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INNOVATIVE DEVELOPMENT OF AGRICULTURAL BUSINESS AND RURAL AREAS

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Director: Vesselin Angelov, +359 2 8195 251
Dep. Exe. Director: Stefan Vlasev, +359 2 8195 551
Chief Editor: Todorina Nedeva, +359 2 8195 564

UNIVERSITY OF NATIONAL AND WORLD ECONOMY
1700 Sofia, Student Town, UNWE

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INTRODUCTION

ВЪВЕДЕНИЕ

The collection includes the reports presented at the another International Scientific Conference "Innovative Development of Agrarian Business and Rural Areas", organized by the Department of Natural Resource Economics of the University of National and World Economy on September 29 and 30, 2022.

The development of agrarian business in the conditions of the Common Agricultural Policy, the processes of digitization and globalization, climate changes, the COVID-19 pandemic and others, posed a number of challenges to agrarian business and rural areas. They led to the need to look for new solutions in the field of policies, business models, the transition to a green economy, bio-economy, circular economy and others. On this basis, a number of problems, discussion questions and strategic opportunities arose to researchers and experts in the agrarian economy and regional development.

The topic of the scientific conference aroused wide interest in the scientific community. Proof of that is the participation in the forum of researchers from a number of scientific research institutions such as:

- Institute for Economic Research – Bulgarian Academy of Sciences, Sofia;
- Thracian University, School of Engineering, Stara Zagora;
- Business Academy "D. A. Tsenov", town of Svishtov;
- Institute of Agrarian Economics – Agricultural Academy, Sofia;
- University of Economics, Varna;
- The Institute of Viticulture and Winemaking – Agricultural Academy, Pleven;
- Institute of Agriculture – Agricultural Academy, Kyustendil;
- Institute of Animal Husbandry – Agricultural Academy, Kostinbrod;
- New Bulgarian University;
- The Higher School of Agribusiness and Regional Development, Plovdiv and
- the host of the scientific forum – the University of National and World Economy.

Graduated and young researchers from the Institute of Agrarian and Food Economics in Warsaw, Poland presented their research results in the field of innovative development of agrarian business and rural areas; as well as from the University of Peloponnese, Greece and University of Western Macedonia, Greece.

In the plenary session and at the meetings by sections, were presented reports in several thematic directions: Innovative business models for the development of agrarian business and rural areas; European and national policies for innovative de-

velopment of agriculture and rural areas; Digitization, diversification and sustainable growth in rural areas; Bioeconomy, green architecture and business; Innovative approaches to agricultural and rural management.

In her report "Environmental and climate risk management in agricultural holdings in Bulgaria", Prof. Zornitsa Stoyanova assessed the sources of environmental and climate risk for agricultural holdings based on an analysis of climate-related crisis events in Bulgaria for the period 2010 – 2020 and their impact on agricultural production. Special attention was given to financial support to compensate the damage to agricultural crops caused by adverse climatic phenomena that can be equated to natural disasters. This allowed her to propose recommendations for adapting agricultural production and reducing environmental and climate risk.

The report of the team of researchers from the University of Peloponnese, presented by Prof. Dimitrios Petropoulos, aims to assess the development of wheat production in Greece over a 40-year period. The analysis of trends in the production of soft and durum wheat, as well as the trade balance, revealed a number of problems facing the development of this strategic crop for Greek agriculture.

The research of Prof. Hrabrin Bashev and Assoc.prof. Bozhidar Ivanov from the Institute of Agrarian Economics put the emphasis on "Review of assessment modes to Bulgarian agrarian governance". The purpose of the study is to analyze to what extent expert judgment and statistical evaluation modes are reliable and convergent for applying management evaluation by using ANOVA test and significance test equation. The results of the evaluations of the management principle and indicators through these two modes show very similar and close variations in the results. On this basis, the authors suggest that the application of the same criteria where experts are asked to make their judgment on indicators, having the EU average in mind is the key to obtaining similar results.

Assoc.Prof. Nikolova emphasized in her report the role of organic farming as a sustainable agricultural model and an innovative approach for the transition to a higher degree of sustainability of a healthy and ecologically clean food system, related to the production of products with high added value under sustainable management of natural resources. The purpose of the research is to establish the contribution of organic agriculture to the sustainable management and development of rural areas in the Republic of Bulgaria. On the basis of the outlined strategic framework for the development of organic agriculture, is defended the opinion that the innovative development of agribusiness in rural areas, by applying a model for sustainable organic production, is based on the cooperation between authorities, local communities and businesses for diversification in the functional use of the territory and optimal utilization of the available resources.

The report by Prof. Szczepan Figiel "Potential impact of artificial intelligence applications on agricultural productivity" from the Institute of Agricultural and

Food Economics – National Research Institute (Poland), assesses how artificial intelligence solutions applied in agriculture can affect not only production practices, but also the total factor productivity of the sector worldwide.

Impact of subsidies in agricultural income and crop production: the case of Greece is the subject of the paper presented by Zisis C. Mandanas. It examines the relationship between the amount of agricultural income and the value of agricultural output and the level of product subsidies for the period 1993 – 2020 for Greece. The results of the research show a significant reduction in the level of subsidies, which, however, is not associated with a corresponding reduction in agricultural production in the long term, but with a reduction in income from agriculture.

The report "Relative comparative assessment of EU-28 farm sustainability" by Veselin Krustev aims to establish the relationship between the economic size of the farm and sustainability. Applying the relative comparative approach, an assessment is applied by normalizing the FADN data and determines the coverage of Member States according to pre-defined criteria used as a sustainability assessment.

In his report "Personal agrarian exchange and uncertainty", Associate Professor Terziev presented his results of a study on business reactions to a high degree of uncertainty in cases of agricultural producers using mainly a personal form of agrarian exchange.

The research of Dr. Pavlin Pavlov is devoted to the economic role of tourism for the development of rural areas. In it, the author proves that alternative forms of tourism, given Bulgaria's rich tourist resources, provide an opportunity for sustainable growth in rural areas.

In their joint report, Prof. Doichinova and Prof. Wzohalska assess the trends in the development of demographic processes in the rural areas of Poland and Bulgaria and their consequences, which affect the development of rural areas for the period 2010 – 2021. Based on the comparisons made between them, conclusions have been made about the deterioration of the demographic structures and the development opportunities of the local economies and communities in both countries.

Associate Professor Harizanova-Bartos presented a study of the relationship between the wage and economic development in the agricultural sector in Bulgaria. The developed regression model shows that the average annual wage in agriculture can be explained to some extent by its value in the previous period. The increase in subsidies and investment pushes wages up significantly.

Associate Professor Kazakova presented results of a study of the educational system and results in peripheral rural areas and emphasized that the EU's vision for rural areas 2040 assumes that qualified, educated and motivated people will be in rural areas to make them stronger, connected, resilient and prosperous. For this purpose, it is necessary to develop educational and regional development policies that include specific and targeted actions to overcome the gap in school education in peripheral rural areas.

Another part of the reports is devoted to the problems of agricultural lands. In them, Prof. Perkov and Dr. Nenova present a model to highlight the significant factors influencing the price of agricultural land in Bulgaria. Fixed-effect panel regression and stepwise regression were applied. The empirical results prove that the price of agricultural land in Bulgaria for the considered period is influenced by: the relative share of households with Internet access, the length of first-class roads and the average annual salary of employed persons. The existing differences in the variables by area also have a strong influence.

The report by Sonya Todorova and Prof. Atanasova analyzes the current legal framework regarding the right of ownership and the right to use agricultural land in Bulgaria, the economic and legal consequences of the practical application of the legal institutes governing the right to use agricultural land.

The study "Evolution of apple production in the post-macrosocial transformation period" developed by Dr. Monika Kabadzhova and Associate Professor Iliyana Krishkova analyzes and evaluates the development of apple production in Bulgaria for the period after the 1990s. It was established that the transition to a market economy in Bulgarian agriculture had a negative impact on foreign trade in fresh fruit. As a result of all this, Bulgaria turned from an exporter into an importer of fruits.

The report by Dr. Ani Dimitrova and Assoc. Professor Branzova analyzes the development trends of vegetable production and emphasizes the innovations that can contribute to the sustainable development of vegetable production in Bulgarian agriculture.

Prof. Miteva emphasized that the circular economy represents an innovative paradigm for development, offering cutting-edge models for production, distribution, consumption and recovery that improve the protection of ecosystems and increase the well-being of people. On this basis, in her report, she presented the theoretical foundations of the circular economy and the possibilities for its development in our country.

In her report "The impact of COVID-19 on agri-food enterprises in the Peloponnese region", Eleni Anastasopoulou examines the problems arising from the pandemic in the production process of 405 agri-food enterprises, including producers (farmers, livestock breeders, fishermen), processors/micro, small and medium-sized agri-food enterprises located in a predominantly rural area of Greece, Peloponnese region. In her presentation, she emphasized that the uncertain economic environment creates uncertainty among producers and entrepreneurs in the food industry about sustainability and future investment. Local and regional authorities together with the state must take relief measures to provide financial support to producers and entrepreneurs in the food industry so that the food supply chain functions properly and we do not face a food crisis.

The subject of digitalization of agriculture and rural areas aroused wide interest among the conference participants. In the presented five reports, teams of authors

from the Thracian University, the Institute for Economic Research of the Bulgarian Academy of Sciences and the Institute of Viticulture and Winemaking in Pleven analyze and evaluate various aspects of the process and its effects. Emphasis is placed on the possibilities of digital marketing for the wine trade (Dr. Vladimir Dimitrov and Dr. Daniela Dimitrova), the digitization of agriculture (Assoc. Prof. Petya Branzova), profitability in agriculture as a prerequisite for digitalization (Assoc. Prof. Desislava Ivanova and Assoc.Prof. Evgeni Genchev), the potential for digitalization of agriculture in Bulgaria (Dr. Rumyana Angelova, Prof. Georgy Zhelyazkov and Assoc. Prof. Dimitrina Stoyancheva) etc.

Another part of the reports discusses the problems of sustainable food production (Dr. Iliyana Krasteva), the development of green architecture through the application of agro-ecological practices (Dr. Anton Blagoev), the grain market in the Black Sea region (Desislava Ivanova), the problems of creating producer organizations in Bulgarian agriculture (Galina Ivanova), etc.

ENVIRONMENTAL AND CLIMATE RISK MANAGEMENT IN AGRICULTURAL HOLDINGS IN BULGARIA

Zornitsa Stoyanova[1]

УПРАВЛЕНИЕ НА ПРИРОДОКЛИМАТИЧНИЯ РИСК В ЗЕМЕДЕЛСКИТЕ СТОПАНСТВА В БЪЛГАРИЯ

Зорница Стоянова

Abstract

The development of agricultural holdings depends on many external and internal factors. The specifics of agricultural production and the high unpredictability of natural phenomena are the reason the factors related to nature and climate to be defined as the risks that have a serious impact on agricultural production. The aim of the paper is to study environmental and climate risks that influence on agricultural holdings in Bulgaria and, on this basis, to propose recommendations for overcoming them. The first part of the paper provides a theoretical overview of the possible climate risks for agricultural holdings. The analytical part of the paper is related to analysis of: 1 climate-related crisis events in Bulgaria for the period 2010 – 2020 and their impact on agricultural production; 2) financial support to compensate damages to agricultural crops caused by the adverse climate events that can be equated to natural disasters for the period 2016 – 2020. Based on the analysis are proposed recommendations for reducing or overcoming the environmental and climate risk.

Key words: climate risk, environment, agricultural holdings, measure

JEL: Q15, Q54

Introduction

The specifics of agricultural production and the high unpredictability of natural phenomena are the reason the factor related to nature and climate to be defined as the risks that have a serious impact on the development of agricultural holdings. Distinguishing the different types of risk enables their effective management (Andreeva, 2022). The classification of the Ministry of agriculture, food and forestry (MAFF, 2016a) classifies risks into external and internal risks, assigning environmental and climate risks to external and linking them to loss or reduction of harvest.

Environmental and climate risks are associated with phenomena such as earthquakes, floods, landslides, storms, hail, large snow accumulations, frosts, droughts, fires. Bielza et al. (2007) add that the main goal of risk management by this type of risk is to protect agricultural production from the harmful effects of natural disasters or catastrophic events. Environmental and climate risks have a direct impact on

[1] Professor, Doctor, University of National and World Economy.

agricultural production, but they also influence on the activity of processors and traders in the sector. Farauta et al. (2011) consider that environmental factors and climate change contribute to the food price crisis and that the impact on agriculture in developing countries is expected to be more serious. Elahi et al. (2019) also share the view that the effects of climate change are more pronounced in resource-poor countries, making them more vulnerable.

Climate risk is one of the risks with serious impact on agriculture and natural ecosystems. Crop yields are affected by many factors related to climate change such as temperature, rainfall and other extreme weather events (Emeka, 2008). In addition, Kanianska (2016) expresses the view that climate change leads to an increase in risk and unpredictability for farmers, increasing the probability of a risk event's occurrence such as drought, changes in rainfall patterns, extreme weather events.

The impact of environmental and climate risks on agriculture at European level is different and depends on the country and region in which they occur. Elahi et al. (2021) consider that the impact of climate change on agricultural holdings and their yields depends on the location and therefore in some latitudes yields will be positively affected while in others negatively. For this reason, knowledge of the local situation has a significant role in the assessment of natural phenomena, the application of appropriate risk management mechanisms (Bielza et al., 2007) and adaptation to the changes that occur. Koleva-Lizama (2017) adds that regardless of the ability of some agricultural holdings to adapt to changing climate conditions, others may not have this ability depending on the specifics of the agricultural activity and the characteristics of the holding.

Methodology

The aim of the paper is to study environmental and climate risks that influence agricultural holdings in Bulgaria and, on this basis, to propose recommendations for overcoming them.

The methodological framework of the paper includes: 1) theoretical overview of the possible environmental and climate risks for agricultural holdings; 2) analysis of climate-related crisis events for the period 2010 – 2020 and their impact on agricultural production; 3) respondents opinion about the environmental and climate risk they met in their farms based on survey[2] (Harizanova – Bartos et al., 2018) ; 4) analysis of financial support to compensate the damages to agricultural production caused by climate events. Based on the analysis are proposed recommendations for mitigating and overcoming the environmental and climate risk.

[2] Some of the conclusions made in the analytical part of the paper are confirmed also by the results based on university project NI 16/2018 Integrated approach to risk management in the agricultural sector

In order to study the impact of occurred environmental and climate risk events on agricultural crop and livestock breeding gross production, a correlation analysis was carried out. Correlation analysis is also done to examine the relationship between the received recovery funds for damages and agricultural crop and livestock breeding gross production. The used probability is 5%, i.e. α-error equal to 0.05.

The paper was developed under the project "Development of rural territories in the conditions of transforming to sustainability economy " (RTtowardsSE). The project is financed by the Scientific research fund and is fulfilled by the Dimitar A. Tsenov Academy of Economics – Svishtov, in partnership with the University of National and World Economy – Sofia and the Economic university – Varna, 2021 – 2024, contract KP-06 PN 55/1, 15.11.2021.

Analysis of environmental and climate risk management in agricultural holdings in Bulgaria

Analysis of climate-related crisis events for the period 2010 – 2020 and their impact on agricultural production

Figure 1 presents the total number of climate related crisis events in Bulgaria. For the period 2010 – 2020, their decrease is observed, and the variation in the number is most strongly affected by the fires and floods that have occurred.

The highest number of crisis events was observed in 2015, and the lowest in 2018, with a difference of more than 4.5 times. In 2020, there were 907 crisis events related to climate phenomena. Most of them – 83% are fires.

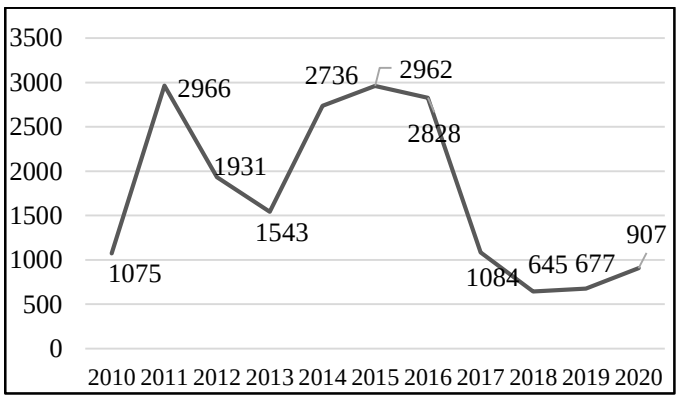

Figure 1. Total number of climate-related crisis events in Bulgaria for the period 2010 – 2020

Source: NSI, 2021, Crisis events for the period 2010 – 2020.

The data of the type of crisis events related to climate phenomena, which also have an impact on agricultural production, shows that for the period 2010 – 2020, the number of fires are the most in 2014, 2015, 2016 (Table 1). The number of landslides in 2020 was at least – 24, floods also decrease from 651 in 2010 to 100

in 2020. The number of hail followed a decreasing trend and during the period they decreased more than 5 times. Snowstorms, icing and frost also a decreasing trend and the reduce around 9 times.

Table 1. Number of crisis events related to climate phenomena by type for the period 2010 – 2020

Crisis event	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fires	163	2185	301	764	2245	2474	2448	741	480	521	754
Landslides	59	76	72	51	75	125	71	32	27	31	24
Earthquakes	12	4	22	6	4	1	2	.	.	.	.
Droughts	6	30	23	3	1	.	.	28	.	4	1
Floods	651	382	692	547	360	266	184	159	84	108	100
Storms, tornadoes, whirlwinds	47	48	528	89	14	12	29	6	13	5	15
Hails	16	13	14	13	8	21	5	14	8	3	.
Snowstorms	103	94	93	50	26	56	87	52	13	4	11
Icing, frost	18	134	186	20	3	7	2	52	20	1	2

Source: NSI, 2021, Crisis events for the period 2010 – 2020

Data on damages determined due to crisis events related to climate phenomena (Figure 2) show that the financial value of damages was the highest in 2011 and 2013 due to floods and landslides (Table 2). In 2012 are determined the lowest damages – 10 616 thousand BGN.

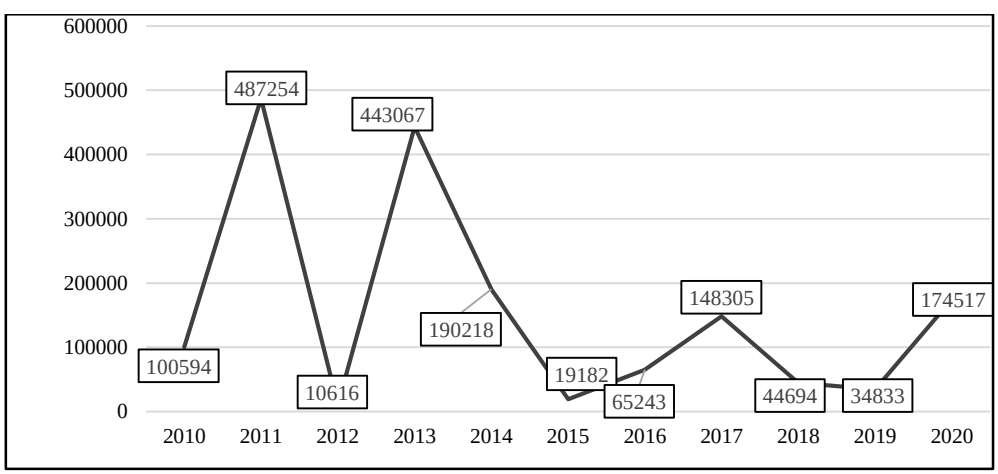

Figure 2. Damages determined as a result of crisis events related to climatic phenomena, thousand BGN

Source: NSI, 2021, Crisis events for the period 2010 – 2020

For the period 2010 – 2020, the highest amount for damages as a result of floods were determined, with the amounts varying from 15 285 thousand BGN to 206 659 thousand BGN. In 2011 and 2013, damages due to landslides were respectively

224790 thousand BGN and 294 459 thousand BGN. During the analyzed period, the determined damages from fire decreased significantly (about 8 times) from 2239 thousand BGN to 281 thousand BGN. In 2020, the highest amount for damages is for landslides – 154996 thousand BGN, and the least for icing and frost – 20 thousand BGN.

Table 2. Damages determined because of the crisis events related to climate phenomena by type for the period 2010 – 2020, thousand BGN

Crisis event	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fires	2 239	2 186	1 437	2 013	729	1 795	1 061	1 250	1 703	194	281
Land-slides	21 82	224 79	17 384	294 459	9 291	10 011	9 632	7 720	6 248	8 101	154 996
Earth-quakes	224	.	59 037	915	62	.	.	.	.	.	.
Droughts	1	117	149	.	1	.	.	.	.	.	.
Floods	38 882	206 659	20 898	15 285	177 604	171 032	30 617	135 530	28 384	21 173	16 664
Storms, torna-does, whirl-winds	54 722	1 614	3 488	99 387	746	1,64	3 267	45	3 266	451	561
Hails	505	50 150	187	.	853	583	10	1 978	89	935	.
Snow-storms	441	1 205	945	200	410	5 436	351	757	79	600	794
Icing, frost	.	128	135	.	.	200	2	20	25	.	20

Source: NSI, 2021, Crisis events for the period 2010 – 2020.

In order to study the impact of occurred environmental and climate risk events and also the influence of recovery funds for damages to agricultural crop and livestock breeding gross production, a correlation analysis was carried out. Table 3 presents the correlation coefficient between the number of environmental and climate risk events and gross production in agriculture for the period 2010 – 2020. The coefficient of correlation between the number of environmental and climate risk events and the total gross production in agriculture for the period 2010 – 2020 according to the Pearson scale is negative "- 0.18", and this negative correlation is weak. The degree of significance is 0. The coefficient of determination is 0.33, which means that a 33% increase in the occurrence of environmental risks is associated with a decrease in gross production in agriculture. The coefficients of statistical significance of the relationships between the number of climate risks and gross production from livestock breeding and crop production are higher than the acceptable error, and therefore these results have to be approached with caution due to the fact that one of the conditions of the correlation analysis is not met.

Table 3. Correlation coefficients and significance between the number of environmental and climate risk events and gross production in agriculture, 2010 – 2020

	Number of environmental and climate risk events	Number of environmental and climate risk events	Number of environmental and climate risk events
Gross production – total	-0,18 0		
Gross production – crop production		0,58 0,16	
Gross production – livestock breeding			-0,74 0,14

Source: own calculation.

The correlations between the funds for recovery as a result of environmental and climate risk events and the total gross production in agriculture for the period 2010 – 2020 and the gross production from crop and livestock breeding are positive. The coefficient of correlation dependence between the recovery funds and the total gross production in agriculture for the period 2010 – 2020 is low on the Pearson scale – 0.2, with a significance level of 0.03. This means that the total gross production in agriculture is slightly influenced by the recovery funds. The relationship between recovery funds and gross production from livestock breeding is also weak, the correlation coefficient is 0.3 with a statistical significance coefficient of 0.03. Above average correlation dependence is the connection between recovery funds and gross crop production. The correlation coefficient is 0.57 with a statistical significance coefficient of 0.03. It can be concluded that recovery funds affect the gross crop production. According to the coefficient of determination, a 37% increase in the recovery funds for damages from environmental and climate risk is associated with an increase in the gross crop production. A 9% increase in recovery funds is associated with an increase in gross production from livestock breeding.

Table 4. Correlation coefficients and significance of recovery funds as a result of environmental and climate risk events and gross production in agriculture, 2010 – 2020

	Recovery funds	Recovery funds	Recovery funds
Gross production – total	0,2 0,03		
Gross production – crop production		0,57 0,03	
Gross production – livestock breeding			0,3 0,03

Source: own calculation.

The results from the correlation analysis show, that crop production is strongly influenced by the natural and climate risks occurred and the impact is more significant for crop production than for the production from livestock breeding. This and other conclusions made in the analytical part of the paper could be confirmed also by the results from the university project NI 16/2018 Integrated approach to risk

management in the agricultural sector (Harizanova – Bartos et al., 2018). On the question of self-assessment of how risk-oriented are crop and livestock farms, the results show that livestock farms are defined as more risk-oriented – score 8.43 (the scale is from 1 – low to 10 – high), and the score for crop farms is 6.72. Owners of crop farms take risks relatively less often, which is mainly due to the probability of occurred environmental and climate risk event, on which crop production activities depend strongly. The results of a survey conducted under the project show that agricultural producers consider that the most important factors that limit the economic development of their holdings are environmental and climate factors (Table 5).

Table 5. Distribution of farms depending on the occurrence of climate risk, its effect and frequency of occurrence, %

Climate risk	Value
Agricultural holdings, that meet climate risk, %	42
Effect of climate risk on agricultural holding (from 1 – low to 5 – high)	3.4
Frequency of occurrence of this risk for the holding (from 1 – low to 5 – high)	3.6

Source: Harizanova – Bartos et al. (2018).

They receive the score of 4.6 according to 5-point scale where 5 is the highest score and 1 the lowest. Farmers are of the opinion that natural disasters such as floods, droughts, hailstorms are relatively less predictable and may affect the development of their farms, causing losses or reduced harvest.

The frequency that farms are affected by environmental and climate risks is 42%, and the effect of this risk was above average – 3.4 out of 5 maxima, and the frequency of occurrence of climate risk was estimated at 3.6.

In relation to climate risk, 29% of farmers undertake compensation with other production or take a loan, 21% undertake nothing, 14% rely on state financing, and only 7% use insurance as a strategy, regardless, many authors (Andreeva, 2021) share a view that have to undertake activities to achieve e financial results and to reduce the risk.

Analysis of financial support to compensate the damages to agricultural production caused by climate events

To deal with environmental and climate risks, farmers could use state financial support. According to the Agricultural report (MAFF, 2021), the funds spent on prevention of the harmful effects of natural and climatic factors in 2020 are over 45.9 million BGN. The report states that this is the highest amount for the last three years, as in 2018 it was 27.08 million BGN, an increase of 41%.

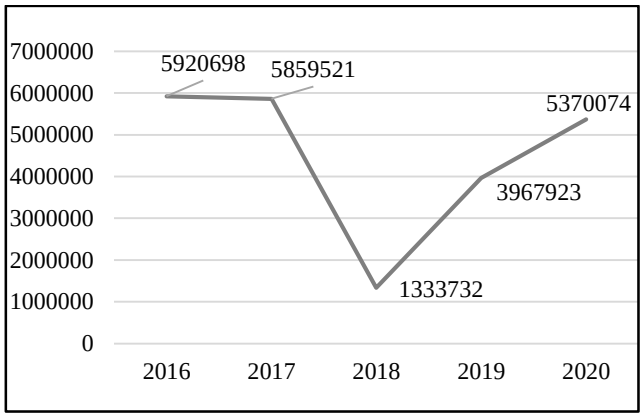

Figure 3. Disbursed financial resource to compensate for damages to crops caused by adverse climate events that can be equated to natural disasters for the period 2016 – 2020, mln. BGN

Source: MAFF, Agricultural report 2017, 2018, 2019, 2020, 2021.

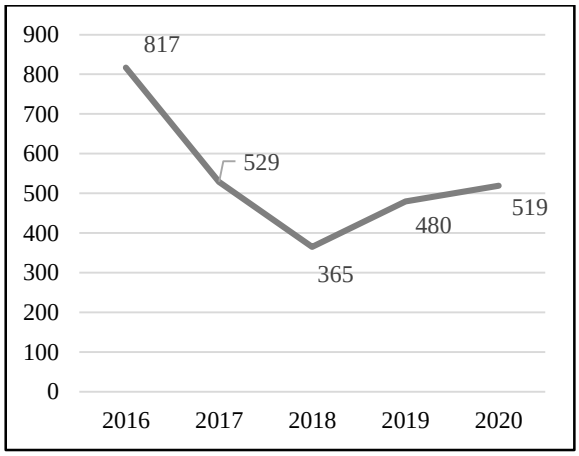

Figure 4. Number of beneficiaries financed to compensate for damages to crops caused by adverse climate events that can be equated to natural disasters for the period 2016 – 2020

Source: MAFF, Agricultural report 2017, 2018, 2019, 2020, 2021.

To overcome the damages due to climate risk, farmers have been benefited from government aid to compensate for crop damages caused by adverse weather events that can be equated to natural disasters. Figure 3 and Figure 4 present state support and the number of beneficiaries to compensate for damages to agricultural crops caused by adverse climatic events that can be equated to natural disasters for the

period 2017 – 2020. It is observed that in 2018 the utilized financial resource and the number of beneficiaries was the lowest.

In 2020, under the planned in RDP 2014 – 2020 measure 5 Restoration of agricultural production potential damaged by natural disasters and introduction of appropriate preventive measures, two sub-measures were opened – Sub-measure 5.1 Support for investments in preventive measures aimed at mitigating the consequences of probable natural disasters, adverse climatic events and catastrophic events 5.2 Investments for restoration of agricultural land potential and agricultural production potential disturbed by natural disasters, adverse climatic events and catastrophic events. They can also be used by farmers to reduce damages caused by climate risk events. According to sub-measure 5.1, 46 project proposals were received, and the value of the requested subsidy is 25 256 217.05 BGN. According to sub-measure 5.2, there were 3 received project proposals with requested subsidy of 1 903 599.96 BGN.

Conclusion

The frequency of occurrence of many environmental and climate risks is low, but their impacts on agricultural production are significant. Due to the fact that these types of risks are difficult to predict, preventive actions could be taken. For this reason, an appropriate measure to reduce the risk due to fires, landslides, earthquakes, storms are insurance and the diversification of agricultural activity. The reduction of the risks of drought and floods can be realized by fulfilling the goals set in the Strategy for the management and development of hydromelioration and protection from the harmful effects of water. This will provide opportunities for: 1) building institutional capacity for the management of sustainable hydromelioration systems; 2) irrigation and drainage of agricultural holdings; 3) access to the hydromelioration infrastructure of agricultural lands; 4) sustainable functioning of the infrastructure for protection against the harmful effects of water. (MAFF, 2016 b). The actualization of the Flood risk management plans for the period 2022 – 2027 initiated by the MEW would also reduce the risk of floods and landslides and take measures to prevent them. In conclusion Figure 5 presents some of the measures to prevent or reduce environmental and climate risk and some of the institutions related to climate risk management in agriculture.

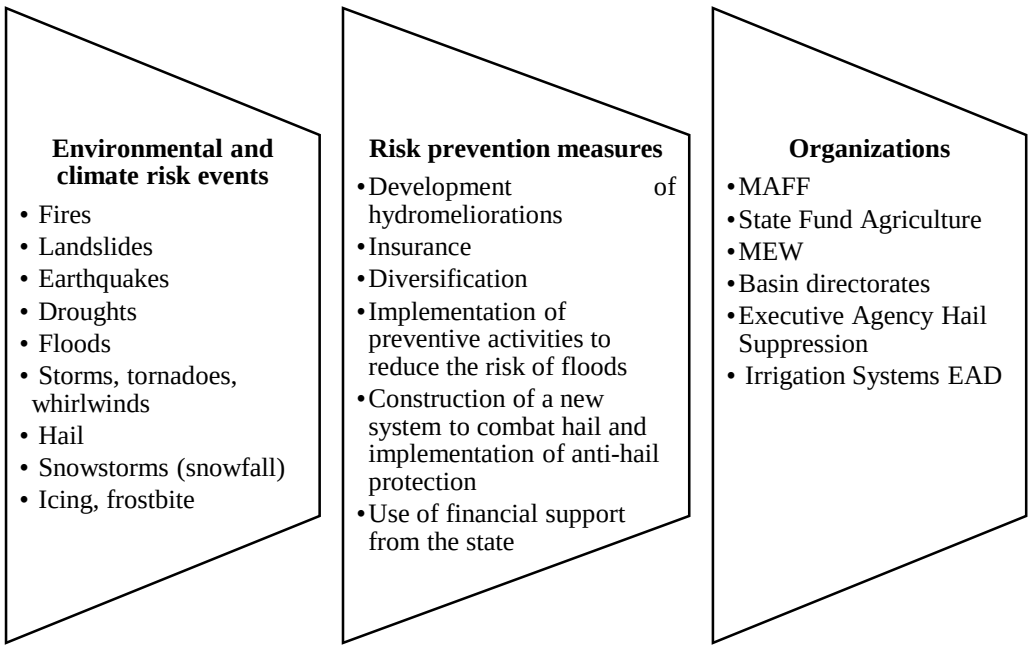

Figure 5. Measures to prevent or reduce environmental and climate risk and some of the institutions related to climate risk management in agriculture

Source: own survey.

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Contact person information: Zornitsa Stoyanova, professor, doctor, UNSS, zstoyanova@unwe.bg

WHEAT PRODUCTION IN GREECE (1980 – 2020)

Dimitrios P. Petropoulos[3], Nikolaos Apostolopoulos[4], Zisis C. Mandanas[5], Eleni Anastasopoulou[6]

ПРОИЗВОДСТВО НА ПШЕНИЦА В ГЪРЦИЯ (1980 – 2020)

Димитриос Петропулос, Николаос Апостолопулос, Зисис Манданас, Елени Анастасопулу

Abstract

Wheat production is of strategic importance for every country. Until the 1970s, wheat self-sufficiency was one of the indicators of economic growth. Of course, no matter how much the characteristics of the society-economy change and no matter how much the consumer habits change, the need for consumption of wheat by the final consumer, as well as their use by the manufacturing industry, remains at high levels.

This work presents the configuration of the following elements for soft and durum wheat: arable land, quantity produced, yield per acre, trade balance, consumption and degree of self-sufficiency. There are strongly different behaviors between the two products. Common wheat shows a decrease in production for the whole period considered, while durum wheat shows a continuous increase in production (quantities and areas) until 2005 and then a continuous decrease, where in 2022, it shows the magnitudes of 1980. The negative trade balance during the period considered – for common wheat – is deteriorating, while the positive trade balance for durum wheat is constantly declining. Finally, the degree of self-sufficiency from 146 for common wheat in 1981, was set at 26 in 2020 and for durum wheat from 234 to 160 respectively.

It is interesting and important to highlight the causes that shaped the above figures over time. The causes, as well as the prevailing market conditions, are even more important during the impending – as it seems – food crisis, as a result of the severe reduction of production – after the war in Ukraine, but also the increase of export restrictions from a number of countries.

Key words: self-sufficiency, agricultural policy, ssubsidies, agricultural production

JEL code: A11, Q18

Introduction

Cereals are among the most important cereal crops worldwide. Wheat covers 17% of the world's cultivated area (217 million hectares) with a production of 770 million tons. Until the 1970s, self-sufficiency in wheat was one of the indicators of economic development. Today, many countries support their food security and nutrition by securing the necessary quantities of wheat. Wheat bread feeds about 40%

[3] Associate Professor, School of Agriculture and Food Science, University of Peloponnese.

[4] Assistant Professor, School of Economics and Technology, University of Peloponnese.

[5] PhD (c), School of Agriculture and Food Science, University of Peloponnese.

[6] PhD (c), School of Agriculture and Food Science, University of Peloponnese.

of the world's population and provides 20% of the calorie and protein requirements in the human diet. (Muhammad et al., 2014). Wheat is an important commercial commodity because of its hardiness, longevity and use in flour production. The import and export of wheat and wheat products is a complex global business (Nanidis 2021). The factors shaping this complex process are the following:

• The phenomena of drought, fires, floods, in several regions of the earth and their direct impact on the global production of agricultural products.

• The imbalance (decrease in supply, increase in demand, export restrictions, increase in prices) caused in the world grain market after the start of the war in Ukraine.

• The increase in global demand, due to their use in the production of biofuels.

• The increase in meat consumption, which results in increased demand and participation of grains in their rations.

The purpose of this paper is to present the wheat production in Greece for the period 1980 – 2020. In order to achieve the purpose, the formation of the following quantities will be analyzed: arable land, produced quantity, yield per hectare, the trade balance and the degree of self-sufficiency. At the same time, it will compare the changes in arable land and produced quantities between the whole of the European Union and Greece. Then the work aims to highlight the policies that shaped the above figures. This point is quite complex, given that a series of policies and tools of the applied agricultural policy are not directly linked to the formation of the above quantities. Nevertheless, the selection-combination of these policies is a useful tool for applied agricultural policy.

The methodology used for the preparation of the work is: defining the above quantities, extracting data from the competent services, processing the configuration of these quantities over time, investigating the factors (politics) that influenced the over time configuration of the above quantities.

In order to investigate the factors (policies) that have influenced the temporal formation of the considered quantities, we take into account the factors that affect the quantity of grain demanded and offered at the global level. Factors affecting grain demand are: grain price, gross domestic product, income, prices of related goods, pandemic and covid virus, the effect of the war in Ukraine. Factors affecting grain supply are: grain price, last year's grain price, oil price, world grain production last year, global rainfall, pandemic and covid virus, impact of war in Ukraine.

Wheat is divided into: Soft Wheat, which is suitable for bakery products and Hard Wheat, which is suitable for industrial use (pasta production). According to the data of the Ministry of Agriculture of Greece, of the 900,000 tons of soft wheat that the country needs, 250,000 tons, i.e. 30%, were imported from Russia and Ukraine, while if Moldova is added, this percentage reaches 35%. For 2022 – 2023 is forecasted a small decrease in the areas of grain cultivation in the EU, according to the Commission (European Union, 2022). Due to the drought and reduced yields

(the increased price of fertilizers also plays a role), all cereals, with the exception of oats, will show a decrease in production. As Commission predicts, given the reduced yields due to the drought, the total production for period 2022/2023 is expected to be reduced, by -7.8%, compared to last year (270 million tons). In particular, the European production of soft wheat is predicted to decrease to 127 million tons (– 2.4% compared to last year), while hard wheat production is projected to decline to 7.4 million tons (-4.9%).

Overall cereal use in the EU is falling significantly as a result of high prices. There is reduced use for animal feed (-1.7% compared to last year) and for food (– 23%). However, reduced corn production and feed shortages in the EU are certain to increase imports to meet demand. Greece in soft wheat produces only 15% of its needs, while in hard wheat it has sufficient production and does not import. In Greece, common wheat production reached self-sufficiency levels in the 1950s, and by the end of the 1970s there was a surplus, which was maintained until 1984. Since then, a rapid decline in the cultivation of common wheat has begun, accompanied by a corresponding increase in the cultivation of the hard.

Looking at Table 1, we see the huge reduction in both the cultivated areas and the produced quantities of Soft Wheat, during the considered period. We observe essentially an isomeric reduction of 81.32% and 81.95% respectively. At the same time the hectare yield follows the same trend – with an decrease of 20.83% and 59 kg per hectare. This decrease does not correspond to the decrease in demand for soft wheat in the domestic market. So the factors that have led throughout time the producers of soft wheat to withdraw from its cultivation and turn to other crops are different.

