcurrant products increases the demand of processing plants for blackcurrants, which contributes to relatively high purchase prices of this fruit in Poland.
2. The positive correlation between the purchase prices of blackcurrants and the occurrence of the pandemic shows that the health-promoting properties of blackcurrants stimulate the demand for this fruit.
3. The estimated econometric model is statistically significant at the significance level $p < 0.05$ and explains about 90% of the volatility of blackcurrant purchase prices. This means that the remaining part of the purchase price volatility is determined by factors not included in the model.

BIBLIOGRAPHY

Baryła Piotr. 2017. *Przyszłość czarnej porzeczki w Polsce* (The future of blackcurrants in Poland). IBA, https://www.blackcurrant-iba.com. access: 29.09.2022.

Berryman David. 2014. The use of fruit juices as natural colouring agents. *New Food* 17 (5): 25-29.

FAOSTAT. 2022. *Food and agriculture data*, http://www.fao.org/faostat/en/#data, access: 20.09.2022.

GUS (Central Statistical Office – CSO). 2012. *Uprawy ogrodnicze. Powszechny spis rolny 2010* (Horticulture. General Agricultural Census 2010). Warszawa: GUS.

Gwara Aneta. 2015. *Pomoc de minimis dla plantatorów porzeczki w żaden sposób nie rozwiązuje problemu* (De minimis aid for currant growers does not solve the problem in any way), www.sadyogrody.pl, access: 25.08.2015.

IERiGŻ-PIB. 2004-2020. *Rynek owoców i warzyw* (Fruit and Vegetable Market). Warszawa: IERiGŻ-PIB.

Kierczyńska Sylwia. 2019. Relationship between producers and processors in terms of fruit production and prices of fruits for processing in Poland. *Journal of Agribussines and Rural Development* 4: 307-317.

Kraciński Paweł. 2020. *Jak kształtuje się tegoroczny rynek porzeczek* (How this year's currant market looks like), www.sadyogrody.pl, access: 13.07.2020.

Kraciński Paweł. 2022. *Popyt na czarne porzeczki jest wysoki. Z jakimi cenami ruszy skup* (The demand for black currants is high. What prices to start buying), www.sadyogrody.pl, access: 07.07.2021.

Maddala G.S. 2001. *Introduction to econometrics*. Chichester, England: John Wiley & Sons Ltd.

Makosz Eberhard. 2006. Porzeczka czarna w Polsce (Black currant in Poland). *Sad Nowoczesny* 8: 36-37.

Makosz Eberhard. 2014. *Przyszłość w produkcji owoców porzeczki czarnej na świecie, szanse i zagrożenia*. [W] IV Międzynarodowa Konferencja Porzeczkowa, 2-6 czerwca 2014 r., Białowieża (The future in the production of blackcurrant fruit in the world, opportunities and threats. [In] IV International Currant Conference). Białowieża, June 2-6, 2014.

Mankiv Gregory N., Mark P. Taylor. 2015. *Mikroekonomia* (Microeconomics). Warszawa: PWE.

Nosecka Bożena (ed.). 2014. *Sytuacja na światowym rynku wybranych przetworów owocowych i warzywnych* (The situation on the world market of selected fruit and vegetable preserves). Warszawa: IERiGŻ-PIB.

Nosecka Bożena. 2017. *Czynniki i mierniki konkurencyjności zewnętrznej sektora ogrodniczego i jego produktów.* Studia i Monografie nr 172 (Factors and measures of external competitiveness of the horticultural sector and its products. Studies and Monographs No. 172). Warszawa: IERiGŻ-PIB.

Nosecka Bożena. 2022. *Ceny czarnej porzeczki utrzymały rekordowy poziom* (Blackcurrant prices maintained a record high), https://www.sadyogrody.pl, access: 29.07.2022.

Nosecka Bożena, Łukasz Zaremba. 2010. Owoce z krzewów jagodowych (Fruits from berry bushes). *Owoce, Warzywa, Kwiaty* 12: 12-13.

Oczkowski Michał. 2021. Health-promoting effects of bioactive compounds in blackcurrant (*ribes nigrum* L.) berries. *Roczniki Państwowego Zakładu Higieny* 72 (3): 229-238. DOI: 10.32394/rpzh.2021.0174.

Rejman Aleksander (ed.). 1994. *Pomologia. Odmianoznawstwo roślin sadowniczych* (Pomology. Variety of fruit plants). Warszawa: PWRiL.