For better information and observation of the course of the Elements of the cultivation of Soft Wheat we present the figure 1 that we can extract from Table 1.

Table 1. Elements of the cultivation of Soft Wheat

Years (average)	Area (hectares)	Production (tons)	Per hectare yield
1980 – 1985	6,641,541	1,922,871	284
1986 – 1990	3,797,400	993,000	260
1991 – 1995	2,947,371	854,066	291
1996 – 2000	2,134,950	568,466	268
2001 – 2005	1,243,594	333,884	270
2006 – 2010	1,652,446	454,110	275
2011 – 2015	1,527,366	449,927	249
2016 – 2020	1,240,371	346,804	225
Percentage Change 1980 – 2020	-81.32%	-81.96%	– 20.83%

Source: Ministry of Greek Agriculture, same processing.

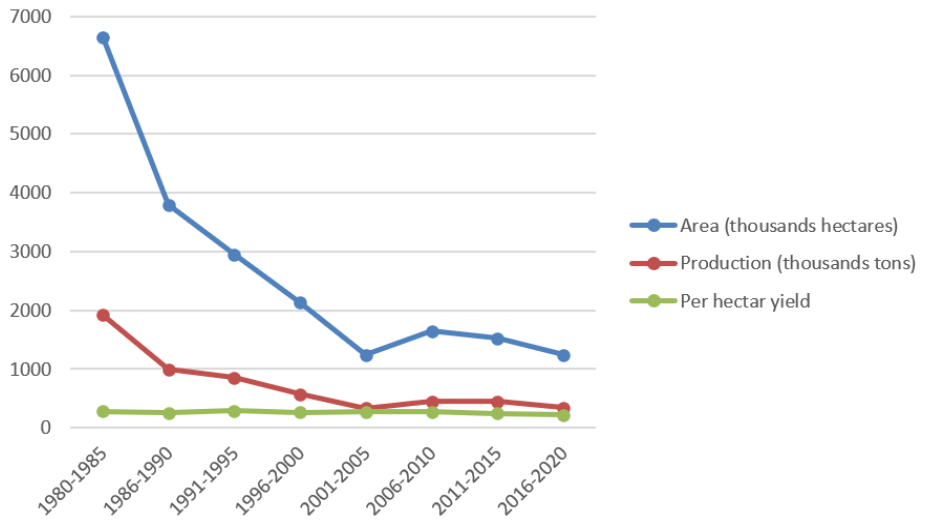

Figure 1 Elements of the cultivation of Soft Wheat – in the years 1980 – 2020

Source: Table 1.

Looking at Table 2, we see a slight decrease of the cultivated areas and an increase of the quantities produced in Durum Wheat, during the considered period. We observe and decrease of 3.36% in cultivated areas and an increase of 17.04% in the quantity produced. At the same time the yield per hectare has increased by 8.92% (22 kg per hectare). The increase in quantities, does not correspond to the decrease in cultivated areas and produced quantities observed for the same period of Soft Wheat.

For better information and observation of the course of the Elements of the cultivation of Hard Wheat we present the figure 2 that we can extract from Table 2.

Table 2. Elements of the cultivation of Hard Wheat

Years (average)	**Area (hectares)**	**Production (tons)**	**Per hectare yield**
1980 – 1985	3,020,726	725,253	246
1986 – 1990	5,429,200	1,169,860	219
1991 – 1995	6,259,435	1,574,118	249
1996 – 2000	6,318,822	1,379,987	218
2001 – 2005	7,315,098	1,532,558	209
2006 – 2010	4,993,846	1,219,623	244
2011 – 2015	4,103,130	1,082,389	272
2016 – 2020	2,919,172	848,831	268
Percentage Change 1980 – 2020	-3.36%	17.04%	8.92%

Source: Ministry of Greek Agriculture, same processing.

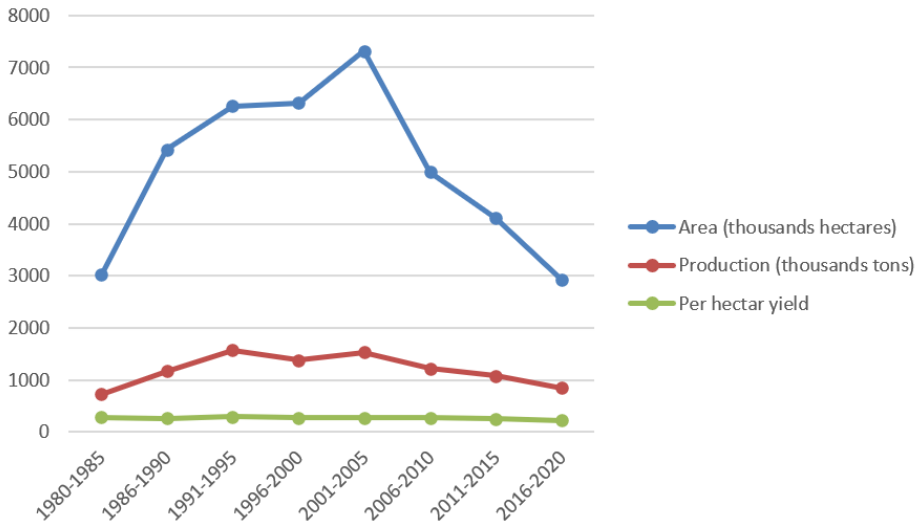

Figure 2. Elements of the cultivation of Hard Wheat – in the years 1980 – 2020

Source: Table 2

In Table 3 below, I can see the configuration of the Trade Balance. For the period under review, we note the rapid deterioration of the trade balance in Soft Wheat, where it went from -188 thousand tons to -980.7 thousand tons. The same unfavorable behavior is experienced by durum wheat, where the positive trade balance practically reached zero during the period under review and from 1,237 thousand tons, it decreased to 28.8 thousand tons. Of course, the formation of the above sizes is understandable, since it is essentially the result of the continuous reduction of cultivated areas.

Table 3. Trade Balance (tons)

Year	Soft Wheat	Hard Wheat
1990	-188.000	1.237.000
2000	-519.730	160.600
2010	-725.000	425.000
2018	-980.744	28.880
Percentage Change 1990 – 2018	+421,67%	-97,67%

Source: Ministry of Greek Agriculture, same processing.

For better information and observation of the course of the Trade Balance between Soft and Hard Wheat we present the figure 3 that we can extract from Table 3.

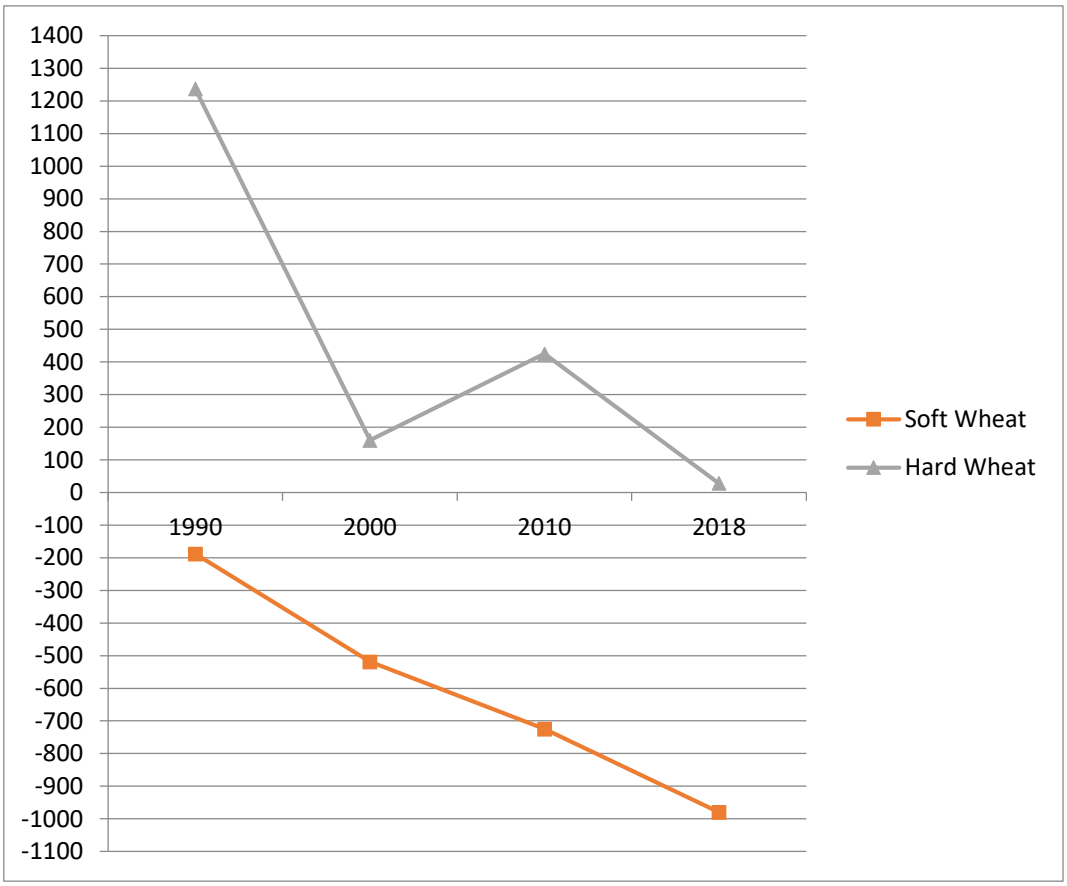

Figure 3. Trade Balance (tons)

Source: Table 3.

Table 4 below shows the percentage of self-sufficiency for the two products, as it is formed during the considered period. As has been pointed out, ensuring self-sufficiency in a range of goods is of prime importance for any national economy. Cereals are included in this product category. Cereals are among the products that each country secures safety quantities – quantities capable of preventing shortages in the market and war reserves – quantities capable of feeding the army in times of war. The importance of grains for the national economy and society is also confirmed by the fact that, until the 1970s, their self-sufficiency rate was recorded as an indicator of economic development.

From the table below, we can see the large reduction in the self-sufficiency rate in Soft Wheat from 146% in 1981 to just 15% in 2020, i.e. a reduction of 89.73%. We also note the reduction of the self-sufficiency rate in Durum Wheat by 44.44%, which however remains above 100%. The formation of the self-sufficiency rate and in this case the large reduction of it for the two examined products is related to the

policies implemented as well as the priorities set during the examined period, through the implemented agricultural policy.

Table 4. Self-efficiency

Type/Year	1981	1990	2000	2010	2020	Percentage Change 1981 – 2020
Total Wheat	160	135	79	83	61	-61,88%
Soft Wheat	146	80	50	36	15	-89,73%
Hard Wheat	234	293	106	160	130	-44,44%

Source: Ministry of Greek Agriculture, same processing.

Finally, important data emerges through the comparative analysis of the sizes – cultivable area and produced quantities – between Greece and the whole of the European Union. These comparative figures are presented in the two Tables below. In Table 5 below, we see the strong differences in terms of the reduction of arable land. Through the comparative presentation, there is a big difference in the reduction of arable land in Soft Wheat between the whole of the European Union – a reduction of 2.08% and Greece – a reduction of 27.0%. The comparison of the change (decrease) of the arable land for Durum Wheat is almost double in Greece compared to the entire European Union, 50.56% and 27.0% respectively.

Table 5. Cultivable area of cereals (000 hectares)

Type/Year	2010	2020	Percentage Change 2010 – 2020
Soft Wheat Total E.U.	21.206	20.765	– 2,08%
Hard Wheat Total E.U.	2.892	2.112	– 27,00%
Soft Wheat Greece	128	93	– 27,35%
Hard Wheat Greece	532	263	-50,56%

Source: www.agriculture.ec.europa.eu, same processing

In Table 6 you present the comparative analysis for the produced quantities of Soft and Durum Wheat between the whole of the European Union and Greece. For Soft Wheat, we find that during the period under review the quantities produced have increased by 5.58% for the entire European Union, while for Greece they have decreased by 13.25%. For Durum Wheat, we see a decrease of 21.42% for the whole of the European Union, while for Greece the decrease is much greater – 38.55%.

The reduction of Greece's production capacity is significant for both products under consideration. Of course, the reduction is not noticed by the consumers – final consumer, intermediate consumers (craftsmanship, industry), because the demand is covered by international trade. This of course applies when there is stability in the market. With the new data taking shape in international markets (war in Ukraine, grain export bans from a number of countries, etc.) lead to price increases, psychological pressure on the markets, which in the end will shape new trade flows.

Table 6. Production (000 tons)

Type/Year	2010	2020	Percentage Change 2010 – 2020
Soft Wheat Total E.U.	112.969	119.270	+5,58%
Hard Wheat Total E.U.	9.443	7.420	– 21,42%
Soft Wheat Greece	347	301	-13,25%
Hard Wheat Greece	1.292	794	-38,55%

Source: www.agriculture.ec.europa.eu, same processing.

Conclusions

We find large differences in the above sizes between the two products under consideration. We can easily see a relative abandoning of soft wheat in contrast to hard wheat production. The reasons for this are: higher yields per acre in durum wheat, better quality of durum wheat, higher durum wheat prices, higher durum wheat subsidy and the decoupling of the subsidy from the quantity produced. The decoupling of subsidy from production is a key factor in the reduction of durum wheat production at the European Union level.

Also, the analysis of the data shows the lack of a national agricultural policy. Producers decide "what to grow", "how much to grow" with profit as the only criterion – they are right. However, the absence of a national agricultural policy highlights key weaknesses – price increases, product shortages, etc. – where in times of crisis and imbalance the "invisible hand of the market" is unable to restore balance.

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Contact person information: Dimitrios P. Petropoulos, Associate Professor, School of Agriculture and Food Science, University of Peloponnes, e-mail: d.petropoulos@uop.gr

REVIEW OF ASSESSMENT MODES TO BULGARIAN AGRARIAN GOVERNANCE

Bozhidar Ivanov[7] **and Hrabrin Bachev**[8]

ПРЕГЛЕД НА МОДЕЛИТЕ ЗА ОЦЕНКА НА БЪЛГАРСКОТО АГРАРНО УПРАВЛЕНИЕ

Божидар Иванов и Храбрин Башев

Abstract

The idea to assess the governance is connected to measure how good is it. The goal of the study is to analyze by using ANOVA test and significance verification equation to what extent experts' judgment and statistical estimation modes are reliable and convergent for implementing governance assessment. The results from governance principle and indicator assessments by those two modes show very similar and close variation in the scores, which is verified by the ANOVA test and significance coefficient estimation. It is assumed that application of same criteria, where the experts are asked to make their judgment on indicators having in mind the EU average is the cue to get such similar results.

Key words: agrarian governance, assessment modes, expert's judgment, estimation methods, criteria, Bulgaria

JEL: D23, L22, M13, 017, Q13

Introduction

A "new" and constantly evolving concept of "Good Governance" has been increasingly used in the last three decades by the international, public, non-governmental and business organizations (Council of Europe, 2022; FAO, 2016; etc), and is been a topic of "keen" academic debates among scholars and researchers. (Fukuyama, 2016; Ostrom, 2014). The critical role of the governance in facing important (economic, social, environmental, etc.) challenges and achieving organizational, business, community, and social (including global) goals has been well recognized by the scientists, decision-makers, and public at large (Ostrom, 1990; Williamson, 2005). Meanwhile, very often when the issue of governance evaluation is raise, it is interlinked to the desired state of this holistic concept otherwise denoted as a "good governance". The idea to assess the governance is connected to measure how good is it, which is a new understanding of the governance as governing and process of social coordination (Bevir, 2012). Despite its widespread use still, there is no

[7] Associate Professor, Institute of Agricultural Economics, Agricultural Academy, 125 Tzarigradsko shosse Blvd., Block 1, 1113 Sofia, E-mail: bozidar_ivanov@yahoo.co.uk

[8] Professor, Institute of Agricultural Economics, Agricultural Academy, hbachev@yahoo.com

consensus about the content of the good governance and a unified approach to its "measurement" There have been suggested and applied multiple methods for assessing the compliance with the principles (standards, codes, characteristics, dimensions, best practices, etc.) of good governance at global, regional, national, corporate, NGO, sectoral scales, at different functional areas of activity (e.g. internet, R&D, environmental management, etc.), and management of major resources (land, water, etc.) and social challenges (e.g. climate change, biodiversity preservation, etc.).

Another major reason for the lack of consistency in defining and assessing the quality of (good) governance is the diverse understanding of the concept of governance itself. Governance is defined in multiple ways but generally restricted either to governing bodies, agents, or groups (Hufty, 2011), or to the system of formal and informal rules and their enforcement (Tleubayev et al., 2020), or to (certain) mechanisms, modes and structures of governance (Fukuyama, 2016; Weiss, 2000), or to the process of governing (Bevir, 2012; Hufty, 2011), or to the specific outcome and resulted social order (Bachev, 2010), or to the different combination of all them. Consequently, a big diversity of approaches and indicators are suggested and employed to evaluate the studied system of governance.

There are also several good studies on particular type of agrarian governance – contractual, cooperative, institutional, environmental, food safety, etc. (Bachev, 2010, Terziev et al., 2018). Nevertheless, up to date, there is no comprehensive study on the compliance of the agrarian governance in the country to the principles of "good governance" including all components of that complex system.

This paper tries to introduce methodology for assessment of the governance in Bulgarian agriculture, as demonstrates the framework and put stress on the relevance and feasibility in combining evaluations derived from expert judgment and data equation mode. The goal of the study is to analyze by using ANOVA test and significance verification equation to what extent both modes for implementing governance assessment are reliable and convergent.

Methodology

The assessment of agrarian governance is envisaged as a holistic framework, which from one hand comprises all dimensions of the governance that are crucial and scientifically significant and on other hand builds up consistent methodology to appraise it. The structural approach for study is made up outlining the components of governance, defining the general principles that are constituted, determining the key aspects, which those principles reflect, defining the desired state in those principle aspects, identifying the relevant indicators to observe, setting up criteria to assess, collecting data and evaluating the governance state.

According to Bachev (2010), the system of agrarian governance consists of diverse mechanisms and modes that govern the behavior, activities, and relations of

involved agents (Bachev, 2010). The major components and general principles of the governance system in agriculture are demarked as: (1) the institutional environment (formal and informal rules and the system of enforcement of these rules); (2) mechanisms and forms of governance (market, contract, internal, collective, public, hybrid, etc.); (3) the process of governing (decision making, involvement, system operation etc.); (4) the agents involved and acting in the process and (5) the system catalyst, which unite and cohere other components to stay and work together. The main principles that are envisaged refer the need and essence of agrarian governance to possess a good quality. According to Council of Europe (2022), United Nations (1997), there are general principles for good governance recognized broadly as participatory, rules of low, transparency, etc, which are immanent. In this research the formulated ones are good legislation and respectful institutional and social relationship (Component 1); good working public administration, fair market and resilient private sector (C2); high transparency, involvement and high efficiency (C3); good leadership, equity and solidarity (C4); synergy (C5). The methodology for assessment continues with outlining the key aspects, which those general principles emanate and determining their desired state and implication. Once the principle aspects are defined, the methodology proceeds with selection and indicators' setup. The implementation of this stage is done based on deep literature analysis, where are explored relevant solutions and ideas available in the scientific and public area.

The key issue in the assessment of governance, which is crucial not only to this issue but to similar topics, as sustainability assessment, development assessment, etc is the matter of assessment criteria. The assessment criteria transpose the question of reference values and how those values are specified. The SAFE project (2007), Acosta-Alba and van der Werf (2012), etc reveal the diversity of ways to set up reference values, which extends from elaborated standards and norms to experts' judgments. In the case of this study is proposed a comparative approach, where the indicators values for Bulgarian agriculture are collated with relevant available EU indicators' values. The assessment criteria vary in different studies, as Bachev et al (2017) used the EU average values and run experts scoring of those values, while in many cases the maximum and minimal values are perceived for Sustainability development index (Hickel, 2020) and IDEA sustainability methodology, as all time ranking and normalization is fulfilled such approach is adopted. The estimation of governance index is implemented by Relative Comparison Assessment Method, which is composed of following steps drafted by Ivanov (2022).

$$ARV = \frac{\sum IV_i}{N} \quad (1)$$

where ARV – Average reference value, IV_i – sum of indicator values in the set, N – number of observations and values in the set.

$$CV = \frac{\sigma}{ARV} \tag{2}$$

$$AMS = 1 - \frac{1}{\sqrt{N-1}} \tag{3}$$

where AMS – adjustment median score, where the median concerns the score range, CV – coefficient of variation, σ – standard deviation.

$$ISA = \frac{IV_i}{ARV + (ARV * CV * (1 - AMS))} * MS + (MS * (CV * AMS - CV * (1 - AMS) \tag{4}$$

where ISA – indicator score assessment and MS – median of the score scale. The equation (4) is adopted to estimate the assessment scores for all indicators, which are derived from statistical database and thereby render the way to use RCA method. Since, some of the aspects and principles of agrarian governance are considered as important and essential and it is either difficult or not enough precise and relevant to find statistical or other data, the approach for experts' judgment is carried out. Besides, one the experts' judgment approach for assessment is applied, the issues with reliability and significance of the assessment outcomes are pointed out, which predisposes the use of ANOVA and test for verification of the significance of the differences between both assessment modes to be done. The significance of similarities and relevance between both modes of assessment RCA method and expert's judgment is fulfilled to those principles within the components of the agrarian governance, where a pair indicators are covered. The particular indicators for experts' judgment comprise in the assessment are:

Level of unlawful payment (2.1.1), Satisfactory level from public services (2.1.2), Market access costs (2.2.1), Market competitiveness and fairness (2.2.2), Contract efficiency (2.3.1), Business entity development equality (2.3.2), Plurality in public decision-making (3.2.1), Harmful lobbying (3.2.2), Transaction costs level (3.3.1), Discrimination cases (4.2.1).

Regarding the indicators processed by the RCA method are drafted: Agricultural government expenditures (2.1.3), Share of farm use + farm consumption to total output (2.2.3), Contractual work to total output (2.3.3), Percent of farms with direct payments to all farms (3.2.3), Price output index to price input index (3.3.2), Total farming output to total farming input (3.3.3), Share of employees' compensation to farm factory income (4.2.2), Subsidy Gini coefficient.

The coefficient of significance of yielded results among both assessment modes is done through the formula below, which includes average governance assessment

by the principles ($AVGA_{PR}$) and the standard deviation between RCA score and experts' judgment (σ_{GAPR}), as if CS coefficient is >1, the differences between two mode assessments are acceptable and principle assessment is significant otherwise the assessment modes differences might not be rejected and the scores need more checks and verification.:

$$CS = \frac{AVGA_{PR} - \sigma_{GAPR}}{\frac{AVGA_{PR} + \sigma_{GAPR}}{2}} \quad (5)$$

Results

The results of the research are designed to find out the reliability and plausibility in the implementation of an experts' judgment and equation mode for assessing agrarian governance. The obtained results for the indicator score assessments, which are encompasses in distinct principles, show that there is closeness and similarity between the two modes. The coefficient of significance shows that for only two of the six principles the difference in the derived scores is greater and they cannot be considered equivalent. These are the principles of good public administration and the resilience of the private sector, where the coefficients are 0,72 and 0,6, which is under the critical value of 1. It implies the indicators in those principles represent discrete aspects or estimation modes are ambiguous.

Table 1. Agricultural governance assessment by principles

Assessment score by principles of agri-governance	**PR 2.1 Good work of public administration**	**PR 2.2 Fair developed market**	**PR 2.3 Resilient private sector**	**PR 3.2 Wide Involvement**	**PR 3.3 High efficiency**	**PR 4.2 Equality and solidarity**
Experts' judgment mode	0,36	0,42	0,40	0,40	0,38	0,88
RCA modes	1*	0,51*	0,12*	0,30**	0,44*/**	0,44***
Coefficient of significance	0,72	1,65	0,60	1,50	1,73	1,00

Source: Author calculations on FADN data, Eurostat** and DG Agri***.*

The ANOVA test illustrates there is and robust equality between the two modes for measuring of the agricultural governance assessment and the two groups of results are similar. The null hypothesis (H_0) cannot be rejected, whereas the p value is 0.97 and F_{crit} is greater than the F_{est}. The principle governance scores are allocated into two separate groups, as their average scores on the experts' judgment and estimation modes are around 0,47. The variation in the RCA method is slightly larger up to 0,08, but not high enough to promote the alternative hypothesis denoting divergent outcomes yielded by those assessment modes. It is assumed that application of same criteria in both modes for assessment, where the experts are asked to make

their judgment on indicators having in mind the EU average is the cue to get such results.

Table 2. ANOVA test for two assessment modes differences

ANOVA test of principle governance assessment	Average	Variance	F	P-value	F crit
Experts' judgment mode	0,47	0,04	0,001	0,97	4,96
RCA modes	0,47	0,08			

Source: Author calculations on FADN, Eurostat and DG Agri data

The agricultural governance score assessment is ranked in the sense of good governance to facilitate the functional understanding of it. The ranking range is founded in four ranges: 0,76-1 stands for a "Very Good", governance; 0,46-0,75 – "Good" governance, 0,26-0,45 – "Not Good" governance and up to 0,25 is meant as "Bad" governance. The proposed classification is operational to expound further the matter of the research and those results are relevantly demonstrated independently by either both assessment modes.

Conclusion

The paper is designated to study the relevance and reliability of the agricultural governance assessments reported in application together of two appraisal modes – experts' judgment and estimation RCA method. The results from governance principle and indicator assessments by those two modes show very similar and close variation in the scores, which is verified by the ANOVA test and significance coefficient estimation. It is important to get answers to if the experts' judgment applied in that case may yield reliable assessment as well as if the selected indicators for score estimation are relevant and adequate. The closeness and convergence of the principle assessment scores between both applied modes reveals the importance of the criteria element, which is the pivot point to get any result. The criteria for this assessment in both modes is the EU average, which gives tool and point of view eventuating likely in obtaining similar and related to each other score results.

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Contact person information: Bozhidar Ivanov, Associate Professor, Institute of Agricultural Economics, Agricultural Academy, 125 Tzarigradsko shosse Blvd., Block 1, 1113 Sofia, e-mail: bozidar_ivanov@yahoo.co.uk

A SUSTAINABLE ORGANIC PRODUCTION MODEL – OPPORTUNITY FOR INNOVATIVE DEVELOPMENT OF AGRICULTURAL BUSINESS IN RURAL AREAS

Marina Nikolova[9]

УСТОЙЧИВ МОДЕЛ „БИОЛОГИЧНО ПРОИЗВОДСТВО“ – ВЪЗМОЖНОСТ ЗА ИНОВАТИВНО РАЗВИТИЕ НА АГРОБИЗНЕСА В СЕЛСКИТЕ ТЕРИТОРИИ

Марина Николова

Abstract

Sustainable agricultural models, as an innovative approach, are essential in the transition to a higher degree of sustainability of a healthy and environmentally friendly food system related to the production of high value-added products under the sustainable management of natural resources. The aim of the research is to identify the contribution of organic agriculture to the sustainable management and development of rural areas in the Republic of Bulgaria. The strategic framework for the future development of organic agriculture and the contribution of a sustainable organic production model as a tool for innovative development of the territory are outlined. It is defended the opinion that the innovative development of agribusiness in rural areas, through the application of a sustainable organic production model, is based on the collaboration among the authorities, local communities and business for diversification in the functional use of the territory and optimal utilization of the available resources.

Key words: sustainable agriculture, sustainable model, organic production, diversification.

JEL code – Q13, Q18, Q57

At the end of the 20th century, humanity is increasingly aware that further development is impossible without serious care for the environment, and economic growth must be consistent with the regenerative capacity of natural resources. Under "sustainable development" we must understand that economic development which does not underestimate ecology and implies the notion that a sustainable economy and a preserved environment are both necessary for any society. According to a number of authors, the sustainability means the ability of a dynamic production system to function effectively in an ever-changing probabilistic competitive environment, despite the uncertainty of the production load. Sustainability is ensured with customer focus; innovative business models; legality and legal support

[9] Assoc. Prof., PhD, D. A. Tsenov Academy of Economics, Svishtov, Bulgaria, Department of Agricultural Economics, m.nikolova@uni-svishtov.bg

of the state; knowledge and technology; trust and increases customers flow (Islamgaleyev, Karibdzhanov, Petrova, 2020).

The agricultural sector fits most closely into the concept of sustainable development for two reasons – on the one hand, it provides food for the population, and on the other hand, it is most closely and directly related to the use and state of natural resources (Nikolova, M., G. Sirashki, 2010). This explains the fact that notions of sustainability in the development of the industry itself are the subject of lively discussion and comments (Hadzhieva, 2007), (Kanchev, Doitchinova, 2008), (EC, 2021). The concept of so-called "sustainability" in agriculture has spread rapidly and developed in various aspects – biological, economic, social, managerial. According to some authors, sustainable agriculture should not be developed in the absence of mineral fertilisation and pesticides, and their use should be reduced to "reasonable" use within the limits, when it does not reduce the final profit and does not lead to environmental consequences. In sustainable agriculture, the use of chemicals should be understood in the sense of "if a little is good, enough is better". It is an alternative system or production that ensures a permanent supply of food products to the population, while preserving the economic stability of the farmers' income.

Nowadays, the production of agricultural crops is faced with a number of difficulties and the possibility of remaining competitive in the world market. Some of the reasons are related to a significant loss of soil fertility and the massive use of expensive external nutrients (mainly nitrogen and phosphorus), for which European agriculture is almost entirely dependent on imported products, or on fertilizers obtained by expensive industrial processes that generate greenhouse gases (EC, 2021). This creates the need for adequate management and the use of strategies for sustainable management of cultivated crop, in order to preserve and prevent the loss of soil fertility. Inappropriate management of the components of the agricultural system (soil, water, biodiversity, etc.) and excessive dependence on the use of external resources (fertilizers, pesticides) in intensive cultivation of agricultural crops causes economic losses for the farmer, environmental pollution and harmful effects on the health status of people.

The agribusiness and the food industry in the world are increasingly recognising the benefits of agro-ecological practices. The rapid growth of market demand for organic and environmentally certified products is attracting the attention of more and more business investors. Public-private partnerships linking sustainable food supply initiatives with water resources and biodiversity management are rising. As an expression of the greening of agricultural activity in modern conditions, in recent years, the production and consumption of organic food has been continuously increasing worldwide. This inevitably requires an increase in entrepreneurial initiatives in the industry. According to a number of authors, the entrepreneurial initiative is one of the main driving forces of the economy (Pavlov, 2018). In agriculture,

making the transition to sustainable agriculture is a continuous and consistent process. For the agricultural producers, it is about requiring a series of small, practical and realistic steps. Every right decision is significant and can contribute to the progress of the whole system of sustainable agricultural development. An essential role in rethinking the approaches used in the management of the modern agricultural system is played by the continuous development of the policy regarding agricultural production in European Union countries.

The accession of Bulgaria to the EU in 2007 turned the Common Agricultural Policy (CAP) into a decisive factor for the development of Bulgarian agriculture. Regardless of the fact that in recent years the positive effects of the development of the sector are the result of the injection of European funds and national subsidies, agricultural production is still characterised by low competitiveness and insufficient market orientation. All this is due to the problems accumulated over the years (Hadzhieva, 2007).

At the next stage, the implementation of the CAP in the period 2007 – 2013 is associated with the requirement for a higher organisation of the agrarian sector, in which each participant in it – the state authorities and agricultural producers, assumes their part of the duties and responsibilities. Solving the problems of Bulgarian agriculture can hardly be expected to happen only with the implementation of CAP measures (Turlakova, 2010).

The common agricultural policy 2014 – 2020 is much more flexible and with a priority share for compulsory "greening" of farmers. The aim is to ensure that all agricultural producers in the EU will provide environmental and climate benefits in their daily activities. In this sense, it is necessary to understand the need for the introduction of environmentally friendly agricultural practices and ecologically oriented technologies in growing crops (Nikolova M. , Challenges to Organic Agriculture in Bulgaria, 2013). This means stabilising agro-ecosystems and increasing their sustainability, by reducing their dependence on additional external energy.

The model of the Common Agricultural Policy (CAP) after 2020 (2023 – 2027) is even more ambitious in terms of the set goals related to key aspects of environmental protection and climate change.

The need to increase agrarian sustainability results from the main objective of agricultural activity, which is related to the production of the necessary amount of food (food security), without jeopardising the expected higher consumption. On the other hand, food quality is also an important factor for consumers. In order to ensure sustainability of agricultural activity and viability of agricultural holdings, it is necessary that the applied practices integrate the ongoing natural processes and ecosystem services, despite the possible climate changes and loss of natural resources.

At first view, competitive agriculture contradicts ecological agriculture, insofar as the latter has a lower economic effect, compared to conventional production. However, the task of sustainable development is, through the joint use of innovative

technological solutions on the one hand, and public policies on the other, to guarantee the economic viability of ecological agriculture that protects natural resources and the environment (Bashev et al., 2019). It should be noted, that the ideology of sustainable development of agriculture, besides many supporters, also has critics. Their main argument is that it lowers productivity and leads to an expansion of usable agricultural land. The calculations of some authors indicate that sustainable agriculture cannot provide food for the estimated 8 billion population of the planet by 2030 (Bashev et al., 2019). Nevertheless, the aspiration to increase the sustainability of agricultural production is more than a necessary and conscious management decision in every entrepreneurial initiative for the development of modern agribusiness.

A sustainable organic production model is one of the possibilities for innovative development of agrarian business in rural areas. Bearing in mind that the rural territory is part of the territory of each specific region in which agricultural production takes place, it is inextricably linked to the sustainable development of the entire territory. The process of development and management of rural areas is invariably aimed at retaining and/or increasing the number of the local population, and this also includes taking advantage of the opportunities for the development of smaller-scale productions related to starting a family business or entrepreneurial initiatives involving gentle farming practices. In this regard, the best solutions are achieved with innovative business ideas that have the potential not only to generate profit, but also to solve environmental problems, achieve a value-creating rural economy for the development of the rural territory, as well as a better standard of living of the local population.

Organic production practices, as a sustainable model of agricultural production, create opportunities for innovative development of agrarian business in rural areas, with the existence of certain *factors in the modern conditions of an economy transforming towards sustainability, namely*:

- Strategy papers for the transformation of Bulgarian agriculture
- Development of the sector at national level
- Funds utilised under the 2014 – 2020 RDP.

Today, in the conditions of increasingly intensive transformation of economic systems and the growing need for sustainable development of one of the strategic sectors of our national economy – the agricultural sector, the driving forces are the following more important strategy papers:

- National Development Programme BULGARIA 2030;
- Recovery and Resilience Plan for Bulgaria (RRP);
- The European Green Deal;
- The Biodiversity Strategy;
- The Farm to Fork Strategy;
- The CAP Strategic Plan 2023 – 2027;

- The Strategy for Digitalisation of Agriculture and Rural Areas of the Republic of Bulgaria (MAFF, 2019);
- Action Plan for the Development of Organic Production – 2030.

In general, the reformed CAP is aimed at supporting and implementing the action plan for the development of organic production – 2030. Significant financial resources are directed to organic production, to specific commitments regarding the sustainable development and management of rural areas and additional financing under eco-schemes. Agricultural policy after 2020 pays particular attention to environmental sustainability, sustainable production models, good practices and innovative solutions related to organic products.

The contemporary aspects of the CAP are mainly aimed at supporting and sustainable growth of the agricultural sector. The vision of the renewed agricultural policy lays the foundation for a fairer and more sustainable future for farmers and rural areas. An important emphasis is on sustainable production models with a view to ecological agricultural practices, eco-sustainability and effective organisation and management of organic farms. The results of the future development of the sector are related to the fulfilment of the goal set by 2030 – that at least 25% of the agricultural land of the EU is under organic farming.

The diversification of economic activities through the application of a sustainable organic production model as a tool for innovative development of the territory is a voluntary initiative and a matter of conscious necessity. For the sustainable development of rural areas in Bulgaria and of the country as a whole, a new perspective on the development of organic farming, as well as other integrated agro-ecological activities, is needed (Nikolova M. , Relationship between the Sustainable Models of Production in Agriculture and the Challenges to Their Development in Bulgaria, 2016). These specific practices can lead to the stabilisation of ecosystems, preservation and development of natural and land resources, revitalisation of the rural economy (Nikolova M. , 2013). More and more municipalities are "embracing" the idea of promoting local foods, including organic foods, through organised markets with the participation of interested parties (Nikolova, Linkova, 2018).

Protecting and restoring biodiversity and natural ecosystems and ensuring sustainable food and production practices are essential to our national economy. This necessitates to an even greater extent the development of sustainable production models for effective management of the components of agricultural ecosystems, which is quite logical given the set ambitious goals of the CAP after 2020 for environmental protection and climate change.

As a sustainable model for the development of modern farms, organic farming has the potential to become an economically efficient sector producing high added value. And as an alternative production model, organic production contributes to the sustainable development of agriculture in general and provides an opportunity to put innovations in service to sustainable agriculture.

The dynamics in the number of biological operators has been tracked from the year before our membership to the EU and after the accession of our country for a 15-year period (2006 – 2020).

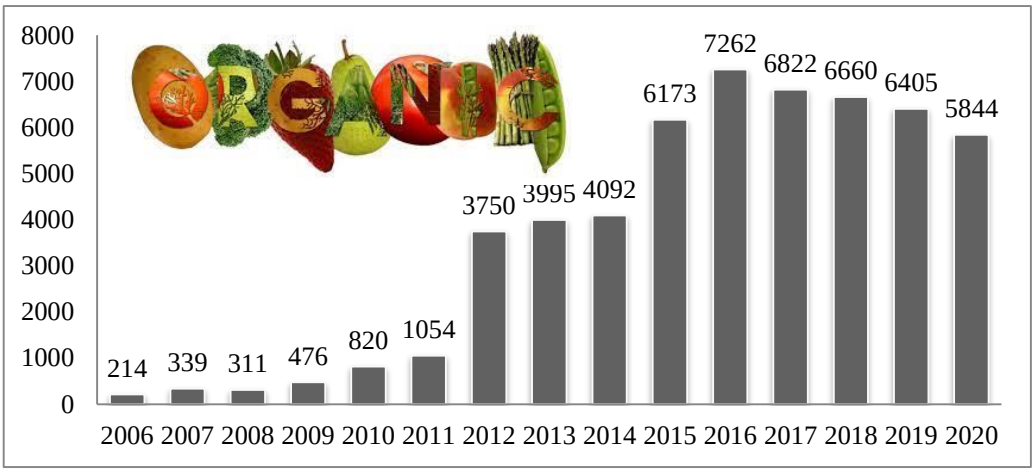

Figure 1. Dynamics in the number of organic operators, per year

Source: Author's figure based on data from the Agricultural Reports.

Despite the negative trend in the last four years, it can be argued that the biological sector has potential for development, due to its innovative nature of a sustainable model, which is in synchronicity with the European and national policy for current and future priority development. A model that, with its environmentally friendly agricultural practices, is becoming more and more important and contributes to ensuring not only resource efficiency, but also people's health and revitalisation of the local economy. It is established as a "boutique model" in the conditions of an economy transforming towards sustainability with a key role in the transition to sustainable food systems. In 2021, the European Parliament, the Council and the Commission were for the first time launching an annual "EU Organic Day" on 23 September. This year (2022) also for the first time in the historical development of the EU, a pan European joint undertaking "organic product" awards is started. This is a unique initiative that can be introduced not only at the European level, but also in every region, municipality, organic restaurant, etc.

Thirdly, the absorption of European funds is also an indicator for the development of the organic farming sector. According to the data of the State Fund "Agricultural" (SFA), the interest of the farmers has a sustainable trend, although the existing difficulties from the implementation of the Rural Development Programme (RDP) (2014 – 2020) as of 31July 2022 (SFA, 2022) it is evident that the percentage

of the utilized funds under measure 11, compared to the total budget under the European agricultural fund for rural development measure (EAFRD) is 68.74%.

Measure 11 "Organic farming"	
EAFRD	184 457 580
Paid funds	126 800 477

For the 2021 campaign, the SFA has paid BGN 24 053 747.50 million to 1 899 farmers under measure 11 "Organic farming" from the Rural Development Programme for the 2021 Campaign.

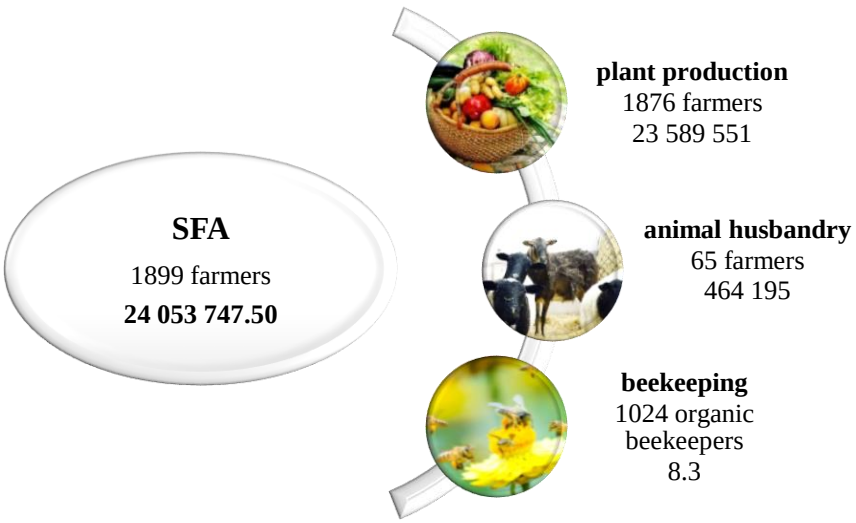

Figure 2. Funds disbursed under measure 11 "Organic farming", 2021 campaign, million BGN

Rethinking the approaches used in modern agribusiness is an important condition in the optimal management of modern agricultural systems. The continuous development of policies regarding sustainable agricultural production in the EU and each member state undoubtedly contributes to this effect. Therefore, the strategic European and national documents for the transformation of Bulgarian agriculture are the driving forces for the sustainable development of agriculture, as a priority sector in our national economy.

Organic farming as a sustainable model for production and effective management of the components of agricultural ecosystems, environmental protection and climate change to the greatest extent meets the benchmarks set in the development of the CAP for the period 2023 – 2027 to reveal its still unrealized potential for development. It is more than necessary to expand the market of organic products at

regional, national and international level, to maintain an effective institutional and regulatory framework for the development of the organic sector based on effective control, as well as ongoing practical scientific research, training, courses within the framework of integrated territorial development.

Conclusion

Under the conditions of transforming economic systems, as a response to specific consumer demands and a responsible attitude towards nature and climate change, farmers are faced with unused opportunities in their choice to develop economic activity on the basis of environmentally friendly practices and opportunities to contribute to the development of the circular bioeconomy.

Organic production is an established innovative business model and an opportunity for regional agribusiness development. Its future development as a sustainable model with a key role and priority in the national agricultural policy is a matter of time and motivated decisions.

The innovative development of agribusiness in rural areas, through the application of a sustainable organic production model, is a possible reality in the presence not only of a European strategic framework, but also of appropriately developed national, regional and local policies, according to the specifics of the territories. Success is based on the collaboration among authorities, local communities and businesses for diversification in the functional use of the territory and optimal utilization of available resources.

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Contact person information: Assoc. Prof. Marina Nikolova, PhD, D. A. Tsenov Academy of Economics, Department of Agricultural Economics, m.nikolova@uni-svishtov.bg

POTENTIAL IMPACT OF ARTIFICIAL INTELLIGENCE APPLICATIONS ON AGRICULTURAL PRODUCTIVITY

Szczepan Figiel[10]

ПОТЕНЦИАЛНО ВЪЗДЕЙСТВИЕ НА ПРИЛАГАНЕТО НА ИЗКУСТВЕН ИНТЕЛЕКТ ВЪРХУ СЕЛСКОСТОПАНСКАТА ПРОДУКТИВНОСТ

Шчепан Фигиел

Abstract

Development of Artificial Intelligence (AI) methods and their applications are becoming important drivers of innovations which significantly affect all areas of economic activities including agriculture. The aim of the paper is to examine how AI solutions applied in agriculture can influence not only production practices, but the sector Total Factor Productivity (TFP). First, types of AI systems and areas of their use in agriculture and related activities are presented. Second, an attempt is made to indicate effects of such technological changes for agricultural TFP worldwide.

Key words: Artificial Intelligence, Technological Change, Agricultural Productivity

JEL codes: O33, O47, Q16

Introduction

Artificial Intelligence (AI) is one of the most striking technology developments which has recently inspired thinking about potential innovations in various sectors of the economy. This includes agriculture where opportunities for innovative development based on implementations of AI solutions are numerous (Bannerje et al., 2018, Eli-Chukwu, 2019). AI while itself discussed broadly both in literature and on business forums, seems to be underestimated by agricultural economists and even more by the agricultural extension service and farmers themselves. Thus, strengthening awareness among all stakeholder groups regarding possible uses of AI methods in agricultural production and benefits of adopting them is important to understand properly this process of unavoidable technological changes we have been recently facing.

Artificial Intelligence (AI) cannot be clearly and concisely defined as a scientific term, nevertheless is well enough rooted as a subject matter for discussion and anal-

[10] Professor, Institute of Agricultural and Food Economics – National Research Institute, Warsaw, Poland, e-mail: Szczepan.Figiel@ierigz.waw.pl

ysis both in theory and practice (Russell and Norvig, 2020). The term AI has become used since 1955 when John McCarthy and team of researchers established scientific foundation for its meaning and understanding (McCarthy et al., 1955). Over the next decades understanding of AI evolved along with the programming and computer technology advancements. AI systems both real and hypothetical can be categorized into three types (O'Carroll, 2017):

- narrow intelligence (ANI), also called weak AI, having limited range of abilities;
- general intelligence (AGI) which can be considered equivalent to human capabilities;
- superintelligence (ASI) being more capable than a human.

While there are a lot of examples of successfully implemented ANI solutions, potential developments of AGI and ASI are more a matter of speculative imagination or futuristic visions. For the purpose of clarifying our considerations we adopt a definition presented by O'Carroll (2017) who described it as a "branch of computer science that endeavours to replicate or simulate human intelligence in a machine, so machines can perform tasks that typically require human intelligence" including planning, learning, reasoning, problem solving, and decision making.

The aim of the paper is to examine how AI solutions applied in agriculture can influence not only production practices, but the sector Total Factor Productivity (TFP). Considering potentially widespread adoption of AI solutions in agriculture it seems to be plausible to hypothesize that effects of such technological changes should be positive for agricultural TFP worldwide. This issue is discussed theoretically using macroeconomic production function and the Solow residual framework. Also, based on the Global AI Innovation Index Report country rankings and agricultural TFP data series indices provided by the United States Department of Agriculture we look for an empirical evidence supporting the proposed hypothesis.

A brief overview of AI applications in agriculture

Various types of AI systems have been used in agriculture since relatively long time ago. The rule based expert systems were extensively used in the 1980s and early 1990s. Next, artificial neural network and fuzzy logic based systems have become dominant solutions. At present, hybrid systems such as neuro-fuzzy or image processing coupled with artificial neural networks are more and more frequently applied. AI solutions impended in agriculture are often of a hybrid nature. In other words, more than just one method or technique is employed in the systems developed encompassing a combination of decision making process and automatization of work to be performed.

Examples of AI applications in agriculture are numerous. They are used in such activities as general crop management, pest management, disease management, weed management, agricultural product monitoring and storage control, soil and

irrigation management, and yield prediction. Current AI applications represent advanced tools which enable implementation of precision agriculture at low cost (Bannerje et al., 2018). They are more automated and accurate systems acting in real time. Apart from supporting farm production AI methods and techniques are applied in other related activities. Examples include agricultural price forecasting, marketing and electronic trading by farmers using special applications allowing implementation a quick go-to-market strategy (Figiel, 2019, Khandelwal and Chavhan, 2019).

AI applications in agriculture constitute a quickly growing market. In 2019 its overall size accounted for almost 1.1 billion U.S. dollars and is expected to grow to more than 3.8 billion U.S. dollars by 2024. AI systems are deployed mainly in field farming, although livestock and indoor farming are considerable segments of the market (Fig. 1).

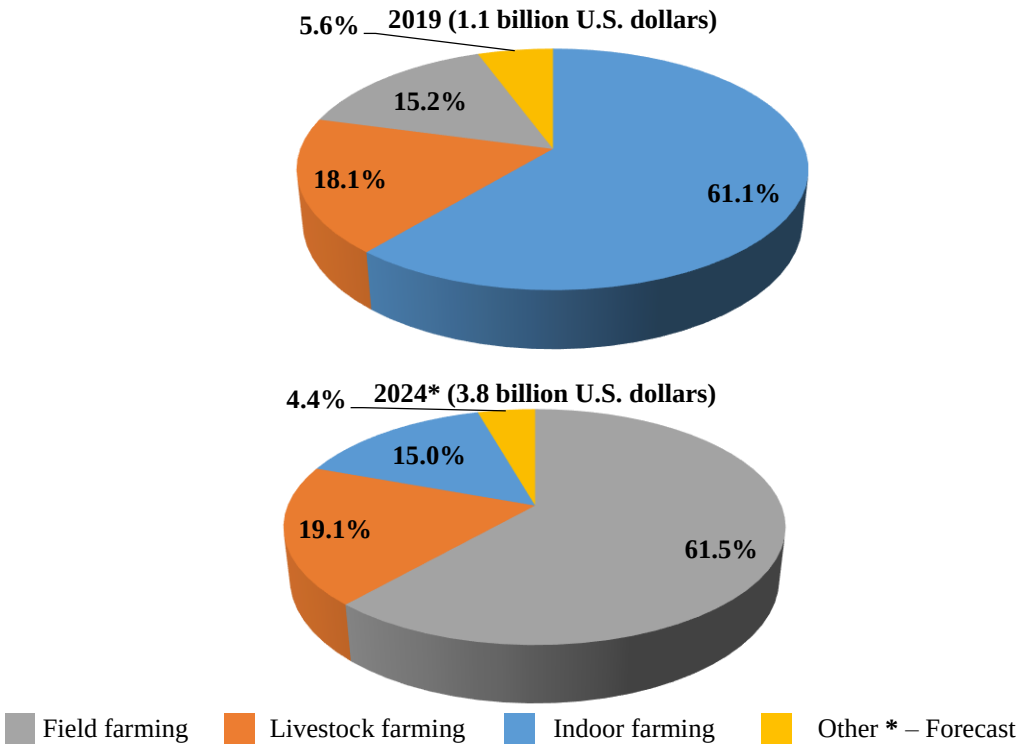

*Figure 1. Structure of the global AI market in agriculture by farming type in 2019 and 2024**

Source: https://www.statista.com/statistics/1174399/global-ai-in-agriculture-market-by-farming-type/ (Date: 2022.04.04).

Theoretical framework for capturing AI impact on agricultural TFP

Agriculture belongs to economic sectors in which work performed by people can be quite easily robotized and many tasks requiring human intelligence can be completed using AI solutions (Kaplan, 2016). Agriculture being inevitably exposed to implementation of such technologies will experience both labor substitution and higher labor productivity effects. Widespread implementation of various AI solutions in agriculture can be viewed as a technical change and analyzed using macroeconomic production function and total factor productivity (TFP) theoretical framework.

First, let consider the textbook Solow model (Solow, 1957):

$$Y(t) = [K(t)]^{\alpha}[A(t)L(t)]^{1-\alpha} \tag{1}$$

$$SR(t) = \frac{\frac{\partial Y}{\partial t}}{Y} - \left(\alpha \frac{\frac{\partial K}{\partial t}}{K} + (1-\alpha)\frac{\frac{\partial L}{\partial t}}{L}\right) \tag{2}$$

where:

$Y(t)$ – output (the GDP in year *t*);

$K(t)$ – capital in year *t*;

$A(t)$ – multifactor productivity in year *t* (technical change or shifts in production function);

$L(t)$ – in year *t*;

$SR(t)$ – Solow residual;

α – equation parameter*;*

$\frac{\partial Y}{\partial t}$, $\frac{\partial K}{\partial t}$, $\frac{\partial L}{\partial t}$ – time derivatives of *Y*, *K*, and *L*, respectively.

Second, let refer to the Solow model augmented with a human capital term, what can be written as follows (Mankiw et al., 1992):

$$Y(t) = [K(t)]^{\alpha}[H(t)]^{\beta}[A(t)L(t)]^{1-\alpha-\beta} \tag{3}$$

$$SR(t) = \frac{\frac{\partial Y}{\partial t}}{Y} - \left(\alpha \frac{\frac{\partial K}{\partial t}}{K} + \beta \frac{\frac{\partial H}{\partial t}}{H} + (1-\alpha-\beta)\frac{\frac{\partial L}{\partial t}}{L}\right) \tag{4}$$

where:

$H(t)$ – stock of human capital in year *t*;

β – additional equation parameter;

other terms – the same as in (1) and (2).

Inclusion of $H(t)$ in equations (3) and (4) means that the effect of changes in human capital is transferred from the Solow residual to capital accumulation, thus, mathematically the residual is smaller in the textbook Solow model. Hypothetical implications of widespread use of AI for agricultural Total Factor Productivity (TFP) can be viewed as expected changes (positive or negative) in the model terms. Considering the nature of AI applications in agriculture it seems plausible to surmise that their impact on all terms in equation 4 but labor term will be positive. Such deductive reasoning comes from meta-analysis of observed and discussed in literature influences of AI development and its applications on agricultural production practices (Bannerje et al., 2018, Eli-Chukwu, 2019, Chu et al., 2019, Elugbadebo and Johnson, 2020, Jha et al., 2019, Khandelwal and Chavhan, 2019, Moallem et al., 2017, Unay et al., 2011)

Diminishing role of physical labor in agricultural production has been observed everywhere in the world and AI development will additionally strengthen this is trend due to substitution effect, therefore, it will have a negative influence on the labor term. The other model terms are supposed to be influenced positively due to productivity effect, investments in physical capital, and accumulation of human capital resulting from education. A general mechanism of AI positive impacts on agriculture is diagrammatically presented in Figure 2.

AI applications help optimize use of inputs, both agricultural (seeds, feed, etc.) and nonagricultural (fertilizers, chemicals such as herbicides and pesticides, and energy), consequently leading to more efficient use of resources (labor, land, water) and higher factor productivity due to the increased yields. Also, the role of AI solutions in monitoring negative externalities (water pollution, gas emissions) and protection of the natural environment cannot be omitted as an important contribution to foster sustainable growth of agricultural production (Geli et al., 2019).

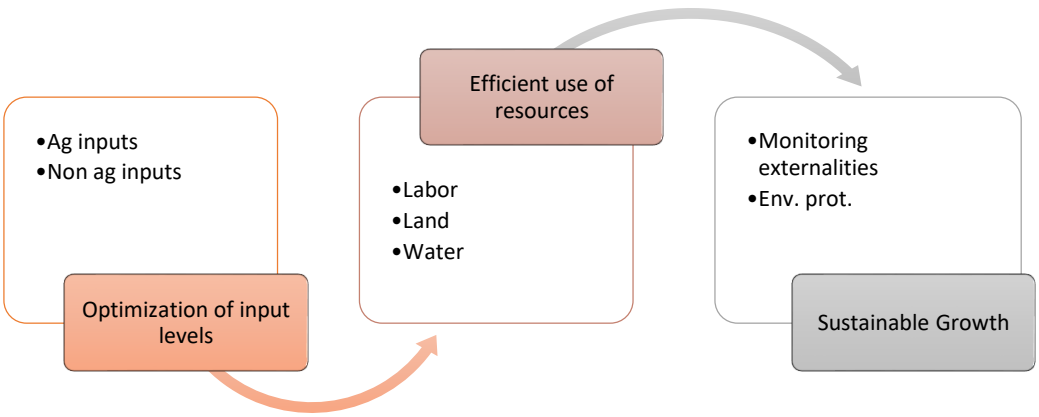

Figure 2. Benefits of using AI solutions in agricultural production

Source: own elaboration.

Countries AI development levels and agricultural TFP

Countries differ regarding the AI development level. Taking into account such criteria as: AI infrastructure, AI research and development, and AI industrial application, the 10 top-ranking countries are the U.S., China, South Korea, Canada, Germany, UK, Singapore, Israel, Japan, and France. The scores countries achieved in this ranking, presented in The 2020 Global AI Innovation Index Report, co-drafted by the Institute of Scientific and Technical Information of China and the Peking University, are shown in Figure 3. The United States is a unquestionable leader of the ranking with China coming second. These two countries are ahead of the other surveyed countries with scores 47 and 12% above the average for the TOP 10, respectively (see the horizontal line).

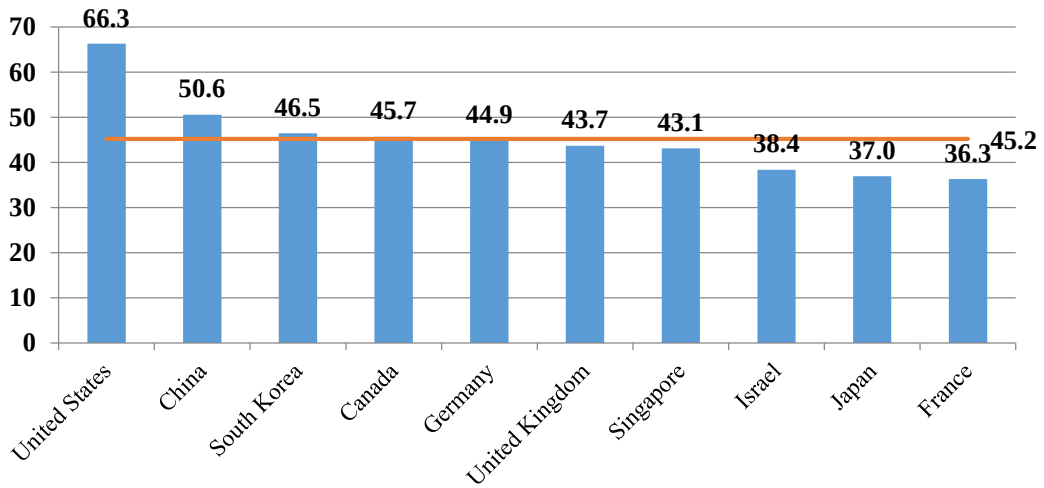

Figure 3.

Source: https://www.chinadaily.com.cn/a/202108/23/WS6122d245a310efa1bd66a545.html (Date: 2022-06-07).

Impact of the AI applications on economic growth is multidimensional and complex. Intuitively, knowing that widespread use of AI methods becomes reality, it seems to be obvious to expect positive effects of such technological change. However, the issue is that AI applications influence basically all areas of human activities, hence, separating pure productivity effects of AI uses without methodological reservations is sort of impossible. In cross-country analysis one of the problems is a global diffusion of innovations among sectors and countries. Nevertheless, it needs to be noticed that the United States and China are the two largest world agri-

cultural producers while Germany, Japan, and France are among the TOP 10 agricultural producing countries. More importantly, values of the index of Agricultural Total Factor Productivity (TFP) calculated for the period 2016 – 2019 indicate a significant agricultural TFP growth in all that countries. For each country every year the index value (year 2015=100) was higher than 100 with average value for the whole set of the panel observations (4x5) equal to 104.2. This implies that agricultural sectors of these countries experienced noticeable productivity growth during the period considered. Whether it is just a coincidence, or indirect evidence showing the positive impact of AI on agricultural TFP should be considered as an open question.

Conclusion

The recent AI based technological advancements and solutions can greatly improve efficiency of farming practices regarding control of crop diseases, pest and weed management, and irrigation and water management. It can be stated that applications of AI in agriculture lead to both substitution and more efficient use of the labor remaining in agriculture. Also, physical asset and land and water resources can be used more efficiently. This is why higher agricultural TFP can be achieved. In fact, there appears to be a connectedness between the advancement level of AI industries in countries belonging to the TOP 10 in this area and their agricultural TFP dynamics observed over the last few years. Incidentally, five of these countries (China, the United States, Germany, Japan, and France) are in the group of TOP 10 largest agricultural producers in the world. This simple observation cannot be ignored considering the share of these countries in the global agricultural production. However, an in-depth analysis is required to provide convincing empirical evidence on the positive connectedness between country AI development level and its agricultural TFP.

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Contact person information: Szczepan Figiel, Professor, Institute of Agricultural and Food Economics – National Research Institute, Warsaw, Poland, e-mail: Szczepan.Figiel@ierigz.waw.pl

IMPACT OF SUBSIDIES IN AGRICULTURAL INCOME AND CROP PRODUCTION: THE CASE OF GREECE

Zisis C. Mandanas[11], Dimitrios P. Petropoulos[12], Nikolaos Apostolopoulos[13]

ВЪЗДЕЙСТВИЕ НА СУБСИДИИТЕ ВЪРХУ СЕЛСКОСТОПАНСКИЯ ДОХОД И РАСТЕНИЕВЪДСТВОТО: СЛУЧАЯТ НА ГЪРЦИЯ

Зисис К. Манданас, Димитриос Петропулос, Николаос Апостолопулос

Abstract

Subsidies are an important element in supporting agricultural income and expanding production. This element is typical for the case of Greece in terms of crop production, which is fragmented, with the majority of farmers owning small rural areas. The purpose of this paper is to study the relationship between the amount of agricultural income and the value of agricultural production and the level of subsidies on products. The research data refer to the period 1993 to 2020 for Greece. All data were drawn from the Eurostat database and are annual. The results of the study showed a significant reduction in the level of subsidies, especially after 2004, which, however, is not associated with a corresponding reduction in agricultural output in the long run. On the contrary, the reduction of subsidies is related to a reduction of agricultural income.

Key words: Subsidies, agricultural income, agricultural production

JEL: Q13

Introduction

The European Union spends annually around €50 billion on the Common Agricultural Policy (CAP), with the primary objective of supporting farmers' income and improving the environmental impact of agricultural production (Rizov et al., 2013). The majority of CAP subsidies are disbursed in the form of decoupled direct payments from the EU budget, which are not linked to current and future amounts of agricultural production. Under CAP there are also subsidies, linked to the production of specific crops or livestock products, or are available for rural development projects.

[11] PhD (c), School of Agriculture and Food Science, University of Peloponnese.

[12] Doctor, Associate Professor, School of Agriculture and Food Science, University of Peloponnese.

[13] Doctor, Assistant Professor, School of Business Administration, Neapolis University Pafos.

The impact of subsidies on agricultural output, allocation of inputs and the distribution of farm income, as well as on farm productivity, has been widely documented in the existing literature (Femenia et al., 2010; Weber. Key, 2012; Latruffe et al., 2017). The results obtained are mixed, as a positive impact of subsidies on the level of agricultural output is observed, and on the other hand a negative impact on the overall productivity of agriculture sector is detected, given the expansion of the quantity and quality of production factors (Ciaian, Swinnen, 2009). Keeney (2000) concluded that the introduction of direct payments through the MacSharry reform contributed to the balanced income distribution of rural households. Also, Mishra et al. (2009), Moreddu (2011) and Benni Finger (2012) also conclude that subsidies contribute to reducing income inequality of rural households.

In contrast, Schmid et al. (2006) conclude that direct payments have little effect on the level of absolute farm household incomes. Furthermore, the authors emphasize that direct payments and agri-environmental subsidies increase absolute income inequality, due to the fact that they are mainly linked to the size of agricultural holdings and therefore the corresponding payments increase according to their size. The use of science and technology in production and combined production systems (production chains) are related to the rise of productivity increase along with the size of production (Oosting et al., 2014). Thus, larger agricultural enterprises have a competitive advantage in terms of the level of subsidies they receive in both relative and absolute terms compared to smaller ones but especially compared to individual farmers, alongside with the strengthening of the tendency for verticalization (Hedoui et al., 2019).

Aim of the present study is to examine the relationship of agricultural subsidies, output and income in the short and long run, with reference to the Greek agricultural sector. Therefore, focuses on the influence exerted by subsidies on the level of agricultural output and economic efficiency of agricultural households, in order to clarify their role as an element of ensuring the rational development of agricultural production and ensuring a satisfactory standard of living for the agricultural population by boosting its income.

Methodology

The primary data that are used for the purposes of the present paper include annual data, which were drawn from the Eurostat database and concern Greek the Economic Accounts for Agriculture for a period of 28 years (1993 – 2020). Data refer to crop production value at producer and basic prices, agricultural revenue and product subsidies. The econometric tools used to examine the nature of the relationship between the level of agricultural subsidies, output and income in the short and long run are Ordinary Least Squares regression and Engle – Granger cointegration

analysis. Additionally, time trend plots and Spearman's linear correlation coefficients are presented. To study the effect of subsidies on the level of the output of crop production and agricultural income, the following OLS models are estimated:

$$lpv_t = a + \mathrm{b} \times lsubs_t + \mathrm{e} \quad (1)$$

$$lrev_t = a + \mathrm{b} \times lsubs_t + \mathrm{e} \quad (2)$$

where:

lpv_t: Natural logarithm of crop production value at producer prices;
$lrev_t$: Natural logarithm of agricultural revenue;
$lsubs_t$: Natural logarithm of product subsidies;
e_t: The disturbance term.

As previously mentioned, in order to detect the existence of a long-term equilibrium relationship between the volume of product subsidies and crop production output and agricultural revenue, the Engle-Granger cointegration method is used. For the existence of a cointegration relationship, this specific method assumes as a prerequisite that the residuals of the OLS regression of the variables under examination, are integrated of zero order (I (0)), with the basic condition of the existence of I (1) process in them. Stationarity is examined with the use of ADF (Augmented Dickey – Fuller) unit root test, with the inclusion of a constant term and trend, while the appropriate number of time lags is selected through Akaike Information Criterion (AIC).

Results

Figure 1 shows the overtime trend in crop production value at producer prices and product subsidies. Also, production value at basic prices yielding by the sum of the two aforementioned quantities and the level of agricultural revenue resulting from the difference between the producers' operating surplus and the land rent payable and land lease expenses are presented. It is observed that the production value at producer and basic prices show a common movement, with an upward trend until 2005, where the level of subsidies is also increased. Subsequently, there is a decrease in production value both in producers and basic prices and a simultaneous decrease in the level of subsidies, to show an increasing trend with small fluctuations until 2020, where they reach the pre – 2005 levels. In contrast, the amount of product subsidies is consistently low after 2007 relatively to the period 1993 – 2006. Also, the level of agricultural income shows relative stability, despite its fluctuations after 2006, a result that can be attributed to the crisis phenomena that affected the Greek economy and the relative uncertainty that characterized it.

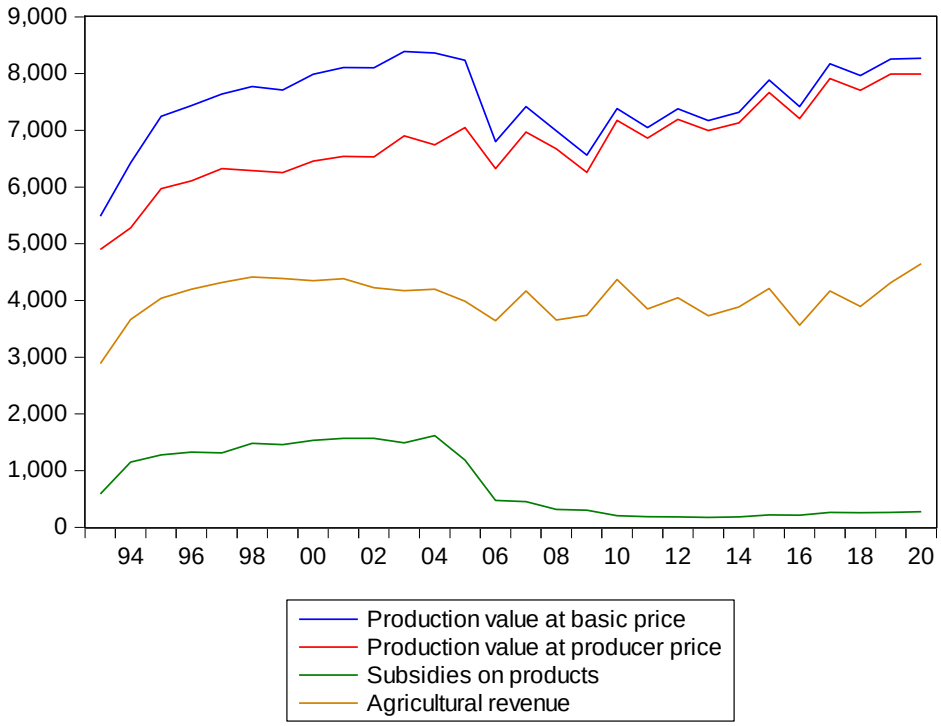

Figure 1. Time trend in subsidies, crop production value and agricultural revenue

The reduction in the level of subsidies is more clearly perceived when they are presented as a percentage of agricultural revenue and of production value at producer and basic prices. As shown in Figure 2, there is a significant reduction in subsidies after 2005, especially as a percentage of agricultural income, until 2010, while the relative ratio stabilizes after 2011. Similar are the results regarding the level of the ratio of subsidies to crop production value at producer and basic prices.

Interpreting the results of the Spearman correlation matrix of Table 1, it is initially observed that a negative and statistically significant relationship emerges between the level of subsidies and production value at producer price (r=-0.583, p=0.001). This particular result indicates that an increase in subsidies is associated with a decrease in the value of crop production and vice versa. At the same time, the positive correlation between subsidies on products and production value at basic price (r=0.389, p=0.041), confirms the important role of subsidies in determining the level of crop production. Additionally, an increase in the value of subsidies is associated with increased agriculture revenue and vice versa with the associated correlation coefficient also being positive and statistically significant (r=0.409, p=0.031).

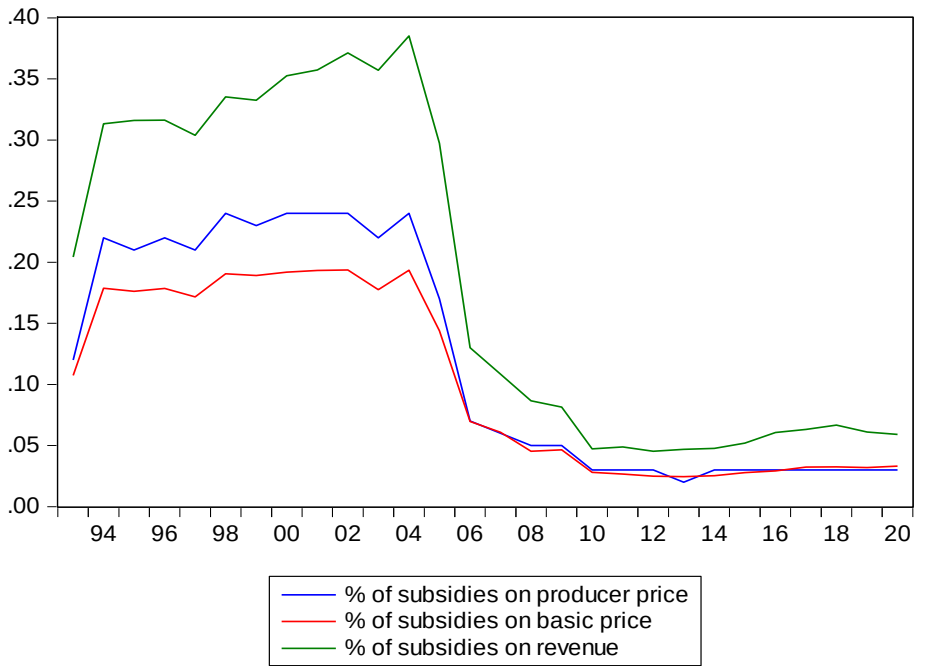

Figure 2. Time trend of subsidies to crop production value and agricultural revenue ratio

Table 1. Spearman correlation matrix

		Subsidies on products	Production value at producer price	Production value at basic price	Agricultural revenue
Subsidies on products	rho	1			
	p	-			
Production value at producer price	rho	-0.583	1		
	p	0.001	-		
Production value at basic price	rho	0.389	0.483	1	
	p	0.041	0.009	-	
Agricultural revenue	rho	0.409	0.137	0.669	1
	p	0.031	0.487	0.000	-

By studying the effect of subsidies on the volume of agricultural production and agricultural revenue, OLS regressions are applied. As observed (Table 2), subsidies show a negative impact on the level of production (b=-0.070, p=0.003), as an increase in subsidies by 1% leads to a corresponding decrease in production value at producer prices by 0.07% and vice versa. On the contrary, there is a positive effect of subsidies on agricultural revenue (β=0.028, p=0.040), with a change in subsidies

by one percentage point leading to a corresponding change in agricultural revenue by 0.028%.

Table 2. OLS regression results

	Model (1)			Model (2)		
Independent variable:	lpv			lrev		
	Coefficients	t	p	Coefficients	t	p
Constant	9.257	68.394	0.000	8.123	62.330	0.000
lsubs	-0.070	-3.307	0.003	0.028	2.365	0.040
R^2		0.296			0.167	
Adj. R^2		0.269			0.131	

In order to apply the Engle – Granger cointegration test, unit root tests should be performed to determine the order of integration of the time series, which should be I (1). Table 3 presents the results of the Augmented Dickey–Fuller (ADF) unit root tests with constant term and trend. The critical values for the ADF test are equal to -4.374 for a 1% significance level and -3.603 for a 5% significance level. It is concluded that the variables are integrated of the same order, since their order of integration is I (1) in all cases. Given that the time series are first order integrated, the study of the existence of cointegration relationships between the level of subsidies and production value at producer prices and the level of subsidies and agricultural revenue is applied using the Engle – Granger test.

The results presented at Table 4, show that there is a cointegration relationship between the value of subsidies and agricultural revenue, as for critical values of -4.356 for a 1% significance level and -3.595 for a 5% significance level the residuals of the corresponding regression (2) are I (0) based on the ADF test (p=0.001). Therefore, a long-term equilibrium relationship between the two variables is observed. On the contrary, the assumption of stationarity of the residuals at the level for regression (1), referring to the relationship between the value of subsidies and production at producer prices is rejected (p=0.144) and is concluded that there is no long-term equilibrium relationship between the two variables.

Table 3. ADF unit root tests

	Level		1st difference	
	t	p	t	p
lsubs	– 2.304	0.418	-4.381	0.010
lpv	– 1.286	0.620	-5.208	0.002
lrev	-1.916	0.617	-4.813	0.004

Table 4. Engle – Granger cointegration tests

	Level	
	t	p
Model (1) residuals	-3.028	0.144
Model (2) residuals	-5.239	0.001

Conclusions

From the results of the analysis, it is concluded that the effect of the financial flows of the subsidies on the level of income of the Greek farmers cannot be considered negligible, as the relevant financial variables show a linear relationship, fact that was also confirmed through the use of the corresponding Spearman correlation tests. Also, through regression and cointegration analysis, it was observed that subsidies have a positive effect on agricultural revenue both in the short and long term. In addition, it is judged that the increase in subsidies leads to a decrease in agricultural output, which does not show long-term characteristics. The above indicate a clear contribution of subsidies to agricultural income, which may nevertheless discourage the productive performance of the agricultural sector.

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Contact person information: Dimitrios P. Petropoulos, Associate Professor, School of Agriculture and Food Science, University of Peloponnes, e-mail: d.petropoulos@uop.gr

THE IMPACT OF COVID-19 ON AGRI-FOOD ENTERPRISES IN THE PELOPONNESE REGION

Eleni Anastasopoulou[14], Dimitrios Petropoulos[15], Nikolaos Apostolopoulos[16]

ВЛИЯНИЕТО НА COVID-19 ВЪРХУ СЕЛСКОСТОПАНСКИТЕ ПРЕДПРИЯТИЯ В РАЙОНА НА ПЕЛОПОНЕС

Елени Анастасопулу, Димитриос Петропулос, Николаос Апостолополос

Abstract

When the COVID-19 pandemic broke out, it affected the economic and social life of people worldwide. This paper aims to investigate the problems arising from the pandemic in the production process of 405 agri-food enterprises including producers (farmers, livestock farmers, fishermen), processors/micro, small, and medium agri-food enterprises located in a predominantly rural area of Greece, the Peloponnese region. The data were obtained by a detailed online questionnaire survey (quantitative analysis). According to the analysis of the results, it was found that the responses regarding the distribution of products, were almost equally divided between low and high difficulty. Furthermore, despite the increased production costs by implementing sanitary protocols, the agri-food enterprises absorbed it internally and did not pass it through the price of the product. Both the quantity and the quality of produced foodstuffs were practically hardly affected. Also, agri-food enterprises have not been seriously affected by product loss and waste. Furthermore, lockdowns are contributing to labor shortages for agriculture enterprises, particularly those characterized by periods of peak seasonal labor demand. The usage of e-shops was limited and almost half of the enterprises were not satisfied with State funding. The uncertain economic environment creates insecurity among producers and agri-food entrepreneurs for sustainability and future investments. Local and regional authorities together with the State must take relief measures to provide financial support to producers and agri-food entrepreneurs, so that the food supply chain functions properly and we do not face a food crisis.