SadyOgrody.pl. 2022. *Czarne porzeczki 2022: Ile płacą skupy?* (Blackcurrants 2022: How much do purchases pay?), https://www.sadyogrody.pl, access: 22.07.2022.

Smoleński Tomasz. 2004. Czarna porzeczka – zagrożenie opłacalności (Blackcurrant – the threat of profitability). *Sad Nowoczesny* 5: 46-47.

Stanisz Andrzej. 2000. *Przystępny kurs statystyki* (An affordable statistics course). Kraków: Statsoft Polska. 2000.

Stańko Stanisław (ed.). 2013. *Prognozowanie w agrobiznesie* (The forecasting in agribusiness). Warszawa: Wydawnictwo SGGW.

Świetlik Jan. 2004. Porzeczki i agrest po integracji Polski z UE (Currants and gooseberries after Poland›s integration with the EU). *Sad Nowoczesny* 6: 30-31.

Walkowiak-Tomczak Dorota. 2017. Charakterystyka głównych gatunków owoców i warzyw jako artykułów żywnościowych i surowców dla przetwórstwa. [W] *Warzywa i owoce. Przetwórstwo i rola w żywieniu człowieka* (Characteristics of the main types of fruit and vegetables as food products and raw materials for processing. [In] Vegetables and fruits. Processing and role in human nutrition), ed. Jan. Gawęcki, Janusz Czapski. Poznań: Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu.

Watson Anthony W., Crystal F. Haskell-Ramsay, David O. Kennedy, Janine M. Cooney, Tania Trower, Arjan Scheepens. 2015. Acute supplementation with blackcurrant extracts modulates cognitive functioning and inhibits monoamine oxidase-B in healthy young adults. *Journal of Functional Foods* 17: 524-539.

***

DETERMINANTY POZIOMU I ZMIENNOŚCI CEN SKUPU OWOCÓW PORZECZKI CZARNEJ W POLSCE

Słowa kluczowe: produkcja owoców, producenci owoców, owoce do przetwórstwa, mrożone porzeczki czarne, ceny producenta, ceny exportowe, COVID-19

ABSTRAKT

Celem opracowania jest identyfikacja czynników istotnie wpływających na ceny skupu owoców czarnej porzeczki w Polsce. Praca swoim zakresem obejmowała dane za lata 2004-2021. Materiał badawczy stanowiły średnioroczne ceny skupu owoców porzeczki czarnej opublikowane przez Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej – Państwowy Instytut Badawczy w półroczniku „Rynek Owoców i Warzyw". Do analizy związku pomiędzy cenami skupu owoców a wybranymi zmiennymi objaśniającymi zastosowano metodę regresji wielorakiej – wyznaczono jednorównaniowy model ekonometryczny jako funkcję wielu czynników. Kierując się doniesieniami literatury, do zbioru potencjalnych zmiennych objaśniających kształtowanie się cen skupu owoców porzeczki czarnej zaliczono: powierzchnię uprawy porzeczki czarnej w Polsce oraz zbiory tych owoców w Polsce, na Ukrainie i w Niemczech (kraju, który jest głównym importerem mrożonek, ale także producentem porzeczek), wielkość eksportu mrożonek z czarnych porzeczek oraz cenę eksportową mrożonych owoców czarnej porzeczki. Ponadto, utworzono zmienną jakościową COVID-19, uwzględniającą większy popyt na przetwory z owoców z czarnej porzeczki w okresie pandemii. W celu określenia czynników istotnie wpływających na kształtowanie się cen skupu owoców porzeczki czarnej w badanym okresie zastosowano metodę wszystkich możliwych regresji, inaczej zwaną metodą najlepszego podzbioru, dostępną w pakiecie Statistica PL. Otrzymano model z dwoma zmiennymi objaśniającymi: cena eksportowa mrożonek z czarnej porzeczki oraz COVID-19. Współczynnik determinacji liniowej oszacowanego modelu ekonometrycznego wskazuje, że 90% wariancji cen skupu owoców porzeczki czarnej zostało wyjaśnione przez model.

AUTHOR

SYLWIA KIERCZYŃSKA PHD, ENG.

ORCID: 0000-0003-1122-1506
Poznań University of Live Sciences
Faculty of Economics
Department of Law and Organization of Agribusiness Enterprises
28 Wojska Polskiego St., 60-637 Poznań
e-mail: kierczynska@up.poznan.pl

Proposed citation of the article:
Kierczyńska Sylwia. 2022. Determinants of the level and volatility of blackcurrant purchase prices in Poland. *Annals PAAAE* XXIV (4): 103-115.