Key words: agri-food sector, food supply chain, COVID-19, enterprises, producers

JEL: Q13

[14] PhD. (c), School of Agriculture and Food Science, Universety of Peloponnese.

[15] Assoc. Prof., School of Agriculture and Food Science, Universety of Peloponnese.

[16] Assist. Prof., School of Economics and Technology, Universety of Peloponnese.

Introduction

Like any crisis, COVID-19 causes significant changes in the economy, local and global policies, social behavior, and citizens' mentalities. The pandemic has affected the most essential value chain locally and globally, the food supply chain and the changes it brought became a habit.

The food supply chain includes all the processes that start with agricultural or livestock production and end up on the consumer's plate. As part of the mitigation of the spread of the COVID-19 pandemic, governments implemented lockdowns and suspended the transport of products and the movement of workers (Mishra et al., 2021).

In the framework of these policies, the structure of demand and entrepreneurial activity were strongly being influenced as shown by the reduction in labor productivity, the increase in labor costs, transportation costs, and products prices as well as the income shortage for farmers and food deficits (Mastronardi et al., 2020). COVID-19 brought significant changes in the structure of demand and distribution channels (Elleby et al., 2020) more than primary production. Primary production is non-resilient to such external shocks. Local markets and short food supply chains have been shown to respond to difficulties by creating a direct link between producers and consumers. As shown in the research of Mastronardi et al. (2020) in which the short food supply chains were more resilient and showed a greater boost on five farms in central Italy.

Furthermore, online sales have increased significantly (Mastronardi et al., 2020) compared to face-to-face sales. However, it was achieved mostly in areas with strong internet (Phillipson et al., 2020). An example of a free web application is "Save my Local" created by volunteer developers in the UK and Northern Ireland, empowering closed local businesses through online product shopping. However, other countries such as the Netherlands, Belgium, and France have also supported the promotion of agri-food products for rural businesses through online platforms (Lucaci, Nastase, 2020). The more familiar businesses become with the use of e-commerce, the more the smooth functioning of the agricultural supply chain is ensured (Kumar et al., 2020). Of course, lockdowns have created greater problems for horticultural (Mishra et al., 2021) and nurseries (Phillipson et al., 2020) businesses with seasonal labor from third countries (Aday, Aday, 2020). A solution to this problem is to replace them with domestic workers (Bochtis et al., 2020), as the UK did by seeking 70,000 locals to work on farms during harvest season (Aday, Aday, 2020).

The role of government is significant in this crisis analysis and in the implementation of alternative measures to manage risks and overcome financial problems of agri-food enterprises through appropriate funding. In a survey conducted by Popovic et al. (2020) in the Western Balkan countries, it is reported that a large number of small and medium-sized enterprises were significantly strengthened. Another

survey reports that the Turkish government has supported special crop seeds with 75% funding, while imports of cereals are exempted or have reduced customs tax (Hossain, 2020). Also, in Brazil, loans for agricultural producers are being reconsidered or deferred (FAO, 2020). Finally, Hossain's (2020) research showed that the government of China provided 250 million euros for the recovery of the agricultural sector, the expansion of e-commerce, and the export of marketing in the agri-food sector.

This paper aims to investigate the problems arising from the pandemic in the production process of agri-food enterprises located in a rural region of Greece. The Peloponnese region is a predominantly rural area and its agri-food enterprises are at the heart of the economic development. The land of the Peloponnese produces delicious, branded (many of the branded products are organic), quality, and certified agricultural products with significant contribution to National production.

Methodology

A targeted online survey questionnaire was answered, at the beginning of the summer of 2021, by 405 enterprises, including producers (farmers, livestock farmers, and fishermen), processors/micro, small, and medium agri-food enterprises, operating in the agri-food sector of the Peloponnese region, a predominantly rural area of Greece. The questionnaire consists of six questions identifying the respondents' demographics (gender, age, education, business size, agri-food sector, and location) and eight questions on the impact of the COVID-19 pandemic on food production costs, quantity, and quality, selling price, product distribution, and workforce adequacy were sought. In addition, the role of e-commerce on food promotion and the possible support of agri-food enterprises by national and European financial instruments were studied. Each question was measured through a five-point Likert scale range based on (1) Strongly disagreed, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly agree. All respondents participated in the survey with their own consent. After all the data were collected, they were descriptively analyzed and important conclusions were drawn about the impact of the pandemic crisis on agri-food businesses and producers in a rural area.

Results

The sample of respondents consists of 79.8% males, 8% 18-30 years old, 24% 31-40 years old, 33% 41-50 years old, 24% 51-60 years old, and 11% more than 61 years old. Educational level was found 31.1% Secondary education, 50.4% Higher education, 17.8% Master's degree, and 7% Doctoral degree. Concerning the size of the firm, 9.6% were Small and medium-sized enterprises (51 – 250 employees), 26.2% Small enterprises (11-50 employees), and 64% Very small enterprises (<10 employees). The majority of survey respondents (33.6%) live in Messinia, followed by Laconia with 21% and Corinthia, Arcadia, and Argolida with around 15%.

the number of questions in Messinia is higher because there are more enterprises located there. The sample is representative of the most important Greek agrifood sectors consisting of very small and small firms as shown in Figure **1.**

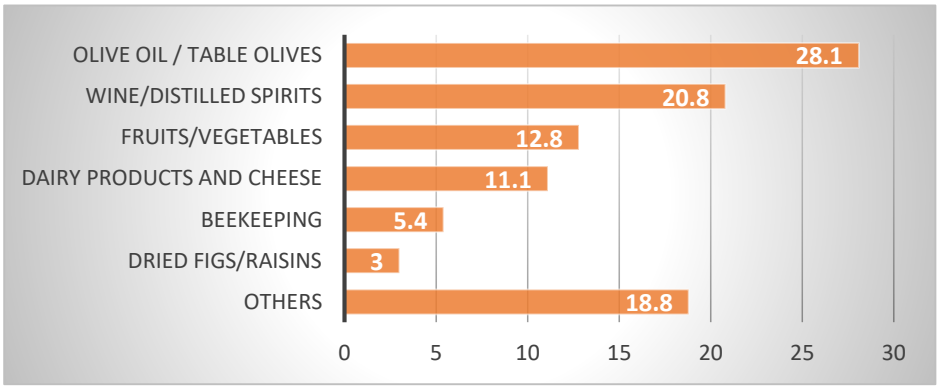

Figure 1. The most important sectors of the agri-food enterprises in the Peloponnese region (%)

The imposition of restrictions on distribution, followed by quarantine has not caused a fundamental problem for agri-food products. The respondents, other than the neutral ones, are split almost 50/50 between disagreed and agreed (Figure **2**). Interestingly, this is not related to the export or non-export character of the enterprises.

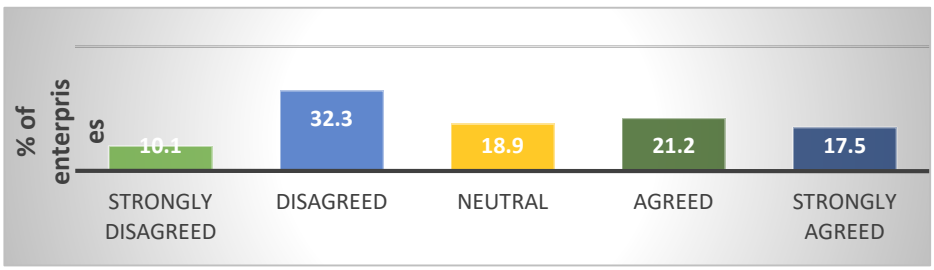

Figure 2. Difficulties in the distribution of agri-food products during COVID-19

COVID-19 containment measures such as hand sanitizer, soap, hand washing facilities, sterile work uniforms, rapid testing of all staff, labor shortages, and social distancing have resulted in a slight increase in operating expenses for enterprises. Overall, the majority of them (60%) have reportedly experienced an increase in operating expenses due to preventive measures instituted by the government to curb the spread of the virus (Figure **3**). Only 25% of the enterprises reported disagreeing with the increase in operating costs. However, 68% of the respondents answered

that they did not increase the price of the product and that any cost was absorbed internally (Figure **4**).

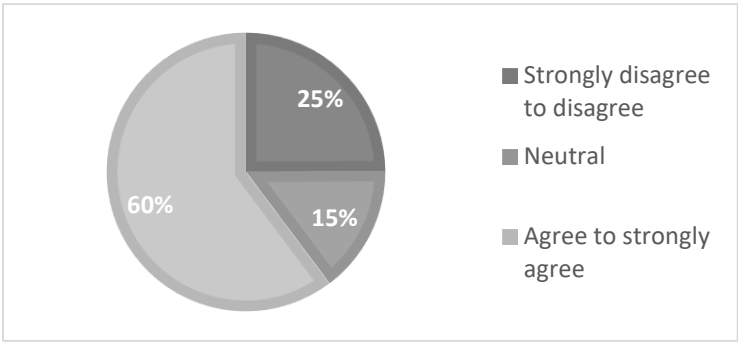

Figure 3. The implementation of preventive measures increased production cost

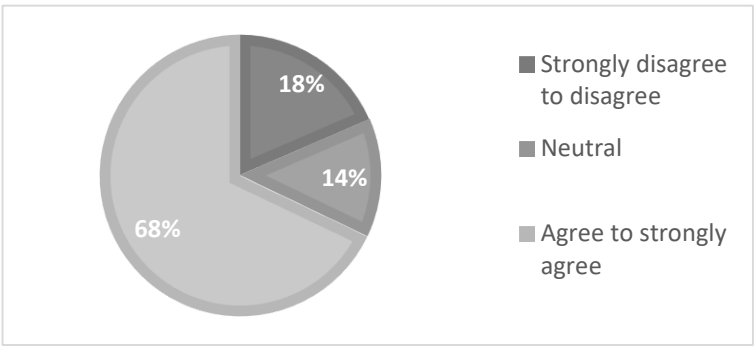

Figure 4. The enterprise did not transfer this cost to the prices of the products

Other worrying concerns include reduced productivity, and quality, as well as more food loss and waste. Although 61.7% of the respondents stated that the containment measures instituted by the government did not cause a further decline in the production quantity, 38.3% of them had led to a decline in productivity due to labor shortages. At the same time, especially in small food chains, the quality of the products is ensured due to the direct link with the producer. Regarding our study almost all the respondents (90.7%) agreed that the quality of products was practically unaffected. Additionally, local producers and enterprises under these measures tackle the issue of food loss and waste. This study indicates that agri-food enterprises (64.4%) in the Peloponnese region were not seriously affected by product loss and waste. However, 35.6% of them had losses and waste, which is in accordance with world literature.

Lockdowns and restrictions in the mobility of workers across borders contributed to labor shortages, mainly in countries that rely on seasonal workers. For many crops, the harvesting season is fixed and a deficiency of labor can result in product shortages in the food market. However, in our study, there are divided opinions on this question. 43.3% of the respondents disagreed and 45.4% of them agreed. The 44% who haven't faced problems, were mainly small family businesses with a small number of permanent staff, while those dependent on third-country workers were affected (Figure **5**).

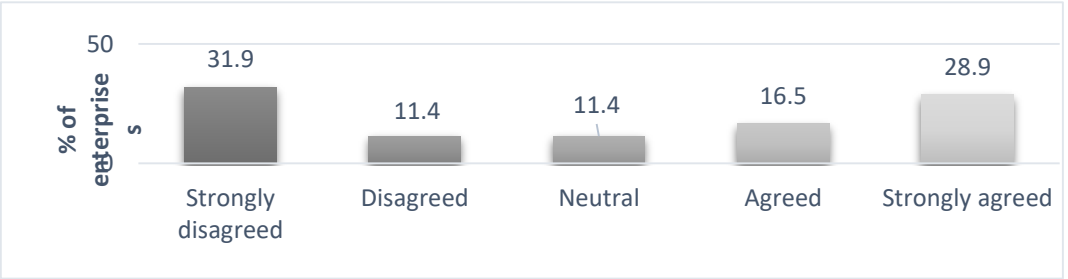

Figure 5. Seasonal labor shortages can result in production shortages

The survey has also investigated the role of e-commerce in the distribution and sale of agri-food products. E-commerce uses electronic systems, such as computer networks and the Internet. It has become one of the preferred ways of shopping by users, since its ease and convenience. Our analysis of the e-commerce variable has allowed us to find that, despite progress in e-commerce, it has a low implementation of mechanisms for online selling products, online payment services, construction of e-shops, websites, and applications. Probably, the lack of familiarity with digitization in rural areas did not help the agri-food enterprises, during the pandemic period, to exploit e-commerce to increase their sales.

SMEs in the agri-food sector could be prioritized for early support, when the COVID-19 pandemic broke up, given the vital nature of their product to people's lives. Government programs could strengthen the primary sector and agri-food enterprises. The Greek Government has taken important measures to support producers and SMEs affected by COVID-19. Among these was the financial support package of €40 million to producers of Kalamata olives, premature watermelon, spring potatoes, and greenhouse crops in Crete. Especially, the Peloponnese Region supported SMEs with €40 million, including agri-food enterprises and restaurants meeting specific criteria. However, in our study, almost half of the respondents (52%) argue that was not supported by state funding, while 33% (1/3 of them) utilized state funding (Figure **6**). The uncertain economic environment creates insecurity among producers and agri-food entrepreneurs for sustainability and future investments. Therefore, it is obvious that a large percentage of respondents (68,4%)

are very affected by the uncertain future and the unknown consequences of the pandemic and do not even think about future investments.

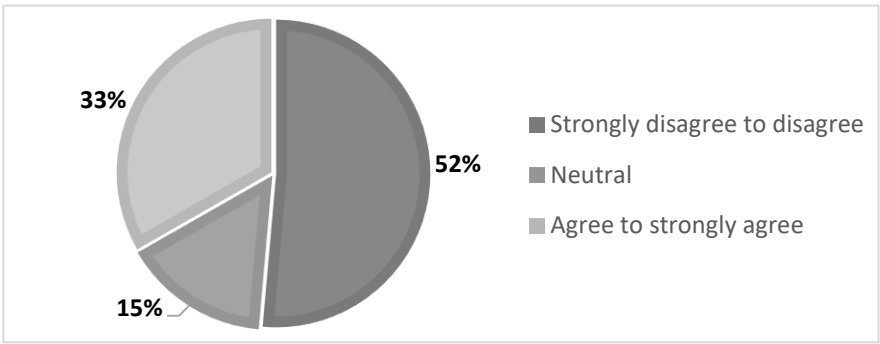

Figure 6. Percentage of support to enterprises from State funding

Discussion – Conclusion

Pandemic COVID-19 limits important activities of society, causing a reduction in income for a large proportion of the population and major disruptions in the normal functioning of the public and private sectors. Through our own research, it was found that rural agri-food enterprises were moderately affected by the impact of the pandemic COVID-19. It is worth noting that while they incurred additional costs for the specific implementation of sanitary protocols they did not increase the final cost of the produced products and did not deteriorate their quality. One of the main risks of lockdowns is that the shelf life of products that are not disposed of in time may expire, resulting in their economic destruction. It is positive that serious losses and wastage of products were not observed in the enterprises in our study. Shortages of seasonal labor are most noticeable in firms characterized by periods of peak seasonal labor demand. While at the same time more than half of agri-food enterprises were not satisfied with government funding.

Local and regional authorities together with the state should take relief measures to provide financial support to agri-food producers and entrepreneurs. It is recommended that specific support packages for the agri-food sector be designed and implemented to transition to a more sustainable food system that will strengthen their resilience to future pandemic threats, natural and other external shocks. This study is under further analysis as the COVID-19 pandemic has brought to the surface the gaps and weaknesses of the agri-food sector of a predominantly rural region of Greece, the Peloponnese region.

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Contact person information: Dimitrios P. Petropoulos, Associate Professor, School of Agriculture and Food Science, University of Peloponnes, e-mail: d.petropoulos@uop.gr

RELATIVE COMPARATIVE ASSESSMENT OF EU-28 FARM SUSTAINABILITY

Veselin Krustev[17]

СРАВНИТЕЛНА ОТНОСИТЕЛНА ОЦЕНКА НА УСТОЙЧИВОСТТА НА СТОПАНСТВАТА В ЕС-28

Веселин Кръстев, Божидар Иванов

Abstract

The main sustainability aspects are defined in a broader definition regarding to which the agriculture should be economically efficient, environmentally compatible and socially responsible.

The EU is transforming the holdings and this reflects on the farm economic size and furthermore its sustainability. This paper aims to find out the connection between the farm economic size and the sustainability.

The relative comparative approach applies an assessment by normalizing the FADN data (representing an average statistical farm performance from each MS sample) and determines the scope of the Member States according to pre-defined criteria used as a sustainability score.

Key words: Agricultural Holdings, Sustainability, Economic Size, Relative Comparative Assessment, EU-28

JEL Codes: D04, Q12, Q56

Introduction

Measuring sustainability involves complex indicators which often do not support each other and there appears the necessity of building a Composite Sustainability Index where the Relative Comparative Assessment approach facilitates the evaluation of influence of a set of variables on farm sustainability. Also provides some clues for policy-makers (Mortimer et al, 2008) that intend to design sustainability-increasing and green agricultural policies. The most papers dedicated to farm sustainability are focused on eco-environmental component. In this paper, we evaluate sustainability through the estimated main detrimental production factors, intensification level and the wellbeing of holdings based on their costs.

One pays attention on the sustainable intensification of the small farms operating in the highlands. The Ethiopian researcher Mutyasira (2017) tried to find out where is the limit of that intensity when a farm is exploiting the land, animals and environment extraordinarily. Longhitano et al (2012) applied a methodology of sustainability assessment to the regional FADN sample of Veneto based on the Italian database (as we used on a MS holding level), keeping into consideration that dataset

[17] PhD student, Institute of Agricultural Economics, Agricultural Academy.

has "to be a valuable source of information to monitor the environmental and social farm assets, beside the economic one". Katona et al. (2005) presented a comparative sustainability approach to the EU-15 and found Hungary farms had lowered the inputs relative to the reference values and during its pre-accession period had even went under the EU-15 input levels. In term of such a goals, while aiming to fulfil the EU framework, a national administration should define effectively institutional checkpoints especially to ensure policy implications for environmental management (Mitov, 2019). Ivanov et al. (2009) concluded that there is a need of continuous monitoring to assess and modify sustainability strategies. That is the reason we created a long-term observation on the average synthetic farm holdings, representing the Member States of EU-28 by an official data.

Methodology

Aiming to build a Composite Sustainability Index includes 15 complex variables. The FADN provided 37 variables used to create complex farm indicators, which form an estimation ranking for every pillar and afterward to form the Composite Sustainability Index:

Economic indicators:

1. Labour Productivity = Total Output / Total Labour Input;
2. Diversification Level* = 1- (Max Output (FADN~SE140÷SE245)/ Total Output);
3. Profitability = Farm Net Income / (Total Inputs – Farm Usage);
4. Capital Productivity = Total Output / Average Farm Capital;
5. Economic Resilience (Bachev et al., 2017) = (Total Output – Total Subsidies excluding on Investments – Subsidies on Investments) / (Other Direct Inputs + Depreciations + Total External Factors);

* The Diversification Level is expressed by the reciprocal value of a Specialization Level

Social indicators:

6. Family Farm Income per Family Working Unit;
7. Internal Consumption per Family Member = Farmhouse Consumption / Unpaid Labour Input;
8. Farm Salaries = Wages Paid / Paid Labour Input;
9. Farm Made Factors of Production = [Farm use – Feed for Grazing Livestock Home-Grown/ (Arable Land + Permanent Crops)];
10. Share of Own Land = 1 – (Rented U.A.A./ Total Agricultural Area)

Ecological indicators:

11. Stocking Density;
12. Fertilizer Usage per Unit Area = Fertilizers / Input Intensified Area*;
13. Pesticide Usage per Unit Area= Crop Protection / Input Intensified Area*;

14. Energy Intensity = Energy / Total Utilized Agricultural Area;
15. Protein Crops Share in the Crop Rotation = Protein crops / Cereals + Energy crops + Potatoes + Sugar beet + Oil seed crops + Industrial crops.
* Input Intensified Area = Arable Land + Permanent crops;

Assessment method:

In order to focus on the majority of results, to normalize the data and to form a score, the following ranking formula was applied to design the values to fit between 0 and 1:

$$\text{Indicator Score} = \text{FADN Value} * \frac{(0.5 + 0.5\ \text{Var. Coeff}^{2})}{\text{St Dev} + \text{AVG}}$$

Where: Variation Coefficient = Standard Deviation / Average

As a consequence, to remove the spikes the following restrictions to values needed to be applied:

a. value <0 = 0;
b. value >1 = 1.

The assessment of each MS Composite Sustainability Index will be presented as an arithmetic **average of the results by pillars**, which in turn will be formed also by the average of each indicator group. What is distinctive about the measurements of the pillars is that they are represented by the assessment on sustainability principles, which represent a common denominator of the indicators that make them up.

Economic Pillar Assessment:

1. Economic Efficiency= (Capital Productivity + Labor Productivity) / 2
2. Risk Management = Diversification Level
3. Financial Stability = (Capital Productivity + Profitability) / 2
4. Economic Viability = Economic Resilience

Social Pillar Assessment:

5. Welfare of Employed in Agriculture = {[(Family Farm Income per Family Member + Internal Consumption per Family Member) / 2] + Farm Wage} / 2
6. Agricultural Preservation and Conservation = (Share of Own Land + Farm Made Factors of Production) / 2

Ecological Pillar Assessment:

7. Animal welfare* = 1 – Animal density
8. Water quality* = 1 – [(Fertilizers per Unit Area + Pesticides per Unit Area)/2]
9. Air quality* = 1 – (Energy intensity of production)

10. Land quality = Share of protein crops in the crop rotation

*inverted values where indicator type is "less is better"

Results

The top **Economic Pillar** score belongs to Belgium after a 3.5 % increase during the last program period – 0.655 on an average basis (Figure 1), while the EU level increases by nearly 3% and reaches 0.435.

The second place among the rising economies is taken by the Netherlands with a growth of 3.7% and a level of 0.61.

The leading role of these countries is supported by stable levels in terms of the productivity (labor and capital), as well as a high level of economic conjuncture where the enterprises operate (Economic Resilience). In fact – Italy ranks third with an increase of 10% reaching a result of 0.60, the basis of which hang on the profitability and the production diversification.

The EU founding group is rounded out by Germany, which shares the fourth place with Denmark at 0.55. France and Luxembourg are also progressing as a consequence of above EU values. In chronological order follow the island countries – Malta (0.54), United Kingdom (0.52) and Ireland (0.51) and Mediterranean countries – Spain (0.51) and Portugal (0.48) with values above France. They include Sweden, whose farms reach 0.48 of the economic pillar. In the case of Portugal and Spain, this is due to the diversification of production, and thanks to the high values of its profitability and economic environment suitability. Malta – small-mid scale farmers are also performing top economic result due to the high intensity of their production.

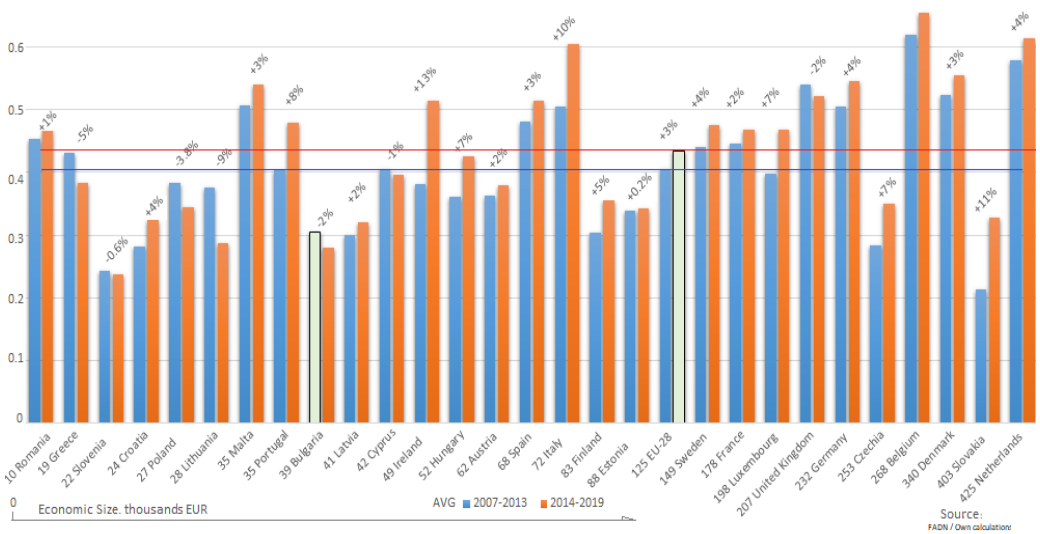

Figure 1. Economic Pillar Estimation Scores

The MS average farm holdings might be separated by the red line received during the second program period as being updated according to the pre-covid situation. The intensification farm level could be easily seen in each economic size class according to the EU typology (average economic size 2007 – 2019 is presented at the bottom of these figures). That level is declining in Greece – minus 5%. United Kingdom is presenting minus 2% performance as the only one decreasing large-scale farm.

Such a trend could be expressed as reducing the intensification level which in turn might be understood as integration of a more environmentally friendly production technologies in both (animal husbandry and land cultivation) production directions. It is also observed in the small (up to 25 th. EUR) – Slovenian farms (-0.6%) and the small-mid ES group (up to 50) – Poland (-3.8%), Lithuania (-9%) and Bulgaria (-2%).

In summary – 10 out of 11 new MS farms have score below the EU – average. The smallest Romanian holdings make the exception, Hungary passed through the 2007 – 2013 blue EU line after that period.

7 out of 11 old MS have score above the EU-average – Greece and Cyprus fall down the EU curve after 2013, Finland and Austria are still below the both references.

Top 3 economically sustainable are the farms from the founding MS and the rest stay above the reference.

Within the small farm size class, **the Social Pillar** values are reciprocal to these compared to the economic one which sum stands on the essential farm wealth. That occurs in the small-mid group – Portugal and Malta, where again are observed bellow the EU results. The big exception is Ireland (again above the average). Poland, Lithuania and Greece have the only farms performing a social decline. Despite of its increase, Bulgaria seems to have the holdings on the most vulnerable socio-economic position. Latvia and Cyprus are close behind, and together with Hungary and the Czech Republic they form the members of the "may be poor" group. All the other MS have a sufficient sum of the selected indicators. Belgium stays bellow the reference but the reason stays on the low share of own cultivated lend, farm made factors of production and farmhouse consumption (which is declining by 45%).

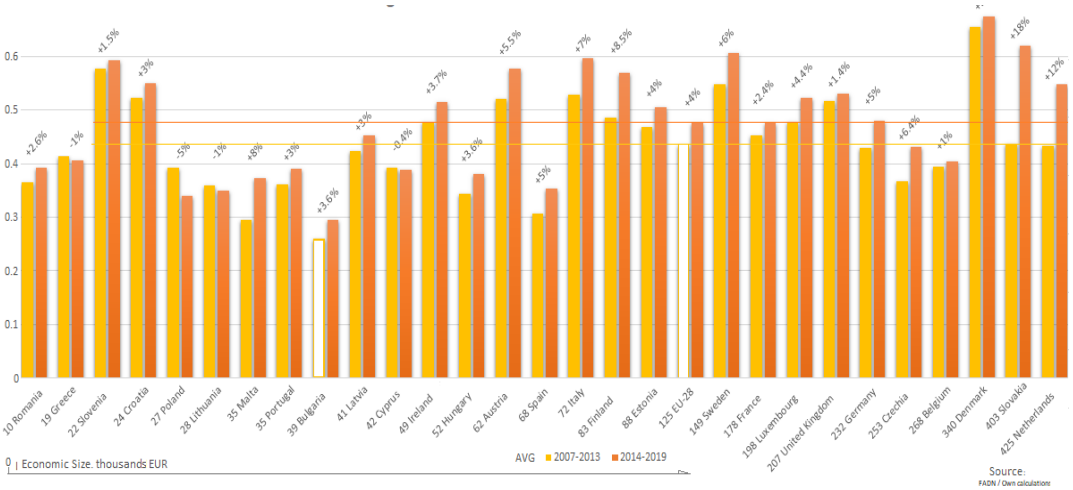

Figure 2. Social Pillar Estimation Scores

In total – 7 out of 11 new MS are below the EU-average. The farms in Slovenia and Croatia from the smallest Economic size class compensate the economical weaknesses (the opposite of Romania). Estonia and Slovakia gain from the larger production scale, while Czech Republic almost reach the 2013 – 2019 EU reference.

6 out of 11 old MS stay above the EU reference – Greece and Cyprus, Malta, Portugal and Spain are not presented as big farm holdings but they represent the south part of EU which seems poor compared to the northern regions like Scandinavian for example.

5 out of 6 founding MS have leading socially sustainable score, except Belgium. Only the German farmers joined the group after a raise in the salaries of the paid labour – 22.4%.

The **Ecological Pillar** estimation reveals what is the price of the intensive agricultural production that Malta, Belgium and the Netherlands pay – quantitatively catastrophic ecological values. Very close to that disaster are Cyprus and Luxemburg with their limited land recourses while Germany and Denmark are well known for their significant large scale units where the ecological purposes are not highly prioritized. Slovenia and Croatia are about 10% far below the border too. A satisfactory impression come from Greece and the new MS – Romania (small) including small-mid farms from Poland, Lithuania, Latvia (together with the large entities in the Czech Republic and Slovakia), also Portugal and Ireland (small-mid). Hungary places in-between the average lines (like Bulgaria and France), with the mid-big group overhead. Sweden and UK have a very little increase demonstrating solid traditions in the usage of the ecologically good agricultural practices.

The eco winners are the Baltic countries where the major increase is boosted by a huge implication of nitro-fixing crop rotation supported by each indicator constructing the pillar.

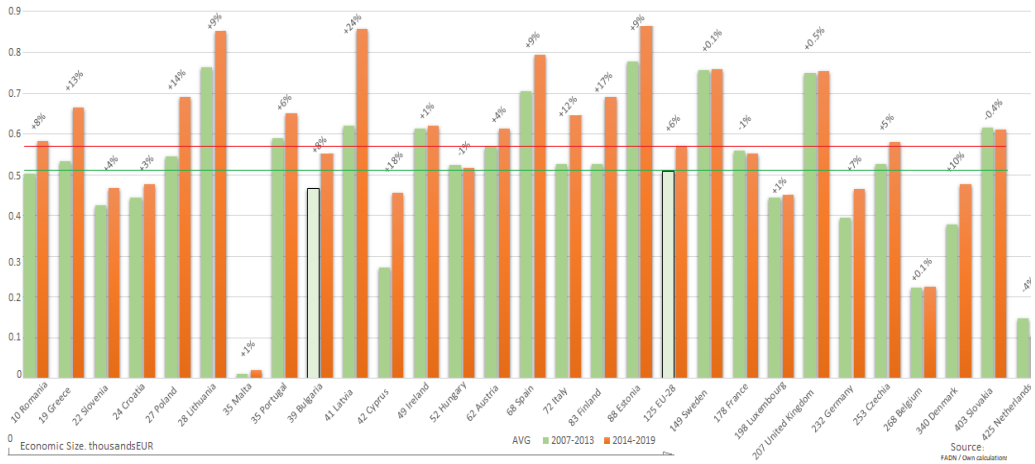

Figure 3. Ecological Pillar Estimation Scores

The huge economic size productions units involve issues concerning the environmental aspects of the sustainable development.

In general – 7 out of 11 new MS perform ecologically better than EU after 2013. Slovenian and Croatian farmers cannot reach the EU level, while Bulgaria reached the 2007 – 2013 level in consequence, while Hungary (-1%) still stays there and could not follow the EU increase.

8 out of 11 old MS have strike above the average. Malta and Cyprus have strongly limited amount of cultivated area while Denmark has intensive animal breeding where the animals could not experience a sufficient amount of outdoor free grazing area. Compared to the other MS – these conditions are represented only in Malta, Cyprus, the Netherlands and Belgium.

Most of the EU founding MS are performing far below the ecological standards included in the study. France step back during the second observed program period but only Italy stays on the green trend.

The Sustainability Index aims to catch the balance between the different pillars where the values are close to the average. The diapason between the average lines compiles five out of six of the smallest farm holdings MS.

Italy, Portugal and Spain are the Mediterranean examples for agricultural sustainability. Baltic and Scandinavian countries, United Kingdom and Ireland might be very good example for governance and management.

Finland and Slovakia gain a great improvement of agricultural sustainability for their holdings mainly based on a boost of the social responsibility but also preserving the nature is laid down in their traditions.

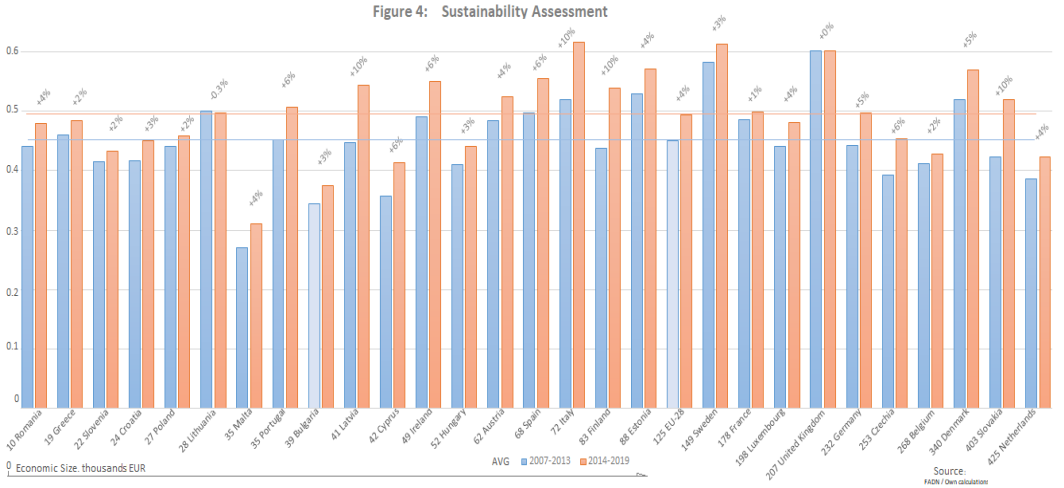

Figure 4. Sustainability Estimation Scores

On the other hand, the holdings in vulnerable position like Bulgarian excessively exploit the land and/or animals – Malta and Cyprus because of land limitations, which partly concern these MS creating some of the biggest agricultural holdings in the EU – Belgium and the Netherlands. Slovenia and Hungary need to improve CAP implementation to extend their results to meet the EU level.

Conclusions

That composite index is built based on comparative approach and the index is not classified to the degree to interpret the implication of the results as a holding is sustainable or not. It is deemed in the following studies. It is found that almost all of the MS gain an increase of the sustainability indices. The small scale farms covered in the FADN turn out not to be the most vulnerable in the EU. Keeping in mind most of them are managed by self-employed owners, they are estimated as well efficient and sustainable. All factors for sustainable development are quite depending on the structure and farm management, but on the other hand the public policy continue to play the crucial role for the implementation of the CAP. The CAP improve the economic performance of farms to a great extent but at the same time affects their resilience to be vibrant for future without subsidies.

The conflict between the ecological and the economic performance is obvious as it reveals the contest between the extensive farming and agribusiness intensive farming system. The production modesty, social and ecological merits are distinctly noted in the small scale farms. Each policy should take the choice how to preserve the land resources to the next generation and describe the sustainable development as its own challenge, opportunity and policy goal.

Bulgaria is reported in the study as one of the vulnerable MS in terms of sustainability and the main reason might be the structure of value chain which defines the country as yet to do more in added value prospect, productivity and distribution of the resources between farms.

The economic size connecting a high sustainability score could not be defined. The investigated holdings are more dependent on their agricultural (Soviet or western) legacy and management practices more then on the economic size.

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Contact person information: Veselin Krustev, phD student, Agricultural Academy, 125 Tzarigradsko shosse Blvd., Block 1, 1113 Sofia.

THE IMPACT OF AVIAN INFLUENZA ON THE POULTRY MARKET

Dorota Pasińska[18]

ВЪЗДЕЙСТВИЕТО НА ИНФЛУЕНЦАТА ПО ПТИЦИТЕ ВЪРХУ ПАЗАРА НА ПТИЧЕ МЕСО

Дорота Пасинска

Abstract

The main goal of the study is an attempt to indicate the effects of the occurrence of avian influenza on the poultry market (production, gate price, export to third countries) in Poland in three seasons of this disease (2016/2017, 2019/2020, 2020/2021). In Poland, in the last few years there has been a fairly frequent occurrence of avian influenza in poultry flocks. The eradication of this disease is associated with huge costs to the state budget. Compensation is payable for the birds killed if biosecurity requirements were respected on the farm. Farms, although probably not all, whose operations are in a protection or surveillance zone also suffer losses. These losses are related to many veterinary constraints on kept stocks. Poultry farms must bear the costs associated with undertaking and searching for innovative activities aimed at preventing the penetration of this disease into the herd. Another consequence of the occurrence of this disease in poultry is the introduction of restrictions on imports from Poland by some non-EU countries.

Key words: bird flu, poultry, foreign trade

Jel Code*:* Q13, Q17, Q18

Introduction

Direct or indirect contact with infected wild birds, usually by inhalation or ingestion is usually the source of infection in domestic poultry (Kosińska and others 2020). Migrating waterbirds that may transmit this disease cannot be controlled, but biosecurity measures can be introduced to limit contact between domestic poultry and wild birds, thus reducing the risk of virus entering domestic poultry flocks (Chmielewski and Swayne 2011).

Consequences of the disease concern not only agricultural producers, but also exporting, importing, and educating farmers, the state and entities cooperating with poultry producers.

The consequences of the occurrence of the disease for agricultural producers can be very varied, e.g., elimination of infected or endangered poultry, the need to keep poultry for more or less days than the standard production cycle of the flock, lower

[18] Assistant professor, Institute of Agricultural and Food Economics National Research Institute, Poland.

prices for products produced in areas affected by avian influenza, restrictions in placing poultry, possible increase in costs related to preventing this disease from entering the flock.

Reducing the spread of the disease involves implementing risk management, including testing for the disease, appropriate cleaning, disinfection, hygiene practices, and restrictions on the movement of poultry from the farm to the market (Chmielewski and Swayne 2011). Not all agricultural producers can bear the costs related to biosecurity. Failure to meet the biosecurity requirements by small producers causes the production risk of large producers to increase as well. Reconciling the principles of biosecurity with some farming systems (e.g., free range) may be a significant difficulty and a source of additional costs for agricultural producers, and sometimes may even cause the need to periodically incur losses.

Many countries restrict imports from HPAI affected countries due to food safety and biosecurity. Such countries decide whether the restrictions apply to the entire territory of the country or selected areas, and whether they are necessary. They must also define which product groups they relate to. An importing country may adopt regional trade restrictions, dividing the exporting country into two zones, avian influenza free and affected. Such arrangements may be negotiated between the countries. As a result, they may be included in a contract. Regionalization in combination with other control measures lets exports from disease-free zones and does not lead to losses in economic well-being in the event of an outbreak. Imposing restrictions on certain regions may help them alleviate poultry supply interruptions (Seitzinger, Paarlberg, 2016 and Thompson, 2018).

It is worth noting that not only exporting countries may suffer losses related to avian influenza (as they lose their share in the market), but also importing countries. An importing country may incur increased import costs due to a lack of international competition (Lokuge, 2005). On the other hand, for the importing country it can be an incentive to increase self-sufficiency in poultry production and / or in diversification of suppliers or even find providers who will supply such products at lower prices. In such situations, the exporting country must consider not only temporary but also permanent loss of certain markets.

The occurrence of the disease has forced changes related to education, for example in such fields of study as animal science and veterinary medicine. In Poland, knowledge about the rules preventing the penetration of the disease into a farm can also be acquired during trainings, including those conducted by agricultural advisory centers.

Review of literature

Avian influenza is an interdisciplinary problem. The research results presented in the Polish and English-language literature on the subject are mainly devoted to veterinary, pharmaceutical, and human health problems related to avian influenza

e.g., Minta and others, 2007, Samorek-Salamonowicz and others in. 2007, Sosińska and others 2017, Scott and others in. 2020, Capua and Marangon 2006, Alders and others 2014. While in the world economic literature on the subject, researchers pay attention to avian influenza quite often (e.g., Seeger and others, 2021), in the Polish economic literature the subject of scientific works devoted to avian influenza is scarce (e.g., Tereszczuk, 2017; Mroczek, 2021).[19]

Methods and data

The obtained results can be used by various participants in the supply chain (e.g. processors or trade), they can support not only the economic policy of the state (identifying some difficulties in running a poultry farm, creating instruments mitigating the negative effects of the disease), but also exporting companies (identification of difficulties in export, the possibility of preparing an action plan in the event of avian influenza, defining the target markets where the products will be sold). The main purpose of the article is to describe changes in the production, trade and gate prices of poultry related to the occurrence of avian influenza in Poland in 2016 – 2021 (until June). Due to the limited study, the egg market was omitted. Achieving the objective of the study was possible thanks to the use of the following methods: comparative analysis of the production and gate prices of live poultry, export of live poultry, meat and offal, and poultry products to third countries (countries which are not members of the EU). To achieve the purpose of the article, unpublished semi-annual data of the Ministry of Finance and Statistics Poland was used. The main premise for undertaking research is no subject of research in the literature which attempted to indicate the effects of the occurrence of avian influenza in Poland in different seasons of its occurrence. The article is a review.

Findings

Avian influenza can affect domestic production, prices, or even foreign trade. In recent years, avian influenza has been quite frequent in Poland. In 2016, there were 22 outbreaks of avian influenza in poultry in Poland, in 2017 – 43, in 2019 – 3, in 2020 – 51, and in 2021 – 402 (General Veterinary Inspectorate).

The impact of avian influenza on production may vary. It was assumed in the article that the occurrence of avian influenza would discourage agricultural producers from newly placing poultry, as a result in the years when this disease was recorded, the poultry production in Poland would decrease. Poultry production is an important part of livestock production in domestic agriculture. Since 2014, the most poultry has been slaughtered in Poland among the countries belonging to the EU (Eurostat 2022). In the years 2010 – 2020, domestic production of poultry in Poland

[19] Due to the limited nature of the study, the Author does not discuss the results of research by other Authors but recommends that you read the publications listed.

increased, despite the occurrence of the disease at the turn of 2016/17 and 2019/2020. In 2021, production decreased for the first time since joining the EU, mainly due to the record number of outbreaks of avian influenza and related restrictions on the placing and moving birds. Based on the estimated linear trend function for 2010 – 2021 ($\hat{Y}$ = 171,34 t + 1797,5, where t – time), for the domestic production of live poultry, it can be concluded that from time to time, production increased by approx. 171 thousand tons. Using the constructed equation, it was possible to explain 94% of the variability of the dependent variable, i.e., domestic production of live poultry.

The impact of the disease on the price situation may be different, it depends on the scale of the phenomenon, its occurrence in European and non-European countries, the type of the influenza, as well as whether the disease affects wild birds, domesticated poultry, the way birds are used and the species of poultry, the supply – demand situation in the poultry and substitution products markets.

Table 1. Development of gate prices of poultry (net prices) and their dynamics (analogous period of the previous year = 100%)

Specification	1st half 2016	1st half 2017	1st half 2018	1st half 2019	1st half 2020	1st half 2021	Dynamics				
							1st half 2017	1st half 2018	1st half 2019	1st half 2020	1st half 2021
poultry	3,68	3,57	3,63	3,82	3,56	3,97	97,0	101,7	105,2	93,2	111,5
hens	1,58	1,34	1,69	1,66	1,34	1,85	84,8	126,1	98,2	80,7	138,1
chickens	3,36	3,29	3,44	3,45	3,24	3,70	97,9	104,6	100,3	93,9	114,2
ducks	4,51	4,66	4,65	4,61	4,47	4,55	103,3	99,8	99,1	97,0	101,8
geese	7,42	8,34	5,76	8,15	6,78	9,09	112,4	69,1	141,5	83,2	134,1
turkeys	5,52	5,18	4,66	5,68	5,19	5,75	93,8	90,0	121,9	91,4	110,8

Source: own compilation based on Statistics Poland data.

Because Statistics Poland publishes monthly data only for poultry in general, half-yearly data was used for the analysis. The six months of the avian influenza season with more outbreaks were selected (table 1). When we analyze changes in the prices of six-month poultry in the half-years with the highest number of outbreaks of avian influenza, we can conclude that the changes in the prices are multidirectional not only for poultry in general, but also for individual poultry species. The situation was different in each of the studied seasons of avian influenza.

In the 2016/2017 avian influenza season, poultry prices tended to decline. In the first half of 2017, the gate prices of poultry decreased by 3.0%. However, it is difficult to unequivocally determine to what extent it was caused by avian influenza, and to what extent it was caused by the greater supply of poultry on the world mar-

kets. The emergence of the disease resulted in the introduction by some third countries of restrictions on the import of specific poultry products from all over the territories or selected regions of Poland. As a result, exports of some poultry products to some countries decreased. Locally, some poultry producers may have found it difficult to market their products. This could apply, for example, to those entities that cooperated with entities with poorly diversified geographic directions of export, entities whose activities were in protection and surveillance areas.

The demand and supply situation in the 2019/2020 and 2020/21 avian influenza season was different. In the case of the first of them, in the period when the most outbreaks were recorded, i.e., in the first half of 2020, purchase prices of poultry showed a rather downward trend, with a record collapse in April and May 2020. In the first half of 2020, gate prices of poultry decreased by 6.8%. It probably resulted from both avian influenza and the COVID-19 pandemic, but the magnitude of the impact of the two variables is difficult to pinpoint. In the first half of 2020, in many countries around the world, including Poland, there were many restrictions on the functioning of the tourism and catering sectors related to COVID-19. The constraints caused the demand for poultry in the sectors, especially in the second quarter of 2020, to decline. Many cold stores and warehouses were overcrowded at the time. There were restrictions on the import of certain poultry products from part or the entire territory of Poland to many third countries, they were related to the occurrence of HPAI in Poland.

In the case of the second of the compared seasons of avian influenza, i.e., 2020/2021, the situation was different, because the restrictions in the functioning of the catering and hotel sectors were slightly milder, and the sectors were already slightly better at dealing with the situation (the possibility of purchasing online, extending the offer by take-away, testing travelers for COVID-19). Due to the record number of outbreaks, the scale of poultry slaughter related to the disease was huge, restriction on the placing and moving poultry, the supply of poultry decreased not only in Poland, but also in the entire EU market, which resulted in an increase in the prices of live poultry. In the first half of 2021, the total purchase prices of poultry increased by 11.5%. Some third countries introduced restrictions on imports from Poland due to avian influenza occurrence in poultry flock, and some did not remove the restrictions introduced in the previous season of this disease, i.e., 2019/2020.

The impact of this disease on foreign trade is difficult to assess due to imprecise information on the restricted product groups. Product groups can be defined differently in the exporting and importing country, which means that we do not always deal with a mirror reflection of trade turnover. The impact of the disease is lower in countries that export little or no poultry, and about half of Poland's domestic poultry production is sold abroad.

One of the consequences of the disease is the introduction of restrictions on Polish imports to some third countries from the entire territory or from indicated areas. The restrictions may also depend on the degree of processing of the product. The restrictions quite often apply to chilled and frozen meat, and less often to processed products. Some third countries allow imports of processed products from Poland, they will undergo specific heat treatment. In the 2016/2017 influenza season, the exclusions for poultry products subjected to a specific thermal treatment applied, inter alia, to: Macedonia, Ukraine, the Philippines, Saudi Arabia, and Korea (General Veterinary Inspectorate 2017). With the disease extinction, many non-EU countries are lifting restrictions, but not all.

In the three analyzed seasons of avian influenza, restrictions on imports from Poland were introduced by many third countries, it was verified whether in the six months with the highest numbers of outbreaks in each season, exports of the main commodity groups changed significantly (e.g. in the case of live poultry, poultry meat and offal, a reduction in export volumes was expected). Changes in the volume of live poultry exports were multidirectional (it increased in two seasons and increased in one season) (table 2). However, poultry was exported at rather lower average prices. In the first half of 2017, the first half of 2020 and the first half of 2021, the volume of exports of poultry meat and offal to third countries increased. However, the analysis of changes in the volume of exports in the first half of 2020 and 2021 is difficult, because in 2020 the United Kingdom left the European Union and is classified as a third country, therefore the changes in the volume and value of exports to third countries were also analyzed, with the assumption that Great Britain did not leave the EU. With this assumption made, it turned out that in the first half of 2020 the volume of exports of meat and poultry offal to third countries decreased, in the first half of 2021 it increased, as compared to the corresponding period of the previous year, however, comparing the export volume in this period with the first half of 2019, we can see that it decreased. The last comparison was made due to the periodic breakdown in exports in the first half of 2020, as related to the restriction in the functioning of foodservice, which was the result of the COVID-19 pandemic.

Properly prepared and cooked meat, even from animals affected by HPAI, is safe for health, therefore countries may exempt the products from trade restrictions (Chmielewski and Swayne 2011). Cooking and pasteurization inactivate the avian influenza virus. Poultry meat is rarely eaten without heat treatment or cooking. Consequently, the avian influenza virus poses a minor biosecurity problem (Chmielewski and Swayne 2011).

Table 2. Changes in volume (t) and value (EUR) of live poultry, poultry meat and offal and poultry products exports from Poland to third countries in the first six months of 2017 – 2021

Specification	2017/1	2018/1	2019/1	2020/1	2021/1	2020/1*	2021/1*	2021/1*
	The same period of the previous year = 1							2019/1=1
volume (t)								
live poultry	0,48	1,60	1,14	1,04	0,69	1,04	0,69	0,72
poultry meat and offal	1,15	1,29	1,34	1,15	1,04	0,85	1,07	0,91
poultry preparations	0,99	0,99	2,43	16,77	1,07	0,72	0,69	0,50
value (EUR)								
live poultry	0,39	1,76	1,24	0,71	0,61	0,71	0,61	0,44
poultry meat and offal	1,06	1,18	1,58	1,85	0,98	0,85	1,00	0,85
poultry preparations	0,97	1,35	2,98	18,59	1,13	0,48	0,76	0,36

**third countries assuming that the UK did not leave the EU.*

Source: own compilation based on MF data.

As some third countries, introducing restrictions on imports from Poland, exclude from them, products subjected to specific thermal treatment, it was assumed, that the volume of exports of this product group would be increase in the analyzed six-month period. Exporters were expected to sell less poultry meat and offal abroad, which would be offset by an increase in processed poultry exports (in fact, some countries have exempted from import restrictions processed products that have undergone a specific heat treatment). Since the United Kingdom left the EU in 2020, changes in the volume of exports to third countries, excluding the country (UK) from the group of third countries, were analyzed (table 2). With this assumption made, it turned out that in all six-month periods of avian influenza outbreaks, the volume of exports decreased, as compared to the corresponding periods of the previous year. If the United Kingdom is included in the group of third countries, in the first half of 2020 and the first half of 2021, the volume of processed exports was higher, which is the result of this country's withdrawal from the EU.

So why has exports of processed products to third countries decreased? There may be many answers to this question. Sometimes exporting countries prefer to import chilled or frozen meat in order to process it in their country (an additional benefit may be additional jobs in processing plants). An insufficient supply of imported raw material can severely limit the activities of their poultry industry. Sometimes the importing country is interested in importing processed products from abroad, however, the offer of such products is very poor and additionally not adjusted to the preferences (e.g., taste) of their consumers, sometimes the offer is appropriate but there is no established system of their distribution or there is no political acceptance of trade relations between exporting and importing country. On the

other hand, the specificity of the market may be such that the demand for processed products is low or close to zero or the importing country strives to be self-sufficient in poultry preparation production or has an adequate supply of domestic products or possibility to increase it. On the other side, some exporters may not be interested in exporting processed products to third countries because of a lack of technical capacity to produce them, or the possible orders would be too small to make it profitable to adapt or set up a suitable production line, or the market is so far away that it is not profitable to do so (e.g. transport costs are too high).

Conclusion

Some of the effects of avian influenza differ from season to season and some are similar. Regardless of the season, many third countries, after noticing avian influenza, introduce restrictions on imports from Poland of the indicated poultry assortments from part or the entire territory of Poland. Some of the countries implement such restrictions very quickly, and lift them very slowly (e.g., China, South Africa). The impact of this disease on the level of poultry production depends on the scale of its occurrence not only in Poland, also in other EU countries, as well as in countries to / from which the chicks are exported /imported from Poland, as well as from the regions of its occurrence, it is usually smaller, when the disease is recorded in areas with less concentration of production.

The control of avian influenza is very costly to the state. The farmer is entitled to compensation for the poultry killed if the farm complied with the bio-assurance requirements. Some of the farms operating in protection or surveillance zones suffer losses. This is due to restrictions on the introduction and movement of poultry resulting from legislation aimed at eradicating avian influenza as quickly as possible. In recent years, the disease has been more common. Therefore, it is necessary to build innovative data collection tools, data management systems that enable determining losses incurred by farms, exporting entities and other participants in the supply chain (e.g., fodder companies), as well as the use of innovative solutions by farms that prevent the penetration of the disease to flocks. It is worth considering the construction of a loss mitigation system, e.g., insurance, a fund that collects a small share of the sales value of live poultry as a source of full or partial coverage of losses, and the identification of participants in such a system. An analysis of the evolution of poultry gate prices in the context of the occurrence of avian influenza shows that continuous monitoring of this market is necessary. Changes in these prices, poultry production and export to third countries can be multidirectional.

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Contact person information: Dorota Pasińska, assistant professor, Institute of Agricultural and Food Economics National Research Institute pasinska@ierigz.waw.pl

EDUCATIONAL SYSTEM AND RESULTS IN PERIPHERAL RURAL AREAS – STATUS AND PERSPECTIVES

Yanka Kazakova-Mateva[20]

ОБРАЗОВАТЕЛНА СИСТЕМА И РЕЗУЛТАТИ В ПЕРИФЕРНИТЕ СЕЛСКИ РАЙОНИ – СЪСТОЯНИЕ И ПЕРСПЕКТИВИ

Янка Казакова-Матева

Abstract

The EU Rural Vision 2040 assumes that skilled, educated and motivated people will be in rural areas to make them stronger, connected, resilient and prosperous. The paper aims to look deeper in the status of the school educational system and its results in the peripheral rural areas in Bulgaria and into their perspectives to respond and benefit from the EU Rural Vision policy initiative. The results urge the educational, rural and regional development policy makers to undertake specific and targeted actions to address the school educational gap in the peripheral rural areas.

Key words: school education, peripheral rural areas, depopulation, EU rural vision

JEL code: I12, R58

Introduction

The European Union launched an ambitious initiative – EU Rural Vision. It led to an agreement on a common vision and an action plan for EU rural areas towards 2040: "*Rural areas are the fabric of our society and the heartbeat of our economy. They are a core part of our identity and our economic potential. We will cherish and preserve our rural areas and invest in their future*." (EC, 2021a). The action plan identifies four main areas aimed to contribute to "stronger", "connected", "resilient" and "prosperous" rural areas. The focus is on empowered and vibrant rural communities developing tailor-made, place-based and integrated policy solutions and encouraging social and other innovations.

The underlining condition for these to happen is having active, educated and motivated people in rural areas that know their places, their strengths and weaknesses, and have the hearts and stamina to work towards the Vision. The schoolchildren of today are the future workforce, entrepreneurs and decision makers of 2040.

[20] Associate Professor, PhD, Department Economics of Natural Resources, University of National and World Economy (UNWE), Sofia.

This paper aims to look deeper in the status of the educational system and its results in peripheral rural areas in Bulgaria and their perspectives to respond and benefit from the EU Rural Vision policy initiative.

Peripheral rural areas

Peripheral rural areas are usually defined as geographically or territorially peripheral, eg. away from urban centers or in border regions (EC, 2021b; Kubeš, Chvojková, 2020); peripheral from socio-economic perspective (Máliková et al., 2016; Vendemmia, Beria, 2022) or from agriculture production perspective (RUR'UP, 2020).

The Bulgarian national policy does not differentiate peripheral rural areas explicitly. There is a definition for rural areas for the needs of the rural development programmes agreed by the Ministry of Agriculture. Then, there is the categorisation of municipalities (Figure 1) for the needs of the Ministry of Regional Development. The two approaches do not compare completely. Both ministries use the municipality (LAU 1 level) as a reference administrative territory.

However, the Ministry of Agriculture uses only one indicator for its definition – the number of population in the biggest settlement in the municipality. Until recently the threshold was 30 000 inhabitants, which covered 232 municipalities. The new CAP Strategic Plan 2023 – 2027 proposes to reduce the threshold to 15 000 inhabitants, which will cover 215 municipalities. The reduction of the threshold is motivated by the desire to focus funding on the municipalities that need it most, but there is still no differentiation between these 215 municipalities.

The Ministry of Regional Development uses an integrative classification of municipalities with five criteria with 17 indicators (Council of Ministers, 2011). It rates their development status by integrating criteria related to population, level or urbanisation, infrastructure (technical, communication, environmental and social), socio-economic, territorial and institutional representation. The classification produces six categories, where '0' is for the capital Sofia, '1' is for the municipalities that are administrative districts. Categories '2' to '5' are mostly rural areas; with those in category '2' being more developed (six of them were in the non-rural group under the classification of the Ministry of Agriculture) and those in category '5' least developed (Figure 1).

Since the approach of the Ministry of Regional Development considers a broader set of criteria and indicators, it provides a better starting point for the analysis. My assumption is that the municipalities in category '5' can be considered peripheral rural areas from socio-economic, infrastructure and institutional perspectives. The territorial periphery criteria, eg. distance from urban center, does not always apply to these municipalities. We can observe on Figure 1 that many of them (red colour) share municipal borders with the district centers (bright green colour).

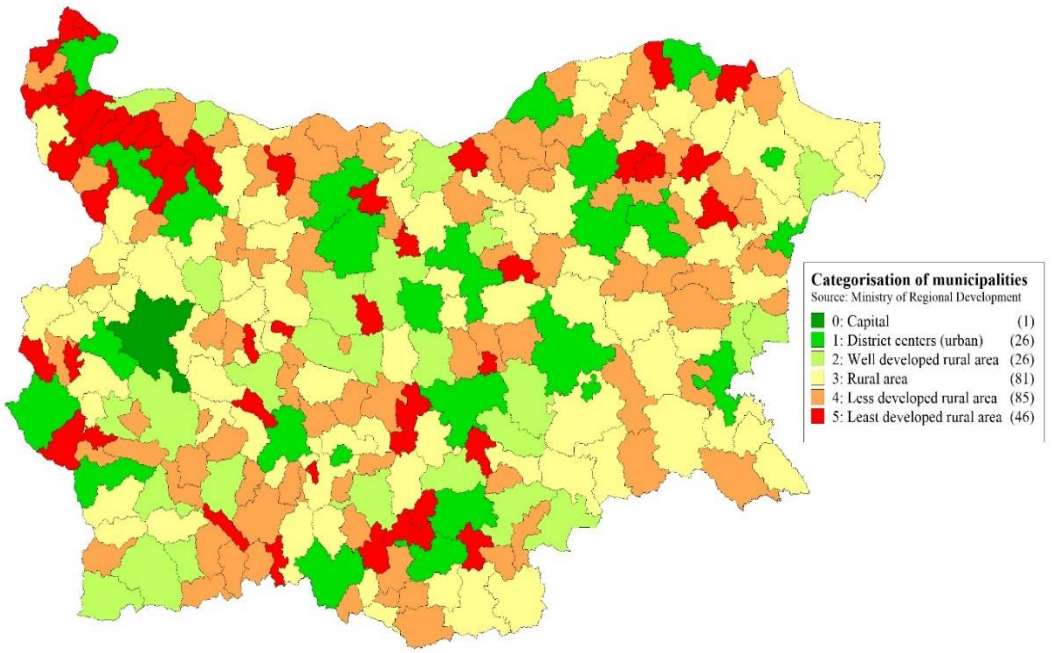

Figure 1. Classification of municipalities in Bulgaria

Source: Author, based on data from the Ekatte, 2022.

Methodological approach

The scope of the analysis covers three aspects of the educational system in peripheral rural areas in the 2012 – 2020 period. First is the population, with a focus on young population (under the age of 15 as reported by the National Statistics Institute, comprising both actual and future students) and population density. The second aspect covers the educational system, represented by the number of schools per municipality, the changes that occurred between 2012 and 2020, and the potential number of students per school. The potential number of students per school is an estimated indicator, calculated by dividing all young people under the age of 15 to the number of schools in the respective year. The final aspect reflects the educational results represented by the results of the national external evaluations in 2021 after the fourth and seventh grade, which measure the level of achievement on maths (MAT) and Bulgarian language and literature (BEL).

The statistical analysis has two steps. [1] Calculation of descriptive statistics for all indicators (Table 1). [2] Comparison of means (independent samples t-test) for the key indicators between the categories of municipalities to identify if there are statistically significant differences.

Table 1. Descriptive statistics of key indicators

Indicator	N	Minimum	Maximum	Mean	Std. Deviation
Population, 2012	264	625	1302316	27593.00	87899.84
Population, 2020	265	768	1308412	26100.18	87694.16
Youth population, 2012	264	32	177568	3969.96	12165.17
Youth population, 2020	265	35	207730	4015.23	14019.07
Population Density, 2020	265	2.9	3354.4	69.233	238.74
Change,Population, 2020 – 2012	264	-32.43	26.15	-7.2040	8.19
Change, Youth, 2020 – 2012	264	-40.54	30.86	-7.1070	10.22
Schools, 2012	264	1	322	10.07	22.19
Schools, 2020	265	1	309	9.16	21.2
Change, schools, 2020 – 2012	264	-66.67	33.33	-9.7297	15.47
Youth/school, 2012	264	25.00	779.00	329.7374	129.81
Youth/school, 2020	265	35.00	1468.00	349.4275	161.17
Change, Youth/school, 20-12	264	-40.54	191.66	6.9967	27.71
BEL7, nvo2021	265	5.67	71.59	39.5236	11.75
MAT7, nvo2021	265	7.94	58.16	27.1346	8.40
BEL4, nvo2021	265	10.00	89.61	60.9815	12.03
MAT4, nvo2021	265	17.33	83.56	52.1021	9.90
Valid N (listwise)	264*				

* Municipality of Satovcha separated from the municipality of Velingrad in 2015, thus the difference in the number of municipalities in 2012 and 2020.

Population and population changes in peripheral rural areas

The peripheral rural areas (category ‘5’ municipalities) cover 9.5% of the national territory and host 2.7% of the population (NSI, 2014, 2022). The share of population under the age of 15 is 2.5. The average number of population within each category of municipalities differs significantly between all categories, both in 2012 and in 2020 (Table 2). This is valid also for the average number of young people per category as well as for the population density. The average population density in the EU is 39 people/sq.km (EC, 2021b). It compares to the density in category ‘3’, while the municipalities in categories ‘4’ and ‘5’ have significantly lower population densities (respectively 32 and 20.5)

The comparison of the population decrease between the categories (‘1’ to ‘5’) shows no statistical significance. All groups of municipalities, with the exception

of the capital city face similar depopulation trend between 2012 and 2020, close to the average for the country – 7.2%.

At the same time, the 2012 – 2020 changes in the number of young people (under the age of 15) register statistical significance between categories '3', '4' and '5' and categories '0' and '1'. In fact, the capital Sofia (category '0') has an increase of 17% of the young people between 2012 and 2020. The district centers (category '1') also register a small increase, while the rest of the municipalities face a reduction in the number of young people. This indicates an ongoing concentration of school age population in the capital city and in the district centers, a trend that differs from the general population reduction across categories '1' to '5'. Unfortunately, youth concentration in urban areas is at the expense of youth decrease in rural areas.

Table 2. Mean values of key population indicators per category of municipality

Category	No.of municipalities	Population			Young population (<15yrs)			Population Density 2020
		2012	2020	%	2012	2020	%	
0	1	1302316.0	1308412.0	.5	177568.0	207730.0	17.0	984.2
1	26	108257.0	102219.0	-7.6	15558.8	16060.5	0.9	343.8
2	26	36190.4	33308.3	-7.3	5276.1	5070.1	-3.9	59.9
3	81	15850.4	14790.4	-7.1	2342.3	2197.9	-7.5	39.5
4	85	8732.5	8213.1	-6.5	1313.1	1208.2	-9.5	32.0
5	46	4454.8	4093.3	-8.5	610.1	569.3	-7.8	20.5
	265	*27593.0*	*26100.2*	*-7.2*	*3970.0*	*4015.2*	*-7.1*	*69.2*

Schools and school changes in peripheral rural areas

The overall number of schools as well as the average number of schools per municipality have decreased across all groups of municipalities (Table 3). Again, there is a significant difference between the number of schools per category of municipality. While the peripheral rural areas (category '5') have on average 2.5 schools per municipality, the more developed rural areas (category '2') have 12, the district centers – 31.3, and the capital city has 309 schools in 2020. However, there is no significant difference in the share of reduced schools since 2012 – minus 9.7% across the all municipalities.

Table 3. Mean values of key school indicators per category of municipality

Category	No.of municipalities	Schools			Young people per school		
		2012	2020	%	2012	2020	%
0	1	322.0	309.0	-4.0	551.5	672.3	21.9
1	26	33.9	31.3	-9.3	430.3	472.3	9.8
2	26	13.5	12.0	-10.5	395.0	424.2	7.8
3	81	7.4	6.7	-9.7	338.6	360.9	7.1
4	85	4.4	4.0	-8.5	329.4	337.3	3.5
5	46	2.9	2.5	-12.0	213.7	233.0	11.1
	265	*10.1*	*9.2*	*-9.7*	*329.7*	*349.4*	*7.0*

At the same time, the average number of young people per school has increased across all categories of municipalities. It is highest in the capital city, despite the highest number of schools there. There is no significant difference in the average number of youth per school in the district centers and in the most developed rural areas, 472.3 and 424.2 respectively. The peripheral rural areas have the lowest average number of youth per school – 233, which is significantly smaller than any other category, and corresponds to the significantly lower number of young people in this group.

Educational results in the peripheral rural areas

The maximum score in all external evaluations, both in 4th and in 7th grades is 100. The mean national results in 2021 are around the middle scores for 4th graders, and significantly lower for 7th graders (Table 4). This points to a national decrease in Students achievements from the 4th to the 7th grade, both in maths (MAT) and in Bulgarian language and literature (BEL). The trend is valid across all categories – '0' to '5'.

Three aspects require special attention. The first one refers to the results for both 4th and 7th graders in the peripheral rural areas, which are significantly lower than the average results in all other groups. This is despite the small number of students per school and the concentration of students in a small number of schools to provide for higher quality of education. The school reform of closing down schools and grouping students does not deliver comparative quality of education in those peripheral rural areas.

The second aspect refers to the results in other three categories of rural areas ('2' to '4'). They are comparable, without significant difference for either 4th or 7th graders. Even if significantly higher than the results in peripheral rural areas and around the national average, they are still very low, and unlikely to deliver on the knowledge and skills required for the workforce of the future.

The highest results and achievement are found in the capital city and the district centers. They are significantly higher than the results in the rural areas and above the national average.

Table 4. Mean values of key education results in 2021 per category of municipality

Category	No.of municipalities	External evaluation 7th grade		External evaluation 4th grade	
		BEL	MAT	BEL	MAT
0	1	59.7	44.0	77.9	66.6
1	26	48.0	32.7	68.7	58.2
2	26	41.6	27.1	63.0	52.8
3	81	40.4	26.8	62.2	52.6
4	85	38.9	27.4	60.3	52.1
5	46	32.9	23.8	54.2	47.0
	265	*39.5*	*27.1*	*61.0*	*52.1*

Conclusions

Peripheral rural areas comprise 46 municipalities, with the lowest development score as calculated by the Ministry of Regional Development. In 2020, the average number of people in these municipalities is just higher than 4000. The young people in peripheral rural areas are on average around 570 per municipality, but there is a municipality with as little as 35 youngsters. The analysed period recorded a 'leak' of young people from rural areas to urban regions and mostly to the capital city, which drains rural areas from their human capital and potential.

Additionally, the closure of rural schools and the ongoing trend of higher quality of education in the 27 biggest cities in Bulgaria paves the way for further relocation and outmigration of families with school age-children from rural to urban areas.

The extremely low educational results in the peripheral rural areas, unmatched in any other rural areas, threatens the capacity for any development that requires skilled and educated workforce.

The Bulgarian policy makers in rural and regional development need to join forces with the education and social policy makers in order to address the extreme internal differences in the educational system and achievements between the peripheral rural areas, rural areas and urban areas. They need to recognise that not all rural areas are the same; and that they have similar but yet specific needs and problems.

If the EU Rural Vision 2040 is to become reality, urgent actions are needed already now, especially in the educational system in the peripheral rural areas.

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Contact person information: Assoc.Prof. Yanka Kazakova-Mateva, PhD, Department Economics of Natural Resources, University of National and World Economy (UNWE), Sofia, y.kazakova@unwe.bg

PERSONAL AGRARIAN EXCHANGE AND UNCERTAINTY

Dimitar Terziev[21], **Mariya Peneva**[22], **Silvia Tomova-Zaharieva**[23]

ПЕРСОНАЛНАТА АГРАРНА РАЗМЯНА И НЕОПРЕДЕЛЕНОСТТА

Димитър Терзиев, Мария Пенева, Силвия Томова-Захариева

Abstract

The last two years (before the war started) was totally dominated by the pandemic. A new virus, no drugs, no treatment, no knowledge on proper administrative measures, various controversial opinions. The result – high level of uncertainty. It was a unique economic situation. Only one factor – uncertainty changed, other remained relatively stable. Something like Economics in a lab. At that time, we started our study on business reactions in high uncertainty. Here we present some results for farming sector. Especially in a case of farmers used mainly personal form of agrarian exchange.

Key words: alternative farmers, personal exchange, uncertainty, governance modes

JEL code: D80, L14. Q12

Introduction

In recent years, we have been conducting research on a particular group of farmers that we called Alternative (Terziev, Radeva, 2016). We defined their economic nature (Terziev, Radeva, 2018) and described their preferred governance modes (Terziev, Zhou, Terziyska and Zhang, 2018). Here, for a better understanding of the text below, we will indicate the business characteristics of these farmers again. They (Terziev, Radeva, 2018):

- are farmers, not followers of modern life style ideas;
- are producers, not just nature keepers and beauty makers;
- are market players, not big but not self-sufficient;
- prefer personal instead of impersonal exchange;
- try to develop exclusive personally designed connection to their clients;
- use intensively unformal institutions – trust and confidence at first place;

[21] Assoc. prof., Research Center Agrobusiness and Nature Use, Department Economics of Natural Resources, UNWE.

[22] Assoc. prof., Department Economics of Natural Resources, UNWE.

[23] Ph.D. student, Department Economics of Natural Resources, UNWE.

- do not believe in government support programs.

Our research over the past three years has pointed to uncertainty as a major problem for these farmers in times of crisis, in this case a pandemic:

- for achieving resilience (Terziev, Bachev, 2021);
- for increasing competitiveness (Terziev, 2022).

Our research so far on the competitiveness of alternative farmers concluded with the following (ibid.): *Clearly, some farms have advantages over others. Here we call them prosperous, which is another way of indicating their high competitiveness. The factors behind their success are varied. We will continue and deepen our research. However, several conclusions can be formulated today:*

- competitiveness is related to transactional innovation;
- organizational ones are easier and faster than institutional ones;
- uncertainty, in the current situation, is the same for everyone and does not depend on the level of competitiveness;
- with high uncertainty, traditional informal institutions are the preferred means of dealing with emerging problems.

Moving forward, the goals of this paper are:

- to clarify, more thoroughly, from a theoretical point of view, the role of uncertainty in personal exchange;
- to present and try to explain the reactions of Bulgarian alternative farmers in a situation of high uncertainty.

Personal exchange in economic theory

In 1776 Adam Smith wrote: *In civilized society [one] stands at all times in need of the co-operation and assistance of great multitudes, while his whole life is scarce sufficient to gain the friendship of a few persons* (Smith, 1776, Book 1, Ch. 1, I. ii, p22). Thus began the tradition of economic science being exclusively interested in the impersonal, anonymous exchange and ignoring that between just of *few persons*. For traditional economic theory (the neoclassical school), exchange is an automatic, guaranteed-to-happen process (supply and demand always meet somewhere). Towards the middle of the last century, ideas began to appear and develop, describing the exchange as a personal act (therefore – difficult, expensive and often not happening). Such are the views on the existence of transaction cost, bounded rationality, asymmetric distribution of information, behavioral characteristics of economic agents, and others. Gradually, they were all united by the school of New Institutional Economics (NIE) into a comprehensive model for economic analysis. In our research we use the achievements of this school[24].

[24] Sociology was the first to leave the world of impersonal exchange (Social Exchange Theory). It was followed by a number of economic schools and theories – Experimental Economics, Business Culture, Law and Economics, and etc.

The distinction between personal and impersonal exchange is of essential theoretical and methodological importance (North, 1990). Personal is driven by informal institutions – confidence, trust, behavioral codes. Formal institutions underlie impersonal exchange – legislation, regulation, organizations. That is why the research approach in both cases is different.

The economic situation in the last almost three years has been unique. For impersonal exchange, nothing changed – supply chains were not interrupted, big stores were open, inflation and unemployment were low, incomes were stable[25], i.e. supply and demand were not significantly negatively affected by the pandemic.

The picture was different with the personal exchange. Unpredictable and of arbitrary duration travel bans and restrictions on the operation of markets and small shops were imposed. A fear of personal contacts appeared. Namely, alternative farmers rely on them – for their supply transactions (labor, seeds, various adding) as well as for their output (marketing) transactions (Terziev, 2022). Thus uncertainty settled into the world of agrarian personal exchange.

Business decisions in crisis

Crises are a constant companion of economic development. That is why economic theory has been dealing with them for a long time. The reasons for their appearance and their course, as well as the reactions and actions of economic agents in such a situation, have been studied. In the agricultural sector, well known decisions are:

- public private partnership (Marbaniang at all, 2020) – work in public parks and gardens (Build-operate-transfer), cleaning and maintenance of the street and road network (Operational/service management contracts), food supply to municipal organizations (Joint ventures), organized markets (Space and facilities leasing), ecosystem services (Build-operate-own) and disaster relief (Informal public-private co-operation);
- polycentric governance initiatives (Ostrom, 2010) – safety food movements, agri-technologies innovations, nature-based educations, agri tourism;
- Community (Complementary) Currency. This is mechanism in which individuals (mainly), businesses (sometime) and local authorities (rarer) voluntary create and use self-established and self-regulated currency in order to isolate themselves from downturns of general economy (Gómez, 2010). It was an exotic idea for a long period of time but today we fount such schemes in more than sixty countries. They are popular and effective namely in rural areas;

[25] All this has changed dramatically in recent months. But the reason is different, not the pandemic.

- other (popular not only in agriculture) – organizational (mergers and alliances), contractual (various type of contracts), social (festivals, fairs, holydays), and etc.

Missing formal agri-governance innovations

All of respondents in our study declared that the last two years have been difficult – broken contacts, decreased number of customers visits, downward income. But our investigation during 2022 year (including an intensive field study) did not find even one case of business decisions of the types mentioned above with Bulgarian alternative farmers relying on personal exchange. Interesting were they answers (Table 1) on the question Why you do not apply … (business forms mentioned above)?

Table 1. Reasons to not apply various business forms

Business forms	Main reasons to not apply	% of all respondents
Public private partnership (various type)	Complicated procedures High cost No guarantees for success Corruption Dislike of this form	100 80 50 70 90
Polycentric governance initiatives (various types)	Broken contacts Lack of partners Low personal initiative	60 80 60
Community Currency	No knowledge No partners	100 100
Organizational	No experience Lack of partners	50 80
Contractual	Negative experience Dislike of this form	80 80
Social	Interrupted initiatives Low results	70 90

Source: authors investigation.

It is obvious that in the situation of high uncertainty Bulgarian alternative farmers are:

- not able – complicated procedures, high cost, lack of partners and knowledge;
- not ready – corruption, broken contacts, no or negative experience;
- unwilling – dislike this form, low personal initiative, to apply such business decisions. It does not mean that they are passive. Just the opposite – all of them (100%) declare their strong efforts for using of various modes to

govern their transactions, but only of market type. They try to renew their former business contacts and establish new, to participate in e-commers and distance delivery, to develop direct marketing and etc.

Economic reasoning

Our study was carried out based on Discrete Structural Analysis (DSA) which is the main NIE methodological approach. Emphasizing exchange as a personal act, DSA points to uncertainty as its main critical dimension, along with asset specificity and frequency (Williamson, 1996). These three factors act together with a few others and define a proper mode for various transactions. But each of them has its own separate way of influence. Generally speaking, uncertainty (no or low ability to predict the future) excludes contractual forms (developing good enough contracts is impossible). Two are the possible directions for searching of effective organization of transactions – market or internal organization. In this logic:

- the fact that Bulgarian alternative farmers in situation of high uncertainty intensively use market mode is understandable. Even the market is not perfect it gives the farmers a chance to sell their products and to save on transaction cost. Some help is needed of course – strong personal contact, positive reputation, good references;
- more hardly to explain is the refusal of organizational modernization. A part of relationships of these farmers are business-to-client and there is no sense of any integration (division of labor is more effective). For the other (business-to-business) the reason has to be search in psychological direction. Bulgarian alternative farmers (as the most of Bulgarian people) are individualistic. They do not like and have no experience in collective action and cooperation.

Conclusion

There is a widespread perception of personal exchange as a long-gone stage in the economic development of human society. But recent years (decades in developed countries) show a different picture. More and more people prefer a personal exchange when it comes to food, prestigious restaurants list the names of the suppliers on their menus, large retail chains describe in details the producers they work with in their brochures, and etc. Of course, modern personal exchange is not the same as it was centuries ago. But it is always distinct from anonymous, impersonal exchange.

Studying the work of people who actually apply it is the best approach to understanding it and creating mechanisms to support it. This type of research is not easy. Farmers hardly agree to discuss their business activities in detail. But there is no other way in order to see the real picture, not to transfer automatically models from other countries and economic situations. We were surprised to see rejected some of

our expectations from the previous stages of our project – organizational modernization for example.

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Contact person information: Assoc. prof. Dimitar Terziev, Research Center Agrobusiness and Nature Use, Department Economics of Natural Resources, UNWE, e-mail: dterziev@unwe.bg

ALTERNATIVE TOURISM – AN OPPORTUNITY FOR SUSTAINABLE GROWTH IN RURAL TERRITORIES[26]

Pavlin Pavlov[27]

АЛТЕРНАТИВНИЯТ ТУРИЗЪМ – ВЪЗМОЖНОСТ ЗА УСТОЙЧИВ РАСТЕЖ В СЕЛСКИТЕ ТЕРИТОРИИ

Павлин Павлов

Abstract

Alternative forms of tourism, given Bulgaria's rich tourist resources, provide an opportunity for sustainable growth in rural territories. This is of particular importance for the economically less developed. It is with them that it is necessary to use and develop the available tourist resources, with a view to profiting not only from the activities typical of rural territories (agriculture and animal husbandry). In this context, the aim of this article is to present the economic role of tourism for the development of rural territories in Bulgaria.

Key words: alternative tourism, rural territories, sustainable development

JEL: L83, R58

According to the national definition formulated for the purposes of the rural development policy, they cover 80% of the territory and nearly 40% of the population of Bulgaria (Ministry of Agriculture and Foods, 2014). According to Bulgaria – Rural Development Program 2014 – 2020 as "rural areas" are defined as municipalities in which there is no inhabited place with a population of more than 30,000 people. The publication is based on the understanding that the rural territory is part of the territory of each specific planning area, in which not only agricultural production is carried out, but also other economic activities (for example, alternative tourism) that are inextricably linked to the sustainable development of the entire territory.

The main part of the land resources, settlements, socio-economic, infrastructural and other potentials of the country are concentrated in the rural territories. On the other hand, rural areas are characterized by worse demographic, social and economic indicators compared to other territories of the country. There is an increasing need for diversification of the economic base in rural areas, which is among the

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[27] Head Assistant Prof. Pavlin Pavlov, PhD, DA Tsenov Academy of Economics.

main factors for their socio-economic growth in the direction of sustainability. Rural tourism is seen as a means of achieving this development due to its ability to generate local employment and stimulate external investment in communities (Giannakis, 2014). The development of tourism and its accompanying activities in rural areas stimulate entrepreneurial activity, which leads that sustainable socio-economic development (Nikolova, 2012). In this context, the aim of this article is to present the economic role of tourism for the development of rural areas in Bulgaria.

According to data from the Association of Bulgarian Villages (ABV), in 2018, compared to 2017, there was an increase in the employment of rural tourism sites in Bulgaria. However, this does not apply to all rural areas. Northwest Bulgaria has the weakest tourist interest. This implies making more efforts by all interested parties for the development of rural tourism in the rural areas of Bulgaria.

Rural tourism is characterized by stays in a rural environment, contact with the hosts, access to the farm (Bulgarian Association for Alternative Tourism, 2022). Also, characteristic is that this is a type of tourism that is practiced outside the large urbanized areas, the massively visited large tourist centers (Nikolova, 2017). It gives tourists the opportunity to get to know the local traditions, way of life and culture, local cuisine, etc. Rural tourism can be combined with agrotourism, ecotourism, hunting tourism, wine tourism, etc. The conditions in most of the rural areas of Bulgaria allow rural tourism to develop qualitatively and dynamically, both independently and in combination with other types of mass and alternative tourism. The most important resources available to our country for the development of rural tourism can be systematized as follows (Ministry of Tourism, 2014):

- a wealth of preserved authentic traditions throughout the country;
- hospitable population;
- rich local cuisine with local ecological products;
- preserved folklore, customs and crafts;
- presence of settlements architectural reserves;
- accommodation base throughout the country.

The socio-economic importance of alternative tourism for the development of rural areas in Bulgaria is determined by the entrepreneurial initiative of local entrepreneurs and the availability of accommodation. This is important because overnight stays mean more income for the local population. The diversification of activities in rural areas through the development of tourism is an opportunity for economic progress for the population of rural territories (Nikolova, Pavlov, 2021). In practice, there is a synergistic effect, expressed in the multiplication of the benefits of tourism for rural areas. Revenues are realized not only from one-day visits, but also from overnight stays for longer-term ones.

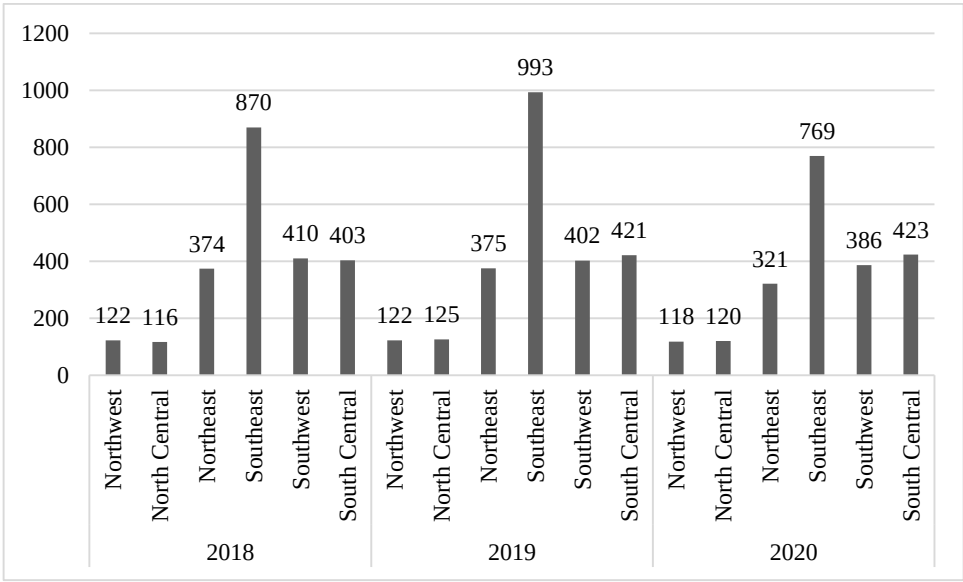

Figure 1. Number of accommodation establishments in rural areas by statistical regions during 2018 – 2020 period

Source: National Statistical Institute (NSI, 2022) and own calculations.

Figure 1 shows the number of accommodation places in rural areas in Bulgaria for a three-year period (2018 – 2020). The analysis of this particular period gives a clear idea of the fluctuations in the indicators related to the places of accommodation in the rural areas, before the onset of the pandemic (COVID-19) and during its action in 2020. It is noted that in the Northwest region no change in 2019 compared to 2018. In North Central region there was an increase of 7.76% as well as in Northeast with 0.27 %. In Southeast region, which has many natural conditions and resources for the development of agriculture and tourism, accommodation places increased by 14.14%. At Southcentral there was also an increase of 4.47%. Southwest only stands out with a decrease of -1.95%. In 2020, compared to 2019, a decrease in accommodation was observed in all rural areas – Northwest -3.28%, North Central -4.00%, Northeast -14.40%, Southeast – 22.56%, Southwest -3.98 %. This is due to travel restrictions related to the COVID-19 pandemic. This reflects on the activity of the whole tourist business and in particular the accommodation places in the country (Pavlov, 2021). South Central region only marked a minimal positive growth of 0.48%. According to expert opinions, it is expected that the negative trends from 2020 will be overcome after the pandemic subsides and positive growth will be achieved again.

Main indicators related to the development of rural tourism are measurable through:

- bed-places – number;

- bed-nights – number;
- room capacity – number;
- nights spent – number;
- visitors for a night and over – number.

Tables 1 and 2 presents the above indicators for the development of tourism in rural areas in Bulgaria for the period 2018 – 2020. Emphasis is placed on their change compared to the previous year, i.e. 2019 vs. 2018, 2020 vs. 2019.

Table 1. Indicators of tourism development in rural areas by statistical regions, during 2018 – 2020 period (bed-places – number; bed-nights – number; room capacity – number)

Year	Statistical regions	Bed-places – number	% change compared to the previous year	Bed-nights – number	% change compared to the previous year	Room capacity – number	% change compared to the previous year
2018	Northwest	5421	-	1697821	-	2587	-
	North Central	4504	-	1326513	-	2126	-
	Northeast	42072	-	6808779	-	16801	-
	Southeast	129013	-	17855547	-	50948	-
	Southwest	27992	-	7978147	-	12421	-
	South Central	18723	-	5822230	-	8908	-
Total for 2018		227725	-	41489037	-	93791	-
2019	Northwest	5225	-3.62%	1634556	-3.73%	2507	-3.09%
	North Central	4691	4.15%	1378979	3.96%	2233	5.03%
	Northeast	41320	-1.79%	6621992	-2.74%	16571	-1.37%
	Southeast	132867	2.99%	18458832	3.38%	54497	6.97%
	Southwest	27804	-0.67%	7975626	-0.03%	12363	-0.47%
	South Central	19920	6.39%	5917508	1.64%	9433	5.89%

Total for 2019		231827	1.80%	41987493	1.20%	97604	4.07%
2020	Northwest	5201	-0.46%	1327284	-18.80%	2450	-2.27%
	North Central	4504	-3.99%	1108051	-19.65%	2161	-3.22%
	Northeast	30592	-25.96%	3812205	-42.43%	13259	-19.99%
	Southeast	97977	-26.26%	10393774	-43.69%	40895	-24.96%
	Southwest	27132	-2.42%	5832748	-26.87%	12166	-1.59%
	South Central	19901	-0.10%	4622753	-21.88%	9344	-0.94%
Total for 2020		185307	-20.07%	27096815	-35.46%	80275	-17.75%

Source: National Statistical Institute (NSI, 2022) and own calculations.

Table 2. Indicators of tourism development in rural areas by statistical regions, during 2018 – 2020 period (nights spent – number; visitors for a night and over – number)

Year	**Statistical regions**	**Nights spent – number**	**% change compared to the previous year**	**Visitors for a night and over – number**	**% change compared to the previous year**
2018	Northwest	297338	-	143532	-
	North Central	190226	-	98728	-
	Northeast	2846453	-	575797	-
	Southeast	9394557	-	1607469	-
	Southwest	2147261	-	867584	-
	South Central	1635437	-	674714	-
Total for 2018		16511272	-	3967824	-
2019	Northwest	318582	7.14%	149839	4.39%
	North Central	202412	6.41%	111044	12.47%
	Northeast	2729913	-4.09%	567394	-1.46%
	Southeast	9896991	5.35%	1764909	9.79%
	Southwest	2125145	-1.03%	907429	4.59%
	South Central	1767494	8.07%	744399	10.33%

Total for 2019		17040537	3.21%	4245014	6.99%
2020	Northwest	230570	-27.63%	98410	-34.32%
	North Central	122793	-39.34%	63703	-42.63%
	Northeast	1037853	-61.98%	279138	-50.80%
	Southeast	3527036	-64.36%	783731	-55.59%
	Southwest	1368897	-35.59%	508396	-43.97%
	South Central	1244043	-29.62%	516755	-30.58%
Total for 2020		7531192	-55.80%	2250133	-46.99%

Source: National Statistical Institute (NSI, 2022) and own calculations.

Tables 1 and 2 shows the growing number of overnight stays with 3.21% on an overall basis for 2019 compared to 2018, which is an indicator of growing interest in tourism services offered in rural areas. There was also an increase in the number of visitors who stayed overnight one or more times by 6.99 %. The most serious growth according to this indicator is observed in North Central with 12.47% and South Central with 10.33%. In all indicators for 2020 compared to 2019, due to the restrictions of COVID-19, there is a drastic decrease. On a general basis for 2020 compared to 2019, the drop in the number of overnight stays is -55.80%. It is assumed that the end of the pandemic will gradually restore the positive values of the indicators in Tables 1 and 2.

A financial measure of the importance of alternative tourism (individually or in combination) for sustainable growth in rural areas is revenue from overnight stays. These are presented in figure 2 for the period 2018 – 2020.

Revenues from overnight stays in rural areas for 2019 compared to 2018 showed positive growth (Figure 2). The largest increases were in South Central (20.10%) and Northwest (14.11%). Accordingly, in Southeast 8.75%, North Central 8.08%, Southwest 5.77%. Since the revenues are in direct relation with the places for overnight stays and the indicators presented in table 1, the significant decrease in their size in 2020 compared to 2019 inevitably stands out. The biggest decrease is in North Central (-66.77%), Southeast (-66.36%) and Northeast (-55.82%). Here, according to expert assessments, the gradual return of the sustainable growth of rural areas through alternative tourism is also expected.

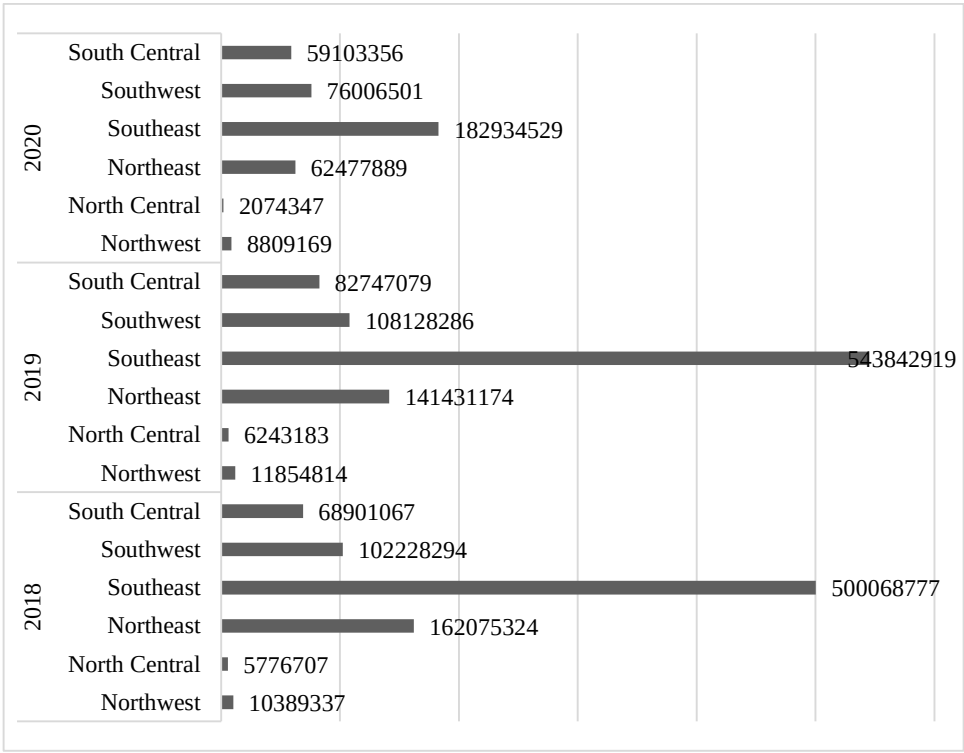

Figure 2. Revenues from nights spent in rural areas by statistical regions during 2018 – 2020 period, BGN

Source: National Statistical Institute (NSI, 2022) and own calculations.

In conclusion, it can be said that alternative tourism enables the sustainable development of rural territories, through the diversification of economic activities. It helps to improve the deteriorated demographic, social and economic indicators compared to the rest of the country's territories. There is a negative trend in 2020 as a result of COVID-19. However, this is a force majeure that can be overcome after the end of the pandemic. Respectively, according to expert assessments, the sustainable growth of rural areas will continue, through alternative tourism (independently and combined). In order to increase the contribution of tourism and strengthen growth in the direction of sustainability of rural territories, it is necessary to continuously improve the infrastructure and superstructure, to create and renovate accommodation, as well as tourist services. To achieve the desired vision, targeted government support, local entrepreneurial initiatives and the search for opportunities to "renovate" rural reality into attractive places to live, provoking visitor interest, are needed.

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Contact person information: Head Assistant. Prof. Pavlin Pavlov, PhD, DA Tsenov Academy of Economics – Svishtov, p.pavlov@uni-svishtov.bg

DEMOGRAPHIC PROCESSES AND PROBLEMS IN RURAL AREAS OF POLAND AND BULGARIA

Julia Doitchinova[28], Agnieszka Wrzochalska[29]

ДЕМОГРАФСКИ ПРОЦЕСИ И ПРОБЛЕМИ В СЕЛСКИТЕ РАЙОНИ НА ПОЛША И БЪЛГАРИЯ

Юлия Дойчинова, Агниешка Вжохалска

Abstract

This report aims to analyse and assess the trends in the development of demographic processes in rural areas of Poland and Bulgaria and their consequences which affect the development of the rural areas. Trends in the demographic processes in rural areas in 2010 – 2021 were analysed and assessed. Different coefficients of demographic replacement and trends in their changes were established. On this base, comparisons between were made and conclusions about the worsening of the demographic structures and the possibilities for the development of the local economies and communities in both countries were made.

Key words: demographic processes, coefficients of demographic dependence, coefficient of demographic replacement

JEL: J 10; J 11; J 14

Introduction

Poland and Bulgaria's accession to the European Union led to significant changes in all aspects of economic life and society. The largest part of the transformations are alike with similar directions and dimensions in the other new EU member countries. At the same time, the national peculiarities of the social and economic relationships, traditions etc. affect not only the speed but in some cases they also affect the directions of the transformations regardless of the implemented common agriculture politics.

In the new member states, changes are observed in the number of inhabitants and in the relative share of the population in rural areas. Researchers of rural areas (Brown, Argent, 2016) link the negative effect not only to population loss, but to the impact on rural society and economy. These changes lead to spiralling effects and severe negative consequences for the transformation of communities and the formation regional identity (Emery, Flora, 2006). A study of the significance of

[28] Professor, DSc (econ), University of National and World Economy, Sofia.

[29] Professor, DSc (econ), Institute of Agricultural and Food economy – National Research Institute, Warsaw.

demographic changes in rural areas in Austria links them to potential regional development approaches to overcome the negative consequences of population loss (Dax, Fischer, 2017). These approaches are logically derived from the concepts of rural areas development which are aimed at using the specific local assets and presenting the diversity of regions as a valuable characteristic (Dax, 2016).

Depopulation worsens the conditions for rural development when local markets shrink and skilled talent workers are insufficient to develop rural industries (Wood, 2008; Carr and Kefalas, 2009; Karwat-Woźniak 2022). This causes a vicious cycle of declining local economies and depopulation that coexist and reinforce each other.

In communities that have successfully renewed their local industries, adapting them to market demand (Westlund and Kobayashi, 2013), transformations of social management, cooperation between different interested persons in accordance with common values and attitudes are observed. Local social capital is a prerequisite for establishing effective interactions with the external environment, access to financial and political capital that improves the results of the development (Li et al., 2016; Fukuyama, 2003).

Demographic processes and their role in the development of rural areas are the focus of research interest of economists (Mitova, 2018; Wasilewski, 2022), regionalists, sociologists, etc. A number of studies are devoted to the characteristics and changes of human capital (Wrzochalska, 2015; Wrzochalska 2022), the educational and social infrastructure in rural areas, the model of agriculture and its effects, the speed of demographic changes (Doitchinova et al., 2017; Doitchinova, Miteva, 2020). Regardless of the methodological approaches adopted, the conclusions of a number of studies lead to the conclusion that the way in which the evolution of rural areas takes place depends on the capacity of rural communities, i.e. from their responses to external changes by adapting the functions and structure of their internal components. In this context, the research question is what demographic processes have occurred in rural areas of Poland and Bulgaria and how these changes affect the capacity of rural communities to develop viable rural areas. This also determines the aim of the report to analyse and assess the trends in the development of demographic processes in the rural areas of Poland and Bulgaria and the consequences for the development of rural areas.

Methodological framework

The object of research are the demographic processes in the rural areas, and the subject is the changes in the number of the population, its qualitative characteristics, structures and the consequences for the development of the rural areas.

In this article, we use indicators to assess the demographic situation and development for the period 2010 – 2021, to assess changes in the number of the population; the age structure of the population; the demographic replacement coefficient; age dependence coefficients; their projected changes, etc.

The information used is from the national statistical institutes of Poland and Bulgaria and Eurostatistics.

Analysis of changes in demographic structures and processes in Poland and Bulgaria

In 2021, rural residents accounted for 40.2% of Poland's total population. In recent years (i.e. since 2010), the number of people in rural areas has increased by 1.5 percent, and according to GUS data, in 2021, nearly 15.4 million people live in rural areas. Throughout the analysed period, a gradual decrease in the number of urban residents was observed, while at the same time the number of people living in rural areas, located mainly around large urbanized areas, has been increasing.

In Bulgaria, 37.7% of the country's total population live in rural areas, including 26.73% in villages. Compared to 2010, their number decreased by 290.2 thousand people or by 13.5 percent against 6.8 percent for the population in cities. The relative share of rural residents has also decreased – by 1.25 percent for the studied period.

Changes in the total population and the rural population are shown in Figure 1, taking 2010 as the base. The data show that the total population in Poland decreased by 0.45 percent, while in rural areas it increased by 1.51 percent.

In Bulgaria, the total number of the population decreased by 8.71 percent, and in the villages the decrease is even greater – by 13.68 percent.

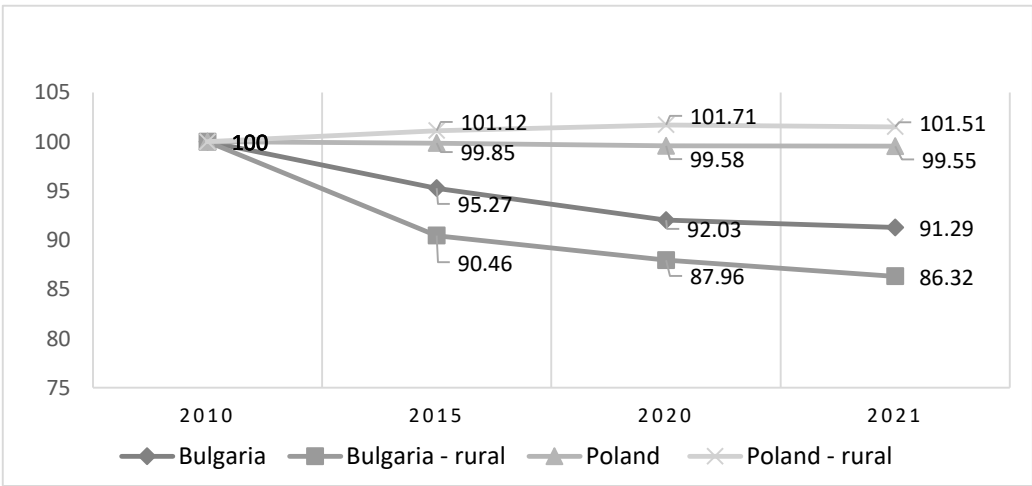

Figure 1. Changes in the total population and in rural areas of Poland and Bulgaria

Sources: National Statistical Institute of Bulgaria, 2022; Central Statistical Office of Poland

In 2010 – 2021, rural areas in Poland were characterized by relatively better demographic indicators than those in cities, mainly in terms of the age structure of the inhabitants. The percentage of population of pre-working age and working age is higher (0-14 years) than in cities, respectively the share of the group of population of post-working age (over 65 years) is lower. As a result, in rural areas the number of people of non-working age per 100 people of working age is lower than in cities, and the ratio of people over 65 to the number of children and adolescents is better. This is proven by the more favourable size of the studied demographic indicators. However, it should be emphasized that during the analysed period there was an annual population decline in the first two groups. Only the number of people in the post-working age group is increasing. As a result, the relative share of the working-age population decreases by 1.8 percent (Figure 2).

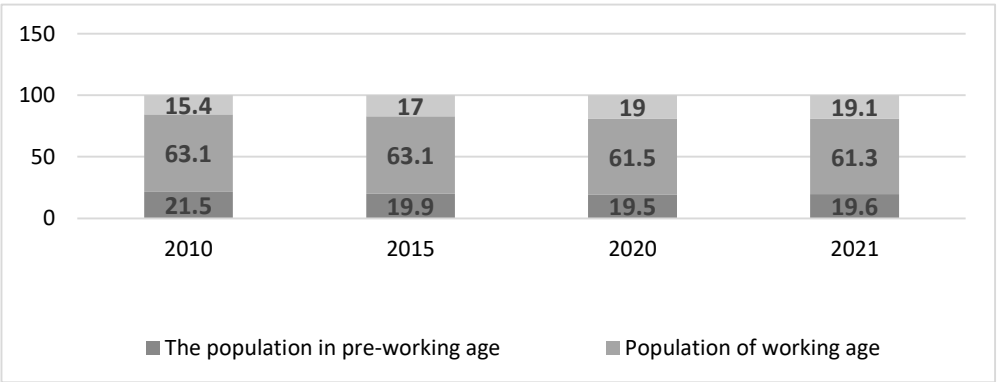

Figure 2. Age structure of the population in rural areas in Poland for the period 2010 – 2021

Source: Central Statistical Office of Poland, 2022.

The age structure of the population in the rural areas of Bulgaria is less favourable, both in comparison with the cities and with the rural areas of Poland. It has a significantly higher relative share of the population of post-working age, and for the studied period it increased by 0.7 percent. In 2010 there were 25.71% of people in the last age group, and in 2021 they reached 26.43% which is respectively 10.3 and 7.3 percent more than the similar indicators in Poland.

The relative share of the population in pre-working age is low. For the entire time period, it lies within 13.06% (2010) and 13.21% (2021). These values determine the tendency towards a decrease of people of active working age by 0.86 percent.

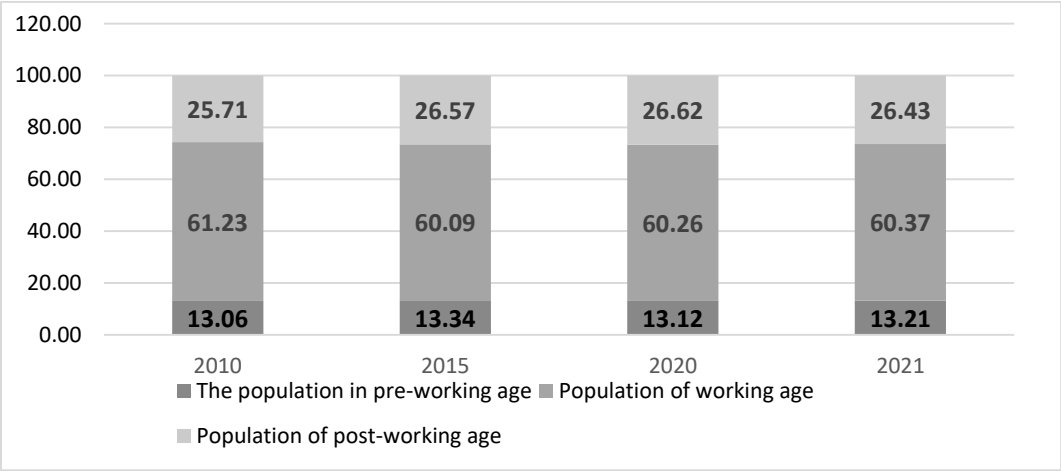

Figure 3. Age structure of the population in rural areas in Bulgaria (2010 – 2021)

Source: National Statistical Institute of Bulgaria, 2022.

The aging of the population is expressed by the increase in the percentage of elderly people while the percentage of children is decreasing. During the analysed period, the percentage of elderly people in rural areas in Poland and in Bulgaria gradually increased. In the rural areas of Poland, the percentage of people over 65 was 19.1% in 2021 and, compared to 2010, it increased by almost 5 percent. In Bulgaria, the relative share of the population over 65 in villages is 26.43%, and compared to 2010, it had increased by 0.7 percent.

Comparative analysis and prognosis

Comparisons between the information in Figure 2 and Figure 3 show the changing shapes of the age structures. In the information about the population of Poland we still observe an approximate parity of inhabitants of pre-working and post-working age, but in Bulgaria the relative share of the population up to 15 years is twice lower than that of the population over 65 years. This shows the significantly more unfavourable situation in the country in 2021.

Table 1 shows some basic indicators of age ratios in the two countries. In general, they show less favourable values in Bulgaria, where the values of the demographic replacement coefficients are lower, and the other age dependence coefficients are higher for the coefficients for the importance of the population of post-working age.

Table 1. Changes in demographic coefficients

Indicators and years	Demographic replacement rate		Coefficients of age dependence					
			Population of post-working age per 100 people at pre-working age		Pre-working age population per 100 people of working age		Population of post-working age per 100 people of working age	
	Poland	Bulgaria	Poland	Bulgaria	Poland	Bulgaria	Poland	Bulgaria
2010	53	70	100	141	26	21	27	42,0
2015	61	61	121	146	27	22	34	44,2
2020	72	62	140	151	30	22	42	44,2
2021	72	63	142	151	30	23	43	43,8

Source: own calculations.

Table 2 shows the differences in trends and the value of changes for the studied period. For some of the indicators (3 out of a total of 7) there are opposite trends. This refers to the number of rural residents, the change in the population of pre-working age and the demographic replacement rate.

Table 2. Differences in the main demographic characteristics of the rural population in Bulgaria and Poland

Indicators	Trends and changes (2021 compared to 2010)	
	Poland	Bulgaria
1. Changes in population	-0,45	-8,71
2. Changes in the population in rural areas	+1,51	-13,5
3. Changes in the number of pre-working age population in villages	-0,9	+0,15
4. Changes in the number of working-age population in villages	-1,8	-0,86
5. Changes in the population of post-working age in villages	+4,7	+0,72
6. Demographic replacement rate	+19	-7
7. Changes in age dependence coefficients		
A) Changes in the number of the population of post-working age per 100 people of pre-working age	+42	+10
B) Changes in the number of the population of pre-working age per 100 people of working age	+4	+2
C) Changes in the number of the population of post-working age per 100 people of working age	+16	+1,8

Source: own calculations.

The most significant are the differences in the values of indicators for population changes. While the population in the rural areas of Poland is increasing, it is decreasing in Bulgaria (by a double-digit number). The demographic replacement rate

also changed differently – in Poland it increased by 19 percent, while in Bulgaria it decreased by 7 percent.

The total number of the population is decreasing in both countries, but while in Poland this decrease is below 0.5%, in Bulgaria it is 8.71%. The remaining indicators, where the trends are unidirectional, have higher values in Poland compared to Bulgaria. The relative shares of the population of pre-working and post-working age and the corresponding age dependency ratios are increasing faster in Poland.

Population aging, according to accepted definitions, means an increase in the percentage of elderly people while a decrease in the percentage of children. In rural areas in Poland and in Bulgaria, the percentage of elderly people gradually increased during the analysed period. In the rural areas, the percentage of people over 65 in 2021 is 19.1%, and compared to 2010, it has increased by almost 5 percent.

According to data from the Central Statistical Office of Poland, in the coming years the population in Poland will decrease and in 2040 it will reach 35,668 million inhabitants, i.e. according to the forecast from 2021, it will decrease by nearly 2.5 million inhabitants (GUS, 2014). Population decline will be observed primarily in urbanized areas in the number of residents of working-age. At the same time, the number of people of retirement age will increase in both urban and rural areas, thus continuing the process of population aging. Already in 2030, 26.3% of the population in rural areas and 31.0% of the population in urban areas will be over 60 years old. In 2040, these indicators will be even more unfavourable.

The trend of decreasing population in Bulgaria continues. By 2040, it will be 5.359 million people, taking into account the current trends of change. The rates of reduction will increase significantly after 2030 and will reach between 16% in the optimistic scenario and 27% in the pessimistic scenario. According to the authors of the prognosis (Ilieva, Bardarov, 2021), the most probable option is the one between the tendentious and pessimistic options, which means that in the next 20 years the population of Bulgaria is expected to decrease by nearly a quarter.

Another alarming trend is the increase in the number of villages that will be completely depopulated. In the structure of villages in 2011, settlements without population were 4.4%, and in 2040, they will be nearly 25% of settlements in Bulgaria. Another expected alarming trend is the decrease of the number of villages with more than 1000 residents. Their share of 10.9% in 2011 will drop by almost half to 5.04% in 2040.

Conclusions

Population decline, unfavourable trends in demographic indicators are characteristic of developed countries in recent decades. They are more pronounced in rural areas where some territories are already defined as "demographic deserts" with low population density (Ilieva, Bardarov, 2021).

Demographic processes lead to many challenges for the countries (and especially for Bulgaria) connected to the availability and accessibility of various types of social and administrative services, the construction of an efficient transport network which can guarantee quick access to them, the creation of incentives for entrepreneurial activity etc.

Regardless of the relatively better demographic indicators in the rural areas of Poland, in both countries the opportunities for the activation of rural communities are decreasing, especially in border areas and territories far from large towns. In a number of municipalities and voivodeships, the necessary critical mass of interested parties – local residents, entrepreneurs, representatives of local authorities and organizations which can develop, apply for and implement strategies for local development does not exist. This necessitates cooperation between interested parties from several neighbouring territories, increases controversial decisions on development priorities and on the use of financial resources. Practically, the creation of local capacity for the implementation of projects with European funding among the beneficiaries of local communities becomes an essential condition for the activation of local communities and for the implementation of a number of initiatives to dynamize the development of the local economy and improve the quality of life of rural residents.

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Contact person information: Prof. Julia Doitchinova, DSc, University of National and World Economy, Sofia. e-mail: juliadoj@unwe.bg

RELATIONSHIP BETWEEN SALARY AND ECONOMIC DEVELOPMENT IN THE AGRICULTURAL SECTOR IN BULGARIA

Tsvetana Harizanova-Metodieva[30],
Hristina Harizanova-Bartos[31]

ВРЪЗКА МЕЖДУ ЗАПЛАТА И ИКОНОМИЧЕСКО РАЗВИТИЕ В АГРАРНИЯ СЕКТОР В БЪЛГАРИЯ

Цветана Харизанова-Методиева,
Христина Харизанова-Бартос

Abstract

The aim of the study was to analyze the relationship between salary and economic development in the agricultural sector in Bulgaria. The following statistics, concerning the agricultural sector, were used: average annual wages and salaries of the employees under labour contract; employed persons; Gross Value Added; expenditure on acquisition of tangible fixed assets and other subsidies on production. Correlation coefficients were calculated for the primary data and for the first, second and third differences. A regression model was developed and it showed that the average annual salaries in agriculture could be explained to some degree by its value in the previous period. The increases in the subsidies and in the investments significantly push salaries up, and vice versa.

Key words: salaries in agriculture; employed persons; investments in agriculture; correlations; regression model

JEL: Q10, C32

Introduction:

Agricultural sector in Bulgaria forms about 4.3% of Total Gross Value Added in Bulgaria in 2021 and provides employment for 6.3% of employed persons in the country. At the same time, wages in agriculture are about 29% lower than the national average (NSI).

Wages are an important source of income for households in Bulgaria. It has been found (Kolev and Tsoklinova, 2017) that the amount of GDP is influenced by the annual income of households, the inflation rate and interest rates on consumer loans.

[30] Assoc. prof., Institute of Animal Science – Kostinbrod, Agricultural Academy – Sofia, Bulgaria, ts_harizanova@abv.bg

[31] Assoc. prof., University of National and World Economy – Sofia, Bulgaria, h.harizanova@gmail.com

Also, the amount of remuneration is an important motive for changing jobs by employees (Petkova, 2020). The financial motive is important, but not the only factor for the motivation of the majority of people (Сюлча, 2020).

Wages in the agricultural sector are the subject of research by a number of authors. Gospodinova (2020) finds that wages in the agricultural sector in Bulgaria are growing faster than the rate of change in labour productivity. According to Atanasov and Georgiev (2013) the remuneration of labour must be consistent with the quantity and quality of work, the length of the working day, qualifications and others. The object of study (Kalchev, 2020) are also the features of taxation of income from agricultural activity of individuals.

The investment process in the Bulgarian agriculture is also of interest. According to a study, held by Uzunova-Kostova (2012), investing in the agricultural sector is associated with high risk and limited opportunities to minimize it. But on the other hand, it has been found (Anastasova-Chopeva, 2020) that since 2007 investment activity in the agricultural sector has shown a steady upward trend. As a consequence of some factors, such as market risk, limited access to land, lower labour productivity, low return on investments and others, agricultural holdings develop non-agricultural activities (Harizanova-Bartos, 2020).

The decrease of the labour resources in the agricultural sector in Bulgaria is a permanently established tendency, influenced by a number of factors, such as unfavorable demographic situation, quality of life in the villages; lower income; lack of financial resources (Anastasova-Chopeva, 2019).

The aim of the study was to analyze the relationship between salary and economic development in the agricultural sector in Bulgaria.

Materials and methods

The following statistics, published by the National Statistical Institute, concerning the agricultural sector, were used to achieve the aim of the study: Average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing (in BGN); Employed persons in agriculture, forestry and fishing (thousand persons); Gross Value Added (GVA) in agriculture, forestry and fishing (in million BGN); Expenditure on acquisition of tangible fixed assets in agriculture, forestry and fishing (thousand BGN) and Other subsidies on production (in million BGN). Data were gathered for the period 2003 – 2021, with the exception of subsidies, for which data were collected for the period 2003 – 2020.

The variable "Average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing" shows on average how much a person employed in the agricultural sector receives for one year for working under labour contract. Gross Value Added in agriculture generally shows the economic development in the sector. Expenditure on acquisition of tangible fixed assets is one of the indicators through which we can study the investments in the sector.

The real values of the average annual wages and salaries of the employees, Gross Value Added, subsidies and expenditure on acquisition of tangible fixed assets in agriculture were calculated by dividing their nominal values to the consumer price index (CPI), expressed as a coefficient by dividing CPI to 100, calculated as an average for the respective year (CPI, 1995 = 100; Source: NSI). The applied methodology was according to: https://www.dallasfed.org/research/basics/nominal.aspx.

Correlation coefficients were calculated for the primary data (in real values where applicable) and for the first, second and third differences. An autoregressive model was developed, using natural logarithms of the variables, and its diagnostics were checked, with the statistical software Microfit 5.5. The method of ordinary least squares was applied.

The study assumed that current wages in the agricultural sector were influenced by the level of wages, formed during the previous period, subsidies in agriculture, employed persons in the sector and expenditure on the acquisition of tangible fixed assets in agriculture (investments).

The model had the following form:

$$dlnWages_t = c_0 + c_1 dlnWages_{t-1} + \sum_{i=0}^{1} c_2 dlnInvestments_{t-i} + c_3 dlnEmployed_{t-1} + \sum_{i=0}^{1} c_4\, dlnSubsidy_{t-1} + e_t$$

where:

c_0 – constant of the model; **c_1**, **c_2**, **c_3** and **c_4** – coefficients of the variables;

d – first difference of the variable;

lnWages – logarithm of average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing;

lnSubsidy – logarithm of other subsidies on production;

lnEmployed – logarithm of employed persons in agriculture, forestry and fishing;

lnInvestments – logarithm of expenditure on acquisition of tangible fixed assets in agriculture, forestry and fishing;

e – error of the model.

Augmented Dickey-Fuller (ADF) test was applied in order to check the stationarity of the variables.

Result and discussions

During the period 2003 – 2021 the increase of average annual wages in agriculture, calculated on the basis of 2003, was by 445% (in nominal terms: from 2424 BGN in 2003 to 13204 BGN in 2021). In real terms, the increase was 196%.

Employed persons in agriculture decreased significantly during the period under review: from 285.9 thousand persons in 2003 to 193.6 thousand persons in 2021, or a decrease of 32%.

With regard to Gross Value Added in agriculture, there was an increase of 49%, calculated on the basis of 2003 (in nominal terms: from 3332.4 million BGN in 2003 to 4949.6 million BGN in 2021). In real terms, however, there was a decrease of 19% for the period 2003 – 2021.

During the period 2003 – 2021, the increase in expenditure on acquisition of tangible fixed assets in agriculture on the basis of 2003 was 363% (in nominal terms: from 265536 thousand BGN in 2003 to 1229035 thousand BGN in 2021). In real terms, the increase was 151%.

During the period 2003 – 2020 the increase of other subsidies on production in agriculture, calculated on the basis of 2003, was by 1594% (in nominal terms: from 135.4 million BGN in 2003 to 2294.1 million BGN in 2020). In real terms, the increase was 850%.

The correlation dependences between the primary data and the first, second and third differences of the studied variables are examined (Table 1). The presented variables are not stationary at level, so the correlations calculated on the basis of the primary data are scrutinized to assess whether this corelations are true or spurious.

There may be a discrepancy between the signs of the correlation coefficients between the primary data and their differences. Mills (2011) studied the relationship between tobacco consumption and savings and found a discrepancy between the correlations in the primary data and the correlations between some of their differences.

Table 1. Correlation matrices

	Variable	**Salaries**	**Expenditure on acquisition of tangible fixed assets**	**Employed persons**	**Subsidy**	**GVA**
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.721	1			
	Employed persons	-0.753	-0.835	1		
	Subsidy	0.963	0.799	-0.767	1	
	GVA	-0.479	-0.673	0.798	-0.605	1
First difference	First difference					
	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	-0.010	1			
	Employed persons	0.210	0.088	1		
	Subsidy	0.298	-0.424	0.064	1	

	GVA	0.283	0.093	0.496	0.264	1

	Second difference					
Second difference	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.207	1			
	Employed persons	-0.109	0.274	1		
	Subsidy	0.250	-0.546	-0.117	1	
	GVA	0.156	0.218	0.604	0.249	1
	Third difference					
Third difference	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.236	1			
	Employed persons	-0.198	0.320	1		
	Subsidy	0.199	-0.598	-0.257	1	
	GVA	0.118	0.194	0.631	0.222	1

Source: Own calculations.

The following conclusions can be drawn from Table 1:

- The correlation coefficients between the expenditure on acquisition of tangible fixed assets and salaries are positive in all correlation matrices, except in the first difference matrice, which means that as investments increase, salaries in the agrarian sector also increase.

- The correlation between the salaries and the number of employed persons in the agricultural sector is positive only in the first difference matrice, and in the other correlation matrices it is negative. So we assume that the relationship between the two indicators is negative. Therefore, as the number of employed persons decreases, the salaries increases. The observed inverse relation between these variables was in accordance with the economic theory: a reduction in labour supply increases the price of labour, and vice versa.

- The correlation between subsidies and salaries is positive in all correlation matrices, meaning that as subsidies increase, salaries tend to increase as well.

- The correlation coefficients between salaries and GVA is negative in the primary data matrice, but positive in the first, second and third differences. Therefore, we can conclude that the relationship between salaries and GVA is generally positive, albeit weak: as GVA increases, so do salaries.

- The correlation coefficient between the number of employed persons and the expenditure on acquisition of tangible fixed assets is strong and negative in the pri-

mary data, and from the first to the third difference matrices the correlation is positive, with each subsequent difference the the coefficient becomes higher and higher. There fore we assume that the correlation between the two indicators is positive: with an increase in the expenditures, the number of employed persons increases, albeit slightly, which is probably due to the fact that in order to exploit the investment inputs, work force is needed.

- The correlation between the expenditure on acquisition of tangible fixed assets and subsidies is positive only in the primary data and negative in the first, second and third difference, with each subsequent difference the correlation coefficient becomes increasingly significant in value. Therefore, we can assume that the relationship between the two indicators is negative: as investments decrease, subsidies increase. This is probably a consequence of replacing one financial resource (investments) with another (subsidies). But the reasons why investments in the sector decline as agricultural subsidies rise remain a source of discussion.

- The correlation between GVA and expenditure on acquisition of tangible fixed assets is negative in the primary data and positive from the first to third differences, although the values of the correlation coefficiens are low. Therefore, we cannot agree that there is a negative correlation between GVA and investments. Rather, we can assume that overall the relationship between them is positive, albeit very weak.

- The correlation between the number of employed persons and subsidies is positive, albeit very weak, at first difference. In the rest of the correlation matrices, the relation is negative, indicating the presence of negative correlation between them. Therefore: as the number of employed persons decreases, the subsidies increase, which probably means that the subsidies to some extent serve to compensate for the decrease in the number of persons employed in agriculture.

- The correlation between the number of employed persons and GVA is positive and significant in value in all correlation matrices. Therefore, with an increase in the number of employed persons, GVA increases, and vice versa. This clearly shows the role of the human factor for the development of the agricultural sector.

- The correlation between GVA and subsidies is negative in the primary data, while from the first to the third difference matrices, the correlation coefficients are positive, although low in value. Therefore, we can assume that there is a weak positive correlation between the two indicators: as subsidies increase, GVA shows a tendency to increase.

The regression model was analyzed. It was found that none of the variables, included in the regression model, were stationary at level according to the ADF test with included intercept and a linear trend at 5% significance level, meaning that the inclusion of the first difference of the time series in the regression was an appropriate decision.

Table 2. Estimates of the regression model with dependent variable $dlnWages_t$

Variable	Coefficient	Standard Error	t-Statistic	Probability
c_0	0.019415	0.01058	1.8351	0.100
$dlnWages_{t-1}$	0.50325	0.15703	3.2048	0.011
$dlnInvestments_t$	0.077271	0.026251	2.9436	0.016
$dlnInvestments_{t-1}$	0.034742	0.023502	1.4782	0.173
$dlnEmployed_{t-1}$	0.15197	0.083947	1.8103	0.104
$dlnSubsidy_t$	0.047237	0.010837	4.359	0.002
$dlnSubsidy_{t-1}$	0.015416	0.012738	1.2103	0.257
R^2	0.84658	Adjusted R^2	0.7443	
Standard error of regression	0.016536	F-statistic / Probability	8.2770 / 0.003	
LM-test (F-statistic / Probability):	2.4861 / 0.154	Heteroscedasticity (F-statistic / Probability):	0.0068114 / 0.935	
Jarque-Bera test ($\chi 2$ test / Probability):	0.81946 / 0.664	Ramsey RESET test (F-statistic / Probability):	0.50004 / 0.500	
CUSUM и CUSUMSQ	Fall between the 5% critical bounds.			

Source: Own calculations with the software Microfit 5.5.

Table 2 represented the statistics of the model with the dependent variable dlnWages. Its F-statistic was 8.2770, significant at 1% level. The coefficient of determination (R^2) was high (0.84658); the Adjusted R^2 was 0.7443.

The following conclusions could be drawn from the presented estimates of the variables in the model:

The lag of the average annual salaries in the agricultural sector was significant at 5% level, which meant that the dependent variable could be explained to some degree by its value in the previous period. The relationship between subsidies in the current period ($dlnSubsidy_t$) and the dependent variable was highly significant and positive (coefficient of 0.047237, $p < 0.01$), which meant that an increase in the subsidies led to an increase in the average annual salaries, and vice versa. The coefficient in front of the first lag of the employed persons was positive but not significant ($p > 0.05$). The relation between the average annual salaries and the expenditure on acquisition of tangible fixed assets in agriculture in the current period was significant and positive (coefficient of 0.077271, $p < 0.05$), which meant that an increase in the the investments in the agricultural sector led to an increase in the average annual salaries, and vice versa.

Conclusions

The following conclusions can be drawn from the correlation analysis:

- There is a positive correlation between investments and salaries in the agricultural sector.

- The relation between salaries and number of employed persons is negative. The observed inverse relation between these variables was in accordance with the economic theory: a reduction in labour supply increases the price of labour, and vice versa.

- The correlation between subsidies and salaries is positive in all correlation matrices, meaning that as subsidies increase, salaries tend to increase as well.

- The relation between salaries and GVA is generally positive, albeit weak: as GVA increases, so do salaries.

- The correlation between the number of employed persons and investments is positive: with an increase in the investments, the number of employed persons increases.

- The relation between the investments and subsidies is negative: as investments decrease, subsidies increase. This is probably a consequence of replacing one financial resource (investments) with another (subsidies).

- The correlation between GVA and investments is positive, albeit very weak.

- There is a negative correlation between the number of employed persons and subsidies in agricultural sector. This probably means that the subsidies to some extent serve to compensate for the decrease in the number of persons employed in agriculture.

- The correlation between the number of employed persons and GVA is positive and significant in value in all correlation matrices. This clearly shows how important is the human factor for the development of the agricultural sector.

- There is a weak positive correlation between GVA and subsidies: as subsidies increase, GVA shows a tendency to increase.

The regression analysis showed that the average annual salaries in agriculture could be explained to some degree by its value in the previous period. The increases in the subsidies and in the investments significantly push salaries up, and vice versa.

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Contact person information: Assoc. prof. Tsvetana Harizanova, Institute of Animal Science – Kostinbrod, Agricultural Academy – Sofia, Bulgaria, ts_harizanova@abv.bg

NEED FOR A NEW VISION ON DEMOGRAPHIC POLICY IN THE RURAL AREAS OF THE REPUBLIC OF BULGARIA

Valeri Velkovski[32]

НЕОБХОДИМОСТ ОТ НОВА ВИЗИЯ ВЪРХУ ДЕМОГРАФСКАТА ПОЛИТИКА В СЕЛСКИТЕ РАЙОНИ НА РЕПУБЛИКА БЪЛГАРИЯ

Валери Велковски

Abstract

According to a preliminary assessment of the National Statistical Institute for the number of the population of Bulgaria as of 09/07/2021. (www.nsi.bg), according to the last census of the population and housing stock from 09/07/2021. until 10.10.2021, 1,677,139 people live in the villages. This represents 25.7% of the population of Bulgaria, which as of the indicated date is 6,520,314 people. There are several negative demographic trends, among which is the depopulation of rural areas. The stabilization of the demographic situation in these areas, as an important and necessary condition for the sustainable development of rural areas, necessitates the preparation and implementation of a new vision on the demographic situation in rural areas. This vision must include new innovative approaches and policies of a demographic nature. These approaches must be prepared and implemented as a component of the national policy for the sustainable development of rural areas and overcoming their depopulation in the context of the national demographic policy.

Key words: rural areas, rural population, demographic situation, policies, vision, innovative policies

JEL CODE: Q18

Introduction

The preliminary assessment of the population of Bulgaria as of 07.09.2021. (www.nsi.bg) shows three consolidated negative demographic trends, namely:

- Reduction of the population by 11.5% compared to 2011;
- Deepening of the population aging process – the share of persons aged 65 and over has increased by 5.4% points compared to 2011;
- With a total population of 6,520,314 people, 25.7% or 1,677,139 people live in villages.

These main characteristics of the demographic crisis in Bulgaria give serious indications of consolidation and entry into the role of permanent negative trends in the rural areas of Bulgaria. As noted by some authors (Miteva, A., 2015, p. 67-74),

[32] Assoc. PhD. – Higher School of Security and Economics – Plovdiv.

in Bulgaria 231 municipalities out of 264 municipalities (87.5%) are classified as rural, in which the population is primarily rural.

The future of rural areas in Bulgaria is directly dependent on the demographic situation in the country. In this regard, the subject of the report is the analysis of some aspects, such as the resonance of negative demographic trends in rural areas – unemployment, reduction in the number of family farms, lack of qualified labor, depopulation, etc.

The object of research is the effect of the demographic situation in its crisis dimensions on the agricultural sector in rural areas.

The aim of the research is to mark some innovative approaches and ways to stabilize the demographic situation in rural areas in the context of a new vision on this issue.

For the purposes of the research, the results of a conducted survey are presented, concerning precisely some nuances of the demographic situation in rural areas and the resulting consequences and problems.

Materials and methods

For the purposes of the study, the following were used:

- Literary sources of Bulgarian authors;
- Normative sources (accents from the current legislation);
- Analytical toolkit (normative and analytical methodological apparatus) and survey.

In the survey, the demographic situation is evaluated by the respondents on a scale of 3 to 6 points, such as:

a/ 3 points – worsened demographic situation;

b/ 4 points – relatively good;

c/ 5 points – good;

d/ 6 points – sustainable and showing positive trends.

For some of the specialized questions, respondents were given the opportunity to give more than one answer.

Results and discussion

Various aspects of the negative impact of the demographic crisis on the situation in rural areas have been examined and analyzed by a number of authors:

- Some authors study unemployment and employment in rural areas of the Republic of Bulgaria, finding that "unemployment in rural areas is higher than in non-rural areas" (Sarov, Boevski, 2021).

- Other authors, researching the importance of small farms in the sustainable development of rural areas, find a decrease in the number of people permanently engaged in agricultural activities in small farms (Fidanska, Koteva, 2020).

- An observation of the continued decline of agricultural holdings – most often small family holdings, is also made by another author (Doitchinova, 2021).

According to the preliminary results of the census of agricultural holdings in the Republic of Bulgaria in 2020 (www.mzh.governmentbg):

- In 2020, 177,000 annual labor units (ALU) of family and non-family labor and seasonal workers were invested in agriculture. The family workforce and those permanently employed in agriculture are 292,000 people. The relative share of family unpaid labor is 79%;

- Regarding the age structure of employed persons, the age group between 45 and 65 years prevails;

- The segment of managers of agricultural holdings also has a deteriorated age structure – 31% are persons aged 65 and over.

In this regard, for the purposes of the research, an author's survey was conducted among 102 people – owners and users of agricultural land from the South-West planning region. The selection of respondents from this region is related to the fact that its territory is home to the largest in the country Regional Directorate "Agriculture" Sofia region.

The summarized results are presented below in the exposition.

The survey covers two sections, namely:

Section I: Profile of the respondent

1. Total number of respondents – 102 people – 100%.

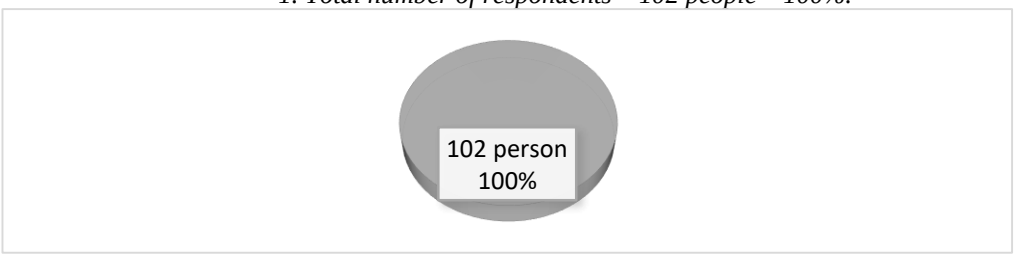

Figure 1. Total number of respondents

2. Gender structure:

a/ men – 68 people or 66.67%;

b/ women – 34 people or 33.33%

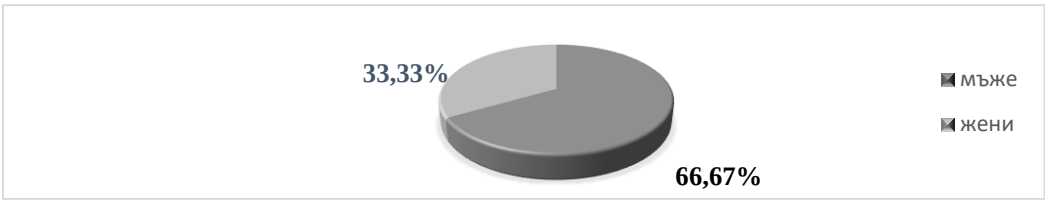

Figure 2. Gender structure of respondents

3. Age structure:
a/ 20 – 30 years old – 17 people or 16.67%;
b/ 31- 40 years – 21 people or 20.59%;
c/ 41 – 50 years – 28 people or 27.45%;
d/ 51+ years – 36 people or 35.29%

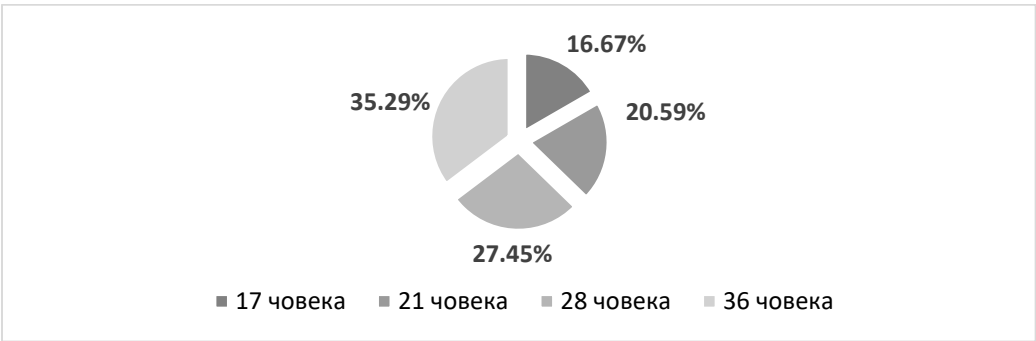

Figure 3. Age structure of the respondents

4. Farmer is from:
a/ up to 5 years – 29 people or 28.43%;
b/ up to 10 years – 38 people or 37.25%;
c/ over 10 years – 35 people or 34.32%.

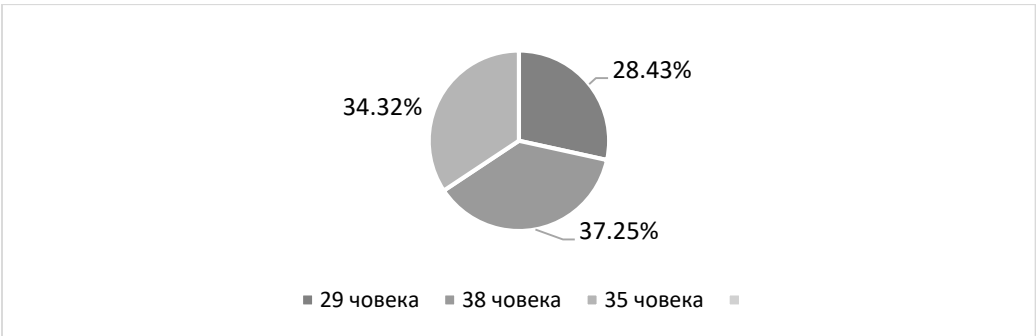

Figure 4. Farmer in years

5. Main residence:
a/ village – 74 people or 72.55%;
b/ city – 28 people or 27.45%

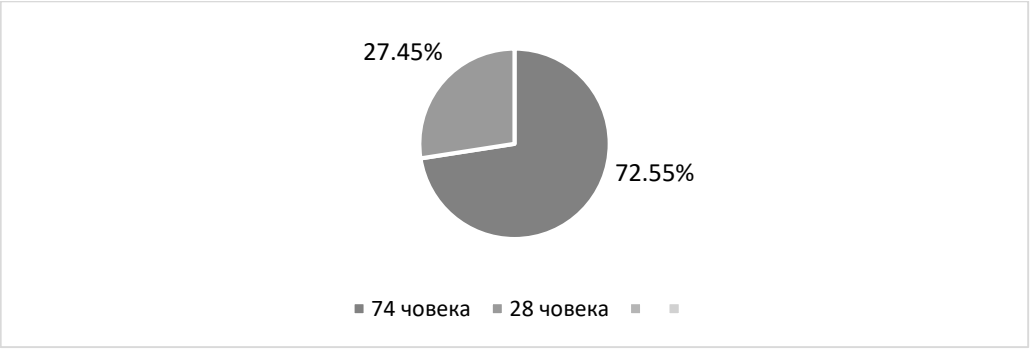

Figure 5. Main residence

Section II: Specialized questions
1. Question: Assessing the demographic situation on a scale of 3 to 6 points:
a/ 3 points – 22 people or 21.57%;
b/ 4 points – 28 people or 27.45%;
c/ 5 points – 31 people or 30.39%:
d/ 6 points – 21 people or 20.59%

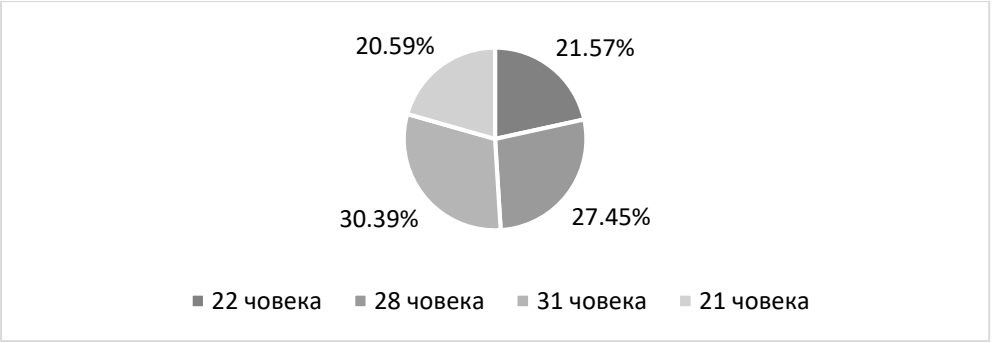

Figure 6. Evaluation of the demographic situation on a scale of 3 to 6 points

2. Question: With a rating of 3 points, the reasons are:
a/ reduction of the population – 22 people or 100%;
b/ depopulation of populated areas – 6 people or 27.27%.

Figure 7. Reasons for rating 3 points

3. Question: With a rating of 4 points, the reasons are:
a/ sustainability of the population – 17 people or 60.71%;
b/ presence of young people – 21 people or 75.00%.

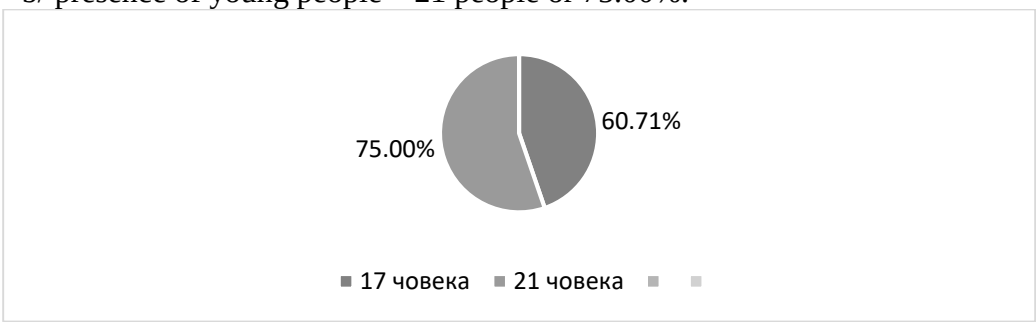

Figure 8. Reasons for rating 4 points

4. Question: With a rating of 5 points, the reasons are:
a/ settlement of people – 22 people or 70.97%;
b/ young people in agricultural business – 18 people or 58.06%.

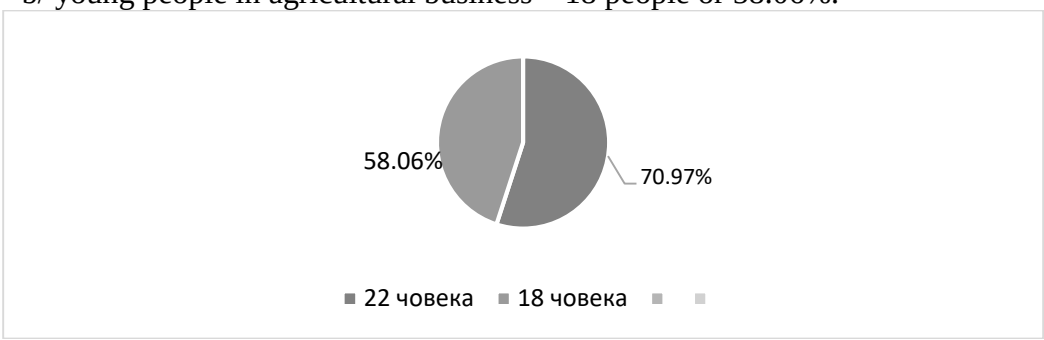

Figure 9. Reasons for rating 5 points

5. Question: With a score of 6 points, the reasons are:
a/ good birth rates – 11 people or 52.38%;
b/ purchase of rural properties – 15 people or 71.43%.

Figure 10. Reasons for rating 6 points

6. Question: It is difficult to engage a labor resource in the agricultural business:
a/ yes – 52 people or 50.98%;
b/ no – 32 people or 31.37%;
c/ not always – 18 people or 17.65%.

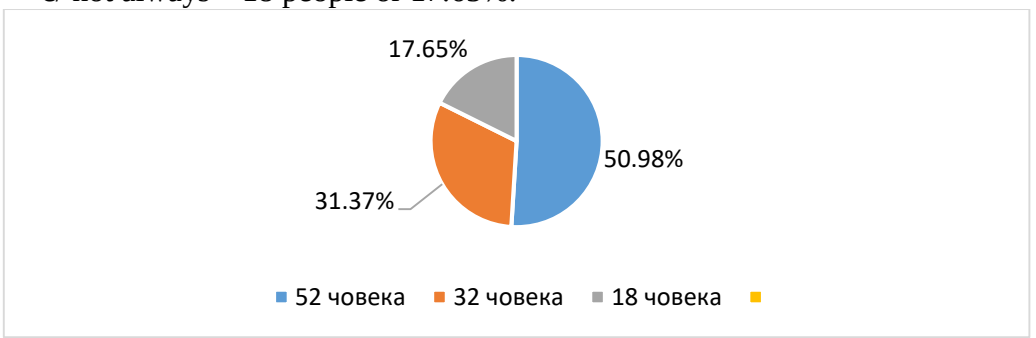

Figure 11. It is difficult to engage labor resources in agricultural business

7. Question: The difficulties are:
a/ quantitative shortage of labor force – 36 people or 69.23%;
b/ lack of qualified workforce – 42 people or 80.77%.

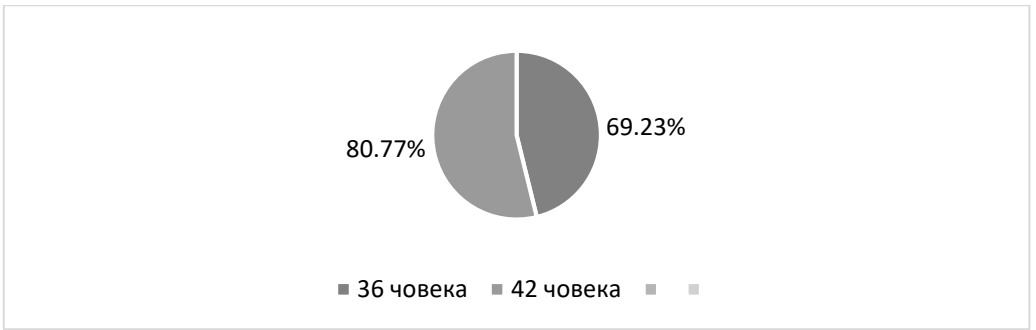

Figure 12. The difficulties are

8. Question: Relationship between labor shortage and the demographic situation:
a/ yes – 32 people or 61.54%;
b/ no – 20 people or 38.46%.

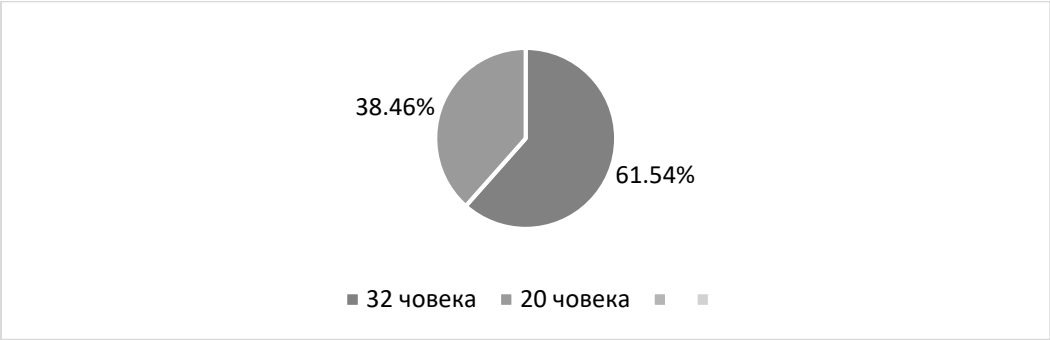

Figure 13. Relationship between labor shortage and the demographic situation

9. Question: Arguments "for" the connection "labour shortage-demographic situation":
a/ depopulation – 21 people or 65.63%;
b/ aging – 15 people or 46.88%.

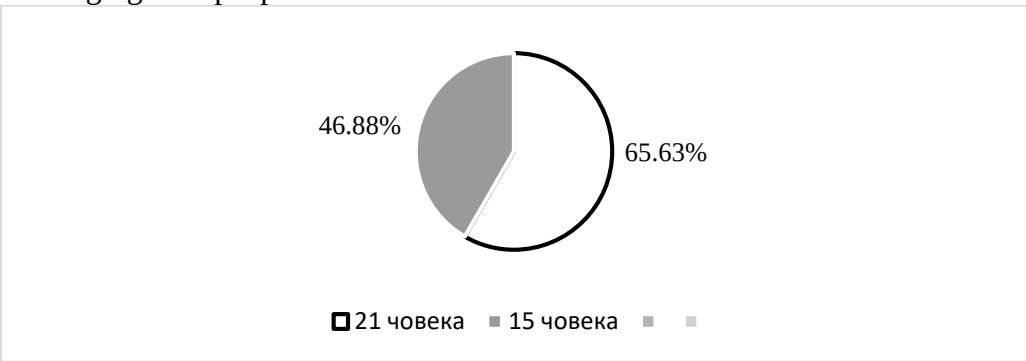

Figure 14. Arguments "for" the connection "labour shortage-demographic situation"

10. Question: The improvement of the demographic situation in rural areas should be:
a/ element of national agrarian policy – 69 people or 67.65%;
b/ element of national demographic policy – 58 people or 56.86%;
c/ both – 83 people or 81.37%.

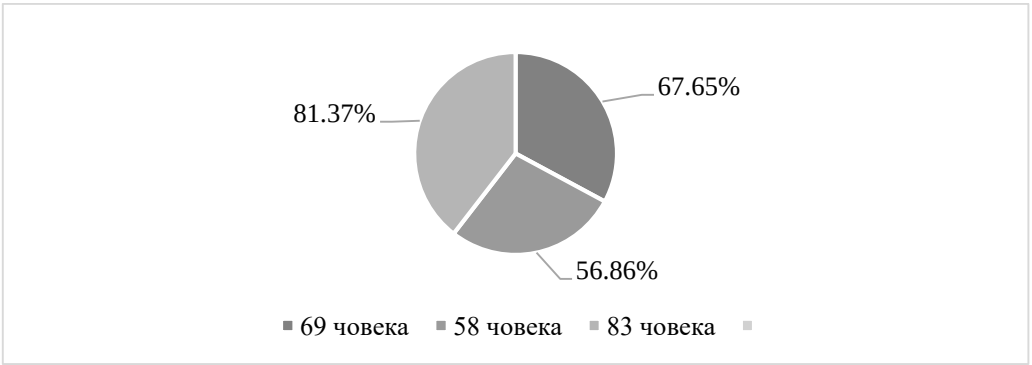

Figure 15. Improving the demographic situation in rural areas

Conclusions

The studied literature on the subject, the statistical data and the summarized results of the survey, impose the following conclusions:

1. Rural areas in Bulgaria are in an unstable demographic situation, the main reason for which is a decrease in the absolute number of the population and corresponding depopulation of settlements;

2. Some more optimistic assessments of the demographic situation are justified by the presence of young people, respectively young people in the agricultural business, settlement of rural areas, purchase of rural properties, etc.;

3. The demographic situation from the point of view of its unsustainability is also a negative factor for creating a sustainable labor resource in rural areas. It is difficult to engage labor resources in the agricultural business, both quantitatively and qualitatively, in terms of qualifications;

4. The opinion is forced that the improvement of the demographic situation in rural areas should be both an element of the national agrarian policy and an element of the national demographic policy.

Based on the above, the following recommendations can be made regarding the development of a new vision on the impact of the demographic crisis in rural areas:

1. Overcoming the demographic crisis in rural areas must be tied to a mandatory package of measures in the following main strategic documents – national demographic strategy (www.mlsp.government.bg), national strategy for regional development (www.mrrb.bg), national security strategy (www.mod.bg) and rural development program (www.mzh.government.bg);

2. Filling the labor vacuum, including highly qualified in rural areas, could be implemented through the application of digitization and digitization in the agricultural sector, for example, the two programs currently in operation: intelligent plant breeding and intelligent animal breeding;

3. It is also necessary to impose a differentiated approach regarding the demographic situation for each rural area separately in view of its specifics and needs for demographic potential and workforce and on this basis formulating and undertaking specific measures to overcome the negative effect of the demographic crisis and building resilience in rural areas.

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Contact person information: Associate Professor Valeri Yordanov Velkovski, Ph.D, Higher School of Security and Economics – Plovdiv, e-mail: jurist57@abv.bg

DEVELOPMENT OF GREEN ARCHITECTURE THROUGH THE APPLICATION OF AGRO-ENVIRONMENTAL PRACTICES

Anton Blagoev[33]

РАЗВИТИЕ НА ЗЕЛЕНА АРХИТЕКТУРА ЧРЕЗ ПРИЛАГАНЕТО НА АГРОЕКОЛОГИЧНИ ПРАКТИКИ

Антон Благоев

Abstract

Reform with the Common Agricultural Policy, strengthens the need of the Council of Farmers to increase environmental practices. The introduction of green architecture determines the requirements, contact the application of more environmentally friendly practices of agricultural holdings. The whole part of the paper is about green architecture, through the application of various agri-environmental practices by farmers.

Key words: green architecture, agroecological practices, agricultural policy

JEL: Q10, O13, Q18

1. Introduction

The Common Agricultural Policy (CAP) influences on EU program that manages the production of agricultural goods in all EU member states. The CAP aims to support agricultural producers and provide them with a stable income. It aims to promote sustainable agricultural practices and control the overuse of natural resources. In order to improve both the efficiency and sustainability of agriculture, it is necessary to reassess current practices and policies for this purpose.

The integration of environmental concerns into the CAP aims to minimize the risks of environmental degradation and improve the resilience of ecosystems. With the help of four types of practices, the CAP is in sync with market requirements and environmental integration, namely:

- ✓ practices aimed at objectives such as market stability or income support that have a positive secondary impact on the environment or contribute to the maintenance of environmentally friendly structures or types of agriculture;
- ✓ practices targeting income support objectives designed to contribute to the implementation of mandatory environmental requirements and the polluter pays principle;

[33] Assistant Professor, PHd, University of National and World Economy.

- ✓ practices aimed at promoting the voluntary provision of environmental services and agro-ecological measures;
- ✓ practices aimed at facilitating compliance with mandatory environmental requirements or compensating the relative economic disadvantage resulting from a region-specific model of environmental requirements.

2. Nature and development of CAP in the context of greening

The challenges facing the whole world require reforms of the CAP, from the point of view of bringing it into line with society's higher demands for healthy and quality food, protecting rural areas and ensuring an acceptable standard of living for agricultural producers.

In 2007, the CAP is aimed at funding from the European Agricultural Guarantee Fund (EAGF) to finance market measures and income support and the European Agricultural Fund for Rural Development (EAFRD).

In 2007, passes the so-called a "health review" that aims to modernize, simplify, rationalize the Common Agricultural System, from the point of view of new challenges such as climate change, better water management and biodiversity protection (Atanasova-Kalaidzhieva, 2017).

In 2013, the CAP underwent a change in the direction of improving food production, sustainable management of natural resources, balanced development of rural areas. (Navarro,A., López-Bao, José.,, 2019) During the period 2014 – 2020, the development of the CAP is aimed at: "greening" payments for agricultural holdings by introducing ecologically sustainable agricultural practices, such as crop diversification, preserving the ecological richness of the landscape and maintaining a minimum area of permanent pastures, fairer distribution of aid, more targeted income support aimed at young farmers (Velikov Y., Georgiev M., 2015).

The new CAP for the future period 2021 – 2027 foresees changes related to environmental principles, namely the introduction of a new "green architecture" that is flexible in terms of design and management. In the new green architecture, it is planned to include the basic requirements (so-called conditionality) and interventions related to the environment and climate in the first and second pillars (Ministry of Agriculture, n.d.). It will have three strands: a new cross-compliance system, the climate and environment programs (which will be funded by the EAGF and will replace the existing greening payment) and the environment and climate commitments (funded by the European Agricultural Fund for Development of Rural Areas (EAFRD) (Buckwell, 2015). The overall goal of the new CAP is a higher ambition and contribution to environmental and climate protection, namely as follows:

- ✓ to contribute to climate change mitigation and adaptation as well as sustainable energy;
- ✓ supporting sustainable development and effective management of natural resources (water, soil, air);

- ✓ to contribute to the protection of biological diversity,
- ✓ to improve ecosystem services and preserve habitats and landscapes (Parry, M. and Sapała, M. , 2018).

3. Materials and methods

The main objective of the report is to be evaluatedthe future changes in the CAP in the context of green architecture, through the application of agro-ecological practices aimed at protecting the environment and natural resources. The data on which the report is based is part of the author's study. The research is based on 61 structured interviews conducted in December 2019 – February 2020 among agricultural producers in three regions of the country. The selection of a research area is done through an analysis of the indicators related to the implementation of various types of agro-ecological practices in order to protect the environment by agricultural holdings:

- ✓ Number of agricultural holdings that carry out conservation, minimal tillage, in which the soil layer is not turned over and plant residues remain on the surface, direct sowing with minimal tillage, use of plant residues,
- ✓ Area of cultivated land on which conservation, minimum tillage is carried out, where the soil layer is not turned over and plant residues remain on the surface, direct seeding with minimum tillage. On the basis of the analyzes carried out in the study, the South Central, South-West and North-East regions were selected.

The share of respondents who state that they have a secondary education is relatively high – 39%. The percentage of respondents with higher education – bachelor's or master's – 47% prevails. The share of respondents who state that they have a secondary education is relatively high – 39%. The percentage of respondents with higher education – bachelor's or master's – prevails – 47%. To achieve the goal, the following tasks are set: 1) theoretical development of the CAP 2) methodological framework and 3) analysis of the challenges to the greening of the CAP 2021 – 2027.

4. The challenges to the greening of the new CAP 2021 – 2027, through the application of agro-ecological measures

The CAP sets out nine general objectives, three of which have a direct impact on the environment and through them will dynamize the process of applying agro-ecological practices in agricultural holdings Figure 1. The EU's agricultural policy has a commitment to provide public goods and ecosystem services related to soils, water, biodiversity, air quality, climate action and landscape attractiveness. Achieving the goals will be ensured in several ways:

- ✓ commitment of the system to support the income of farmers with acarefully attitude towards the environment and the climate;

✓ implementation of new "eco-schemes", which will be financed from the state budget, but will not be mandatory for farmers. With the help of the "eco-schemes" the other available instruments are supplemented in support of the objectives of the CAP, which allows exceeding the requirements in relation to the binding of support;

✓ allocate a minimum of 30% of each member state's RDP budget for environmental and climate measures;

✓ applied environmental measures in areas with natural limitations (mountainous or coastal) will be in addition to 30% for rural development.

✓ 40% of the total CAP budget will be related to climate action.

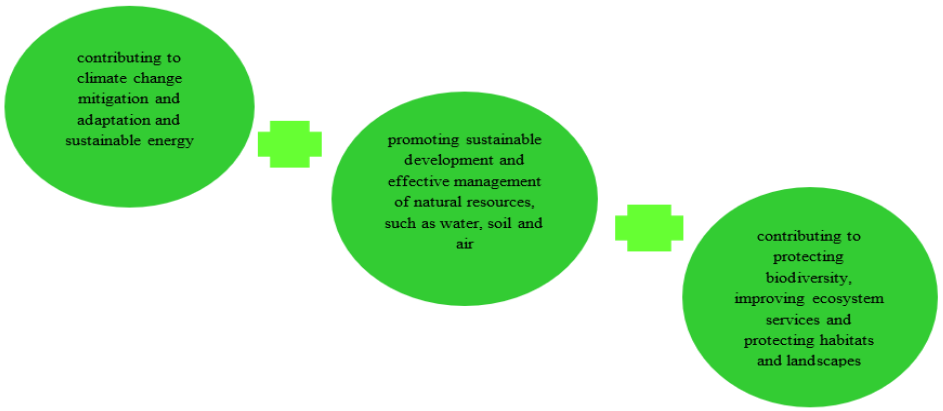

Figure 1. Specific environmental objectives of the new CAP

Source: author's research.

The new program period of the PRDP 2021 – 2027 is mainly associated with the setting of higher goals related to environmental protection. It is also characterized by the higher requirements regarding the application of ecological practices. Regarding the application for environmental measures, farmers should pay attention to compliance with the requirements of ecological practices. Emphasis is also placed on Member States, which are obliged to allocate 30% of payments under the first pillar of the CAP to additional payments under four schemes in which farmers will be able to participate voluntarily: organic farming, permanent grass areas, areas with natural constraints and linear elements of the landscape. In this way, the aim is to encourage agricultural producers and their participation in actions related to the prevention of the negative consequences of the climate and the sustainable management of natural resources. The implementation of standards related to the environment, climate change, public health, animal and plant health, as well as animal welfare is also foreseen, and they will be mainly connected to the new ecological architecture of the CAP. Their application should be for the entire EU, and in case

of non-compliance with the standards by agricultural producers, the member states will impose proportional sanctions.

Interventions in the field of direct payments will be related to compliance with increased requirements regarding the environment and climate. To meet the voluntary requirements, farmers will be rewarded for their extra efforts beyond the mandatory environmental requirements in the context of farming and/or climate change commitments. Eco-schemes will be developed to support and/or stimulate farmers to adopt agricultural practices that do not harm the climate and the environment, which will be beyond the mandatory requirements. Member States will define the requirements related to eco-schemes, as payment to stimulate and reward the provision of public goods within agricultural practices favorable to the environment and climate or as compensation for their introduction. The aim is to aim at improving the environmental and climate-related results of the CAP so that they go beyond the mandatory requirements. Decisions on the introduction of eco-schemes for agricultural practices are taken at national level by each Member State. The implementation of agricultural practices favorable to the climate and the environment must meet at least one or more of the specific objectives, namely contributing to climate change mitigation and adaptation, as well as sustainable energy; promoting sustainable development and effective management of natural resources such as water, soil and air; contributing to the protection of biological diversity, the improvement of ecosystem services and the preservation of habitats and landscapes.

The improved requirements for the new programming period 2021 – 2027, as part of the mandatory area-based support for farmers, will target 14 improved practices for climate, water, soil, biodiversity and landscape protection. Farmers will also have to comply with the standards of the Nitrates Directive, the Water Framework Directive and Natura 2000.

Assessments of the importance of agro-ecological practices at the farm level show that of all respondents, 46% partially or completely share that the implementation and use of the practices are very significant for their farms. The large percentage of respondents who did not express an opinion on the given issue is also impressive – 40%. The relative share of respondents who say that they are little or partially significant is too small – 6%.

Based on the data from Figure 2, the overwhelming opinion of the respondents stands out, that the application of agro-ecological practices for the purpose of environmental protection is very significant. 15% of farmers partly or fully share the opinion that the application of agroecological practices is significant for the environment. Only 2% of them consider them to be partially or slightly significant.

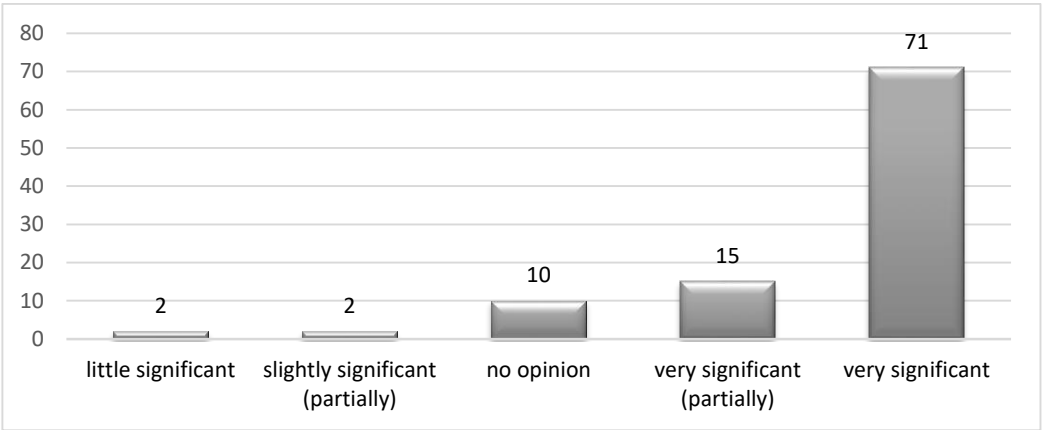

Figure 2. Assessment of the importance of agroecological practices at the environmental level, %

Source: author's research.

The overwhelming majority of respondents share the opinion that the difference in applied agro-ecological measures from the two program periods is due to the addition of a mandatory element – green payments. Green payments are implemented in the second program period, coming into force on 1 January 2015. With the help of the payment scheme for agricultural practices favorable to the climate and the environment, also known as "green direct payments", farmers can be supported in three main directions – diversification of crops, preservation of permanently grassed areas and maintenance of 5% of arable land as ecologically oriented areas (Figure 3). Among those surveyed, 42% indicated that the difference between the two program periods was greater financial assistance, followed by restructuring measures with 25%.

Regarding the relative share of respondents who applied agro-ecological practices in their holdings by applying under the 2007 – 2013 RDP, it is interesting that more than half of the respondents indicated that they did not apply for and did not benefit from the RDP during the period 2007- 2013. Accordingly, only 21% farmers took advantage and applied during this period. It should be noted that the most desired measure during the first program period is measure – 214 "Agro-ecological payments". With few exceptions, the results are similar, with Measure 211 "Payments to farmers for natural restrictions in mountainous areas" ranking second. Only two of the respondents shared that they applied under measure – 121 "Modernization of agricultural holdings". A significant number of the surveyed farmers (37%) indicate that the impact of the applied practice on the agricultural holding has a very strong impact. About 26% say that the impact was strong, and only 10% think that the impact was weak. 62% of the respondents stated that they did not apply for agro-ecological measures under the RDP in the second program period 2014 – 2020. The opinions of the respondents are similar as in the first program

period of the RDP. Here, the trend persists, in terms of the high percentage of reluctance, inability to apply for the possible measures. Only 38% indicated that they benefited from applying under the RDP in the second program period. Of interest is the increased willingness of farmers to apply during this period. The majority of respondents said that they most often applied under Measure 11 "Organic agriculture", followed by Measure 10 "Agroecology and climate" and last but not least Measure 13 "Payments for areas facing natural or other specific constraints".

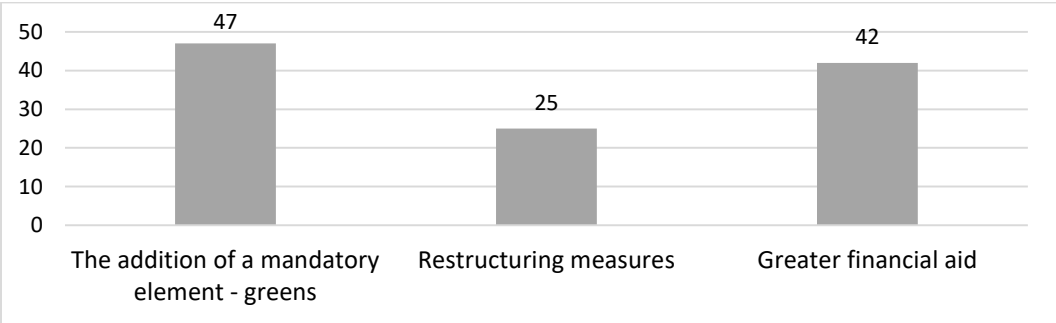

Figure 3. Evaluation of the difference from the application of agro-ecological measures in the two program periods (the question has the possibility of more than one answer), %,

Source: author's research.

Conclusion

A number of changes have been implemented in general agricultural policy, with the main emphasis being placed on changes related to environmental aspects. They have an important role in the modern agriculture property, because without a balanced and preserved natural environment, it is impossible to carry out a sustainable agricultural policy. The common agricultural policy faces new challenges related to the protection of the environment and natural resources during the new programming period 2021 – 2027. Achieving environmental goals is conditioned by the use and implementation of agroecological practices. The correct implementation of environmentally friendly practices is the key to achieving all CAP objectives and in particular the environmental ones.

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Contact person information: Anton Tachkov Blagoev, PhD, University of National and World Economy, e-mail: antonblagoev93@gmail.com

THE CIRCULAR ECONOMY MODEL – GOOD PRACTICES FOR SUSTAINABLE DEVELOPMENT OF COMPANIES/BUSINESSES/ IN BULGARIA

Albena Miteva[34]

МОДЕЛ НА КРЪГОВАТА ИКОНОМИКА – ДОБРИ ПРАКТИКИ ЗА УСТОЙЧИВО РАЗВИТИЕ

Албена Митева

Abstract

The increasing number of world's population, which mainly affects developing countries, the rising urbanization of such areas, accompanied by the increase in the standard of living of the growing middle class leads to an increase in consumption and generation of more waste. Businesses face risks related to shortage of raw materials, large fluctuations in resource prices, unpredictable market fluctuations, dependence on critical materials. The crisis of sustainable development has its roots in the applied inappropriate industrial model. A focus on efficiency alone – reducing the resources and fossil energy used per unit of production output – will not change the ultimate nature of their stocks, but can only delay the inevitable. A change of the entire operating system is required. The circular economy represents an innovative development paradigm, offering cutting-edge models for production, distribution, consumption and recovery which enhance ecosystem preservation and increase human well-being. The purpose of this report is to outline the theoretical foundations of the circular economy and to reveal the possibilities for its development in our country by presenting specific good company practices in this area.

Key words: circular economy, good practices, sustainable development

JEL: Q56

Introduction

The increasing number of the world's population, which mainly affects developing countries, the rising urbanization of such areas, accompanied by an increase in the standard of living of the growing middle class leads to an increase in consumption and generation of more waste. Businesses face risks related to shortage of raw materials, large fluctuations in resource prices, unpredictable market fluctuations, dependence on critical materials. (Su et al., 2013; Whaugray, 2013; EC, 2014a). Growing industrialization and urbanization lead to increasing environmental pollution, problems with overexploitation of land, water, inefficient waste management, loss of value during production. Growing demand for resources poses the problem

[34] Professor at Natural Resource Economics Department, UNWE.

of spreading geopolitical tensions and conflicts, while climate change is dramatically impacting migration patterns and fuels displacement. (Mason et al., 2008; Cuvelier et al., 2014; Andrews, 2015),

According to World Bank projections, urban dwellers will account for a total of 70% of the world's population by 2050, and they will generate twice as much waste as people living in rural areas. The environmental and social consequences are likely to further undermine the possibility of future generations to satisfy their own needs sustainably.

The crisis of sustainable development has its roots in the ьззвсеа inappropriate industrial model. (Ness, 2008; EMF, 2012; Ghisellini et al., 2016). The "linear model" was spread by the Industrial Revolution and prospered in the 20th century, especially in Western countries. (Andrews, 2015). The availability of an abundance of cheap resources and labor from less developed countries, encouraged by the globalization of markets, has created a system that is built on the continuous exploitation of raw materials that are mined, processed and manufactured, sold, used and discarded. The linear "take-make-use-dispose" model relies on large quantities of readily available resources and energy and as such is increasingly inappropriate for the current reality. A focus on efficiency alone – reducing the resources and fossil energy used per unit of production output – will not change the ultimate nature of their stocks, but can only delay the inevitable. A change of the entire operating system is required. (EMF, 2015). The circular economy is a new type of industrial system that is designed to replace the unsustainable but today's leading linear production model. It is an economic system of production and exchange in which, at each stage of the product's life cycle, we strive to increase the efficienct use of resources and to diminish the detriment on the environment. It closes in one cycle the three spheres: supply and responsible producer choice, consumer demand and behavior and waste management.

The circular economy is not a new concept, but it has attracted the attention of vast audience in recent years as climate change, waste and resource scarcity become more pressing. The circular economy promises new economic benefits. Rethinking "waste" as a resource shows how much value is lost in the linear economy. Today, only 8.6% of the resources that enter the global economy are returned to it. The rest goes the way of the linear economy, thrown away and often replaced with new items. When you find ways to recover resources, such as through recycling, composting or remanufacturing, that's the value that is retained and put back into your business. Companies have seen real benefits from making products from waste. The circular economy makes economic growth possible without relying on limited resources.

The purpose of this report is to outline the theoretical foundations of the circular economy and to reveal the possibilities for its development in our country by presenting specific good company practices in this area.

2. General Considerations regarding the Circular Economy

As a result, Generally in the applied sciences, life-cycle approaches and models such as "closed loops" "remanufacturing", "product reuse", "waste management" have been developed and discussed in the literature without in-depth and critical discussions on the theoretical foundations, system boundary limitations and frameworks for methodological inquiries. A paradigm change needs such considerations.

The concept of circular economy has been developed recently and the academic research on it has just begun to emerge. It is still fragmented and mainly at the applied levels. It's theoretical foundations was not discussed in-depth, are not set its limitations strictly. Its theoretical roots are intertwined with the development of the discussion on sustainable development. The first outlining of the idea of circular economy is most often attributed to the eco-economist Kenneth Boulding (1966), who envisioned the economy as an open system, with unlimited inputs and outputs, in contrast to a closed economy in which resources and waste are limited and represent economic problem. He introduces the idea of circular flow of materials and energy and explains that we must be in a "cyclic" production system. In turn, the term "circular economy" first appeared in 1988 in "The Economics of Natural Resources" book and was soon after used by its authors Pearce and Turner to describe an economic system in which waste from the stages of extraction, production and consumption is converted into inputs. They note that the linear economy follows an unsustainable model: extraction – production – consumption – waste, which is based on the continuous extraction of new raw materials and treats the environment as a repository for waste. In the circular economy, materials circulate in a circle for as long as possible, minimal amounts of waste are generated, the need to extract primary raw materials and the dependence on their import are reduced. Today, the concept has been expanded to include a number of other ideas such as an endless cycle of resource use, adaptation of natural forms in technology, and others. In all cases, the circular economy extends the life cycle of resources by using as few non-recyclable materials as possible. Mist of its ideas are based on general systems theory and industrial ecology.

In the 1980s, industrial ecology introduced an innovative approach to industrial system analysis, adding an ecological perspective and characterizing an entire ecosystem marked by "flows of materials, energy, and information, and the provision of resources and services from the biosphere." (Ghisellini, 2016). Industrial ecology is a science of material and energy flows, where waste within industrial cycles serves as raw material for a subsequent process. Manufacturing processes are designed in such a way that they resemble ecological processes. Industrial ecology catalyzes the shift from open to closed material and energy cycles, inspired by research on living systems.

Regenerative design dates back to the 1970s, when J. Lyle proposed a global manufacturing model that respected both the environment and natural resources. Its

purpose is to have all systems and resources used for their own recovery. Processes in all systems can reuse their own energy and materials. Society's demand is also satisfied within nature.

In 1986, Walter Stahel (2006, 2014) introduced the productivity theory of the economy. It consists in the idea of an economy structured in closed circles, which respects the limits of existing resources and prevents waste. The new additions brought by this model are the ability to renew and repair goods and to extend their durability. (Beaulieu et al., 2015:7). Another innovative contribution of Stahel is the idea of selling services instead of goods, so that by combining social, environmental and economic benefits, the demands of households and industry are met. Stahel developed the vision of a closed-loop economy, including the principles of life extension, product repair and waste prevention. Selling services instead of products is an important part of his thinking: everyone pays for the performance of a product.

Stahel also devised a theory called Cradle to Cradle (C2C), which was further developed by Braungart and McDonough. Waste is a major concern of C2C, a theory opposed to the linear Cradle to Grave model (Braungart, McDonough, 2002). The authors claim that only 5% of the raw materials are used in the final product, while all the rest become waste by the end of production. The two scientists also developed the concept of "eco-efficiency", which suggests that waste should not exist: in fact, it could be eliminated thanks to the rethinking of products, processes and services. In the cradle-to-cradle model, materials in industrial and commercial processes are considered as raw materials for technological and biological reuse. The design is literally from cradle to cradle – the entire life cycle of the product and the raw materials used are taken into account in the design process. Technical raw materials do not contain components that are harmful to the environment; biological raw materials are completely biodegradable.

One of the latest direct contribution to CE was developed by biologist Janine Benyus and is called Biomimicry. The model brings nature's mechanisms and designs into the economic realm. Nature is understood as a measure of the sustainability of models and of human existence. Biomimicry imitates designs from nature and applies them to solutions in human society (Benyus, 2002).

There is a direct connection with the idea of Gunther Pauli's Blue Economy. Blue economy is an economic philosophy that derives its knowledge from the way natural systems form, produce and consume. It attaches importance to the goal of zero waste and aims for an auto-regenerative economy. Waste generated in the production of one good will become raw materials and resources for other goods. The model hopes to address both environmental and social concerns about SD. The shared value approach by Porter and Kramer (2011, 2019) proposes "creating measurable business value by identifying and addressing social issues that intersect with business" (Shared Value Initiative, 2015). This framework is focused on value

chains and local communities, postulating that the benefits to society will coincide with the benefits to business. In this sense, businesses are expected to operationalize their models to respond to social needs, and they would do so by reshaping goods and markets, redefining the value chain and promoting the development of clusters in the local community.

The circular economy is also a way to implement the Sustainable Development Goals (SDGs). In particular, there is a strong link with SDG 6 (clean water), SDG 7 (affordable and clean energy), SDG 8 (jobs and economic growth), SDG 12 (responsible consumption and production) and SDG 15 (life on land). Aspects of the circular economy, such as recycling of household waste, e-waste and wastewater, provide a 'toolbox' for meeting the SDGs.

Circular economy stems from the conclusion that economy and environment must be in equilibrium (Boulding 1966)—the concept known as the "self-perpetuating economy" (Stahel 2014) or "productivity economics" (Stahel 2006). It is defined as a "regenerative system in which resource input and waste, emissions and energy leakage are minimized by slowing down, narrowing and ideally almost completely closing material and energy loops. This is achieved through sustainable design, maintenance, repair, reuse, rework, refurbishment and recycling" (Govindan et al., 2018). In this way, the new circular thinking goes beyond making even more "sustainable" products, and emphasizes the reuse of materials that already exist. This economy requires a "product-service shift" by moving from selling a product to renting it out through leasing contracts (paying for use instead of ownership). Stahel added an economic motivation, stressing that product life extension services such as monitoring and repair should lead to increased job creation.

This is "an economic model in which planning, resources, procurement, production and processing are designed and managed as a process to maximize ecosystem functioning and human well-being" (Murray et al., 2017:371).

Strategies to maximize product life and reusability have emerged, such as design for recycling, design for disassembly, and design for remanufacturing. (Geissdoerfer, 2017). These strategies are crucial at the design stage of the production process, not just at the end when the waste has already been produced. Most products currently on the market are designed with planned obsolescence in mind. (Dodick 2017).

The circular economy implements a strategy of production and consumption in which we share, lease, reuse, repair, refurbish and recycle existing materials and products for as long as possible. In this way, their life is extended.

This leads to a maximum reduction of waste. When a product reaches the end of its life, its materials are kept within the economy for as long as possible. They can be productively used again and again, thereby creating additional value. However, the concept of a circular economy is far from exhausted there. The idea here is to produce products in a way that allows them to be easily maintained or transformed

into other products later on (so-called product transformation), with businesses being responsible for them even after they are sold. To close the circle, each industry works with the others and uses their waste material (so-called industrial symbiosis).

In conclusion, it is possible to define circular economy as "a system for the whole economy, planned to be able to regenerate itself, removing waste and toxic substances, which takes into account every product and by-product, by design, nutrient of biological or technical nature, intended to remain in the ecosystem and creating new capital, with minimal loss of value and damage to the biosphere, in an endless cycle" (Huier, 2018:14). The circular economy therefore represents an innovative development paradigm, offering cutting-edge models for production, distribution, consumption and recovery.

Good practices for the development of the circular economy in Bulgaria

The circular economy seeks the balance between economic growth, social development and environmental protection. The problem is in their implementation, because they face resistance from existing practices, and hence the need for systemic changes in management, the value system and consumption patterns.

Here are some socially responsible strategies applied by Bulgarian companies in recent years, which help to start replacing the linear economic model with a circular one, allowing the transformation of waste into resources through recycling and reuse, by introducing innovative technologies, by changing consumption pattern. These strategies focus on recycling practices, the use of energy-saving technologies and environmental protection, transition to circular products and passive (close to zero carbon emissions) production.

Biomic is a biotech startup revolutionizing packaging. The company offers packaging fully compliant with the principles of the circular economy. One of the technologies Biomik is developing transforms agricultural waste such as straw with the help of a type of sponge into an alternative to Styrofoam – a light packaging with thermal insulating and stroke-resistant properties, which, however, does not rot for 300 years in the meadow at the end of its life cycle. In contrast Biomic product can be utilized, as it decomposes completely, turning into fertilizer, and we can even compost them ourselves.

Nasekomo are another such example. The first biotech company in Eastern Europe to produce fodder from insect black fly (Hermetia illucens). The team has found a solution how to produce food again from organic food waste using a natural mechanism. Currently, Nasekomo's product is concentrated protein. Suitable for feeding aquatic crops and pets. Their goal is to build their first industrial factory because this is an industry with huge potential.

Remixshop recycles and reuses clothing and accessories. The clothes are collected by recycling companies who separate them by type and quality. The best

quality – clothes with little or no signs of wear are resold in Europe, USA and Russia. The other quality clothes are sold in other parts of the world or recycled to make materials: fabrics, threads or other derived materials, such as gaskets for the interior of cars. In addition to selling second-hand clothes from abroad, Remix offers its customers to sell their preserved fashion items on their platform, thus making them part of the circular economy.

Another example is Zona Urbana. In 2004 experimentally made their first bags from recycled parts – with pockets from old billboards and a shoulder strap from blocked car seat belts. Subsequently, the brand also offers a number of other products. Despite its growing popularity in the country, most of Zona Urbana's customers are still foreigners.

Zero Wave – a company that is involved in the production of biodegradable tableware, crackers and flour from a material that is thrown away and treated as garbage – the residual malt after the production of beer. And with each package you "save" 100 g of malt from being thrown away. They come in several flavors – sunflower seeds and sun-dried tomatoes, pumpkin seeds, white and black sesame.

The Harmonica company makes a beer with the wonderful name "From nothing – Something", because they produce craft beer from bread that has not reached the table. To make it, in addition to the familiar Bulgarian barley malt, German yeast and hops, they also use a special ingredient – unsold bread with which they replaced 20% of the malt in the recipe. In this way, new life is breathed into a completely edible food product that would otherwise end up in the trash. Beer is offered in 3 variants – light and dark ale, and wheat beer.

Infinity Toy Box creates a toy library in our country. Children quickly lose interest in a toy, others outgrow them, and there isn't always another kid around to do a neighborly exchange with. Just like in an (online) store, you go to a website and choose a toy for your child, and it comes to your door. But here come already used, but preserved and cleaned toys that are ready to continue their mission to put a smile on a child's face. You can keep the box for a week or several months, depending on the subscription you choose.

Woood Makerspace is the first shared workshop and creative center in Sofia. Within 400 sq.m. shared space and co-working space, the workshop gives not only a field for expression 24/7, but also a bunch of tools, machines and specialized equipment for the more handy ones. They also organize courses and workshops on ceramics, wood carving, 3D printing, etc. Woood is for designers, artists, crafters, engineers, inventors, freelancers and entrepreneurs. For anyone with an idea, a project, a prototype, Woood saves the commitment to long-term rentals, investment in inventory and maintenance.

Conclusion

In order to successfully meet the EU's goals for efficient use of resources by 2030, the transition to a circular economy model should become a state priority. It is not enough to increase energy efficiency or reduce emissions, although these are also significant steps. It is necessary to expand the concept not only to reducing waste and its recycling, but also to consumer awareness, maintaining the life cycle of the product, breaking the dependence between economic growth and waste production.

There is significant potential to increase the awareness and ambition of SMEs to increase their resource efficiency and develop products and services for green markets.

The circular economy offers concrete solutions to these challenges through new business models related to recycling, reuse, eco-design and renovation. In this sense, it is an opportunity to break the link "increasing added value and increasing use of non-renewable resources", while simultaneously offering solutions that reduce environmental damage and generate jobs.

The circular economy model aims to radically change not only production, but also consumption, by imposing measures based on functionality and sharing, instead of the use of single-use or limited-use products. In turn, consumers must also actively contribute by gradually changing their consumption pattern – from "consumer" to "user" and from "owner" to "sharer". Creating more demand for services of this type will drive a change in attitudes and business.

Innovative projects connecting the circular economy and sustainable territorial development allow creating many synergistic effects, thanks to which various aspects of sustainable development – economic, social and environmental – are dynamized. The current COVID-19 pandemic has hit low-income people the hardest. Any reforms and measures to deal with the consequences of the crisis should allow the transformation of the economic model into a sustainable, ecological and digital one, giving new perspectives and competitive opportunities, as well as a new quality of life. In order for such projects to be successful, however, it is necessary to combine many conditions.

The transition to a circular economy allows Bulgaria to transform its own economy – from a low-efficiency and resource-intensive one to an economy based on knowledge, digitalization and green growth, generating high added value and guaranteeing long-term sustainability. This will allow finding a balance between economic growth, the health of ecosystems and social development.

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Contact person information: Professor Albena Miteva, Natural Resource Economics Department, UNWE, e-mail: albenakm@yahoo.com

PROFITABILITY IN FARMING-PRESUMPTION FOR DIGITALIZATION. EMPIRICAL EVIDENCE FROM BULGARIAN HORTICULTURE

Desislava Ivanova[35], Evgeni Genchev[36]

РЕНТАБИЛНОСТ В ЗЕМЕДЕЛИЕТО-ПРЕДПОСТАВКА ЗА ДИГИТАЛИЗАЦИЯ. ЕМПИРИЧНИ ДАННИ ОТ БЪЛГАРСКОТО РАСТЕНИЕВЪДСТВО

Десислава Иванова, Евгени Генчев

Abstract

In this article, we investigate the impact of selected factor variables in two directions, on the one hand their impact on the financial performance of firms in the agrarian sector and on the other hand as a prerequisite or barrier to investments related to digitalization in the sector. We use an econometric model with fixed effects of panel data to estimate the dependence between the activity results and the selected variables, taking into account the influence of the individual characteristics of the enterprises. The study is based on 733 companies operating in the "Crop farming" sector (NACE.BG – 2008), and covers a period of 13 years (2007 – 2020). Our dependent variable is the return on assets (ROA), and our assessment aims to analyze the main determinants that form it, such as debt level, size and age, etc.

Key words: panel data regression, profitability, debt, diversified firms, agriculture

JEL: Q12; Q14; C13; C23

Introduction

Agriculture in Bulgaria is facing a number of challenges given the upcoming programs for financing digitization and innovation in the sector. The structure of the industry in terms of farm size shows an overly large share of micro and small farms. Internal risks, such as financing, lacking the opportunity to realize economies of scale, and level of specialization will have negative effects both on the possibility of future higher profitability and as a barrier to subsequent measures related to encouraging farmers to use more environmentally friendly agricultural practices.

[35] Associate Professor, D.Sc. Trakia University, Stara Zagora, desislava.ivanova@trakia-uni.bg; Assoc. Prof., Trakia University.

[36] Associate Professor, D.Sc. Trakia University, Stara Zagora, evg_gen2000@abv.bg; Assoc. Prof., Trakia University.

Literature revenue

A number of authors have suggested that farm size can have a significant impact on many economic aspects of the farm, including its profitability. In a study of agricultural farms in Italy, the authors Henke et al. (2022) base their findings on three studied years, 2008, 2013 and 2018, but in fact the time period covers a whole decade, and it also affects the impact of government policy on supporting these farmers. They prove that firms tend to diversify their activities as the size of the areas used increases and return decreases as their size increases. The dependent variable used, return on assets (ROA), shows how effectively a firm's management uses its total assets to generate positive cash flows. Their research concluded that firms producing multiple products have a lower return on assets. The authors explain this fact by the degree of specialization of the farm. In another study of a sample of 1,612 small farms in Poland in the Farm Accounting Data Collection and Utilization Database (FADN) from the 2018, the authors Strzelecka and Zawadzka (2021) determined small farms as less intensive in terms of gross investments and with a lower potential for profitability growth.

A publication by Bojnec & Latruffe (2013), dedicated to the interrelationships between the size, state subsidies and financial performance of farms in the agrarian sector in Slovenia for the period 2004 – 2006, the authors come to the following significant conclusion: Small farms are less technically equipped, but relatively more financially efficient. While medium-sized farms accumulate all the disadvantages in terms of efficiency: they are more unprofitable than small-sized ones.

In a study by Kryszak et al. (2021) the authors use variables, some of which we also implement in our model: e.g. debt to assets ratio. As can be assumed, the high degree of indebtedness also leads to lower financial results. On the other hand, they find that the large share of liquid assets has a direct relationship to their return.

Based on a study by Nyamao et al. (2012) conducted in Kenya on 41 agricultural farms for the period 2014 – 2018. the authors conclude that younger farms are more profitable than older ones, and that more efficient capital management positively affects their profitability.

Data and methodology

Data

The main source of data for this study are public company balance sheets for a 13-year period of the studied group. The study is based on a stratified proportional sample covering a total of 733 farms (9529 observations) from the "Crop farming" sector (A01, A02, A03), (KID 2008), for the period 2008 – 2020. The sample structured in this way overcomes a number of limitations regarding increasing statistical efficiency and providing adequate data for analyzing the different subsets separately. On the other hand, it overcomes potential problems with periodicity, with data reporting and the adopted methodology of NSI.

Small farms have the highest relative share (72%) of the "Crop farming" sector, followed by micro farms (19%) and 7% of medium-sized companies. In the sample, there are no sharp changes over the individual time periods in the relative shares of farms operating in the sector, which indicates to some extent the preservation of the structure of the sectoral performance in the country.

Variables

The choice of variables in the regression model is dictated by the possibility to highlight the financial performance of the companies and the factors that determine it. On the other hand, we assume that the observed dependencies will show the possibility of subsequent digitalization of farms and the barriers that this will encounter in the medium term. We accept that internal determinants and financial sustainability are prerequisites for the formation of subsequent investments in intangible assets and development activity. Table 1 presents all variables included in the regression equation.

Table 1. Description of the study variables

Variable	Explanation	Formula
Depend variable		
ROA	Return on assets	Net revenue/Total assets
Explanatory variables		
SG	Sales growth	$(Sales_t/Sales_{t-1})$
CR	Current ratio	Current assets/Current liabilities
DR	Debt ratio	Total debt/Total assets
DSC	Debt service capacity	EBITDA/Total debt
Firm size	Natural log of Total assets	LN (TA)
Age	Age of the firm operation	LN (Age)

In order to highlight the effectiveness of company management in turning assets into profit, the economic profitability indicator was used. Annual sales growth rate is taken as a factor positively correlated therewith. In agriculture, and especially for small farms, the possibilities for raising funds and capital are more limited. The financial risk depends on the relative share of financing using loans with fixed payments. Interest on loans – as a constant financial expense, increases the risk in relation to the company's profit. A number of studies postulate the positive role of debt in the financial performance of companies (see Jensen & Meckling (1976), Gebauer et al. (2018), Gloy et al. (2002).

On the other hand, a number of authors examine the effect of farm size and years of existence of the firm on profitability. For example, Pokharel et al. (2019) prove

realized greater economies of scale in large farming structures and a positive correlation with return on capital. Bojnec, & Laure (2013), examine the role of size and subsidies in technical and economic efficiency in Slovenian farms. The relative share of subsidies in the total production is a criterion that shows the effectiveness of the use of subsidies, but its non-application in this study is dictated by the fact of the lack of large company structures that are a proportional part of the total population to derive significant results in the model.

Methodology

To reveal the main characteristics of the samples and to investigate whether the fixed-effect model or the random-effect model should be used, we perform a F test and a Hausman test. A modified Wald model test was applied to examine group heteroskedasticity. Under the current specification, our initial hypothesis that individual-level effects are adequately modeled by a random-effects model is categorically rejected. Finally, the regression model is used to demonstrate the effects of factor influences on profitability.

The choice of this model is also dictated by the possibility of monitoring the individual characteristics and effects that are included in the model as a constant. In this way, it becomes possible to correlate the explanatory variable with the individual effects of each observed unit in the group.

$$y_{it} = \beta \mathrm{x}'_{it} + \alpha_i + u_{it}$$
$$\hat{\alpha}_i = \acute{y}_i - \acute{\mathrm{x}}'_i \hat{\beta}$$

where:

– α_i (i=1….n) is the unknown intercept for each entity
– y_{it} is the dependent variable (DV) where i = entity and t = time.
– x'_{it} represents the independent variable
– β is the coefficient
– u_{it} is the error term

For the purposes of this study, the following fixed-effects panel data regression model was used:

$$ROA_{it} = \alpha_0 + \beta_1 SG_{it} + \beta_2 CR_{it} + \beta_3 DR_{it} + \beta_4 DSC_{it} \beta_5 LNFirmSize_{it} + \beta_6 LNAge + \epsilon_{it}$$

Where ROA is the return on assets, β1, β2, β3, β4, β5, β6 are the regression coefficients of independent variables, CR is the current ratio, DR is debt ratio, DSC is debt service capacity, Age is the ln of a number of years has been in operation, Size is the ln of total assets, and ϵ_{it} is the error term.

Discussion of the results

The results of the descriptive statistics (Table 2) show that the average profitability of assets for the sector "Crop farming" is 10%. The relative share of liabilities to total assets is 37% and the share of short-term assets remains high (54%), which is not unusual for some sub-sectors in the industry. In farms with field crops and vegetables, there is a trend towards an increase in the share of short-term assets in the total amount of assets, while in those with permanent crops, the opposite trend is observed. The average age of the farms is 23 years, with the youngest farms being 11 years old and the oldest being 30 years old. The standard deviation as a measure of the amount of variation indicates low levels for almost all observed variables, while for the debt servicing capability (DSC), a high standard deviation indicates that the values are spread over a wider range.

Table 2. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	9492	0.105	0.177	-0.846	4.735
DR	9474	0.372	0.694	-0.015	55.333
DSC	9462	1.557	15.051	-12.706	106
SG	9068	0.173	4.232	-0.102	125.3
LN (TA)	9474	7.775	1.006	1.386	12.061
CR	9474	0.541	0.197	0.0	1.138
LN (Age)	9492	3.129	0.204	2.397	3.401

The correlation matrix (Table 3) testifies that there is no significant relationship between the studied variables.

Table 3. Matrix of correlations

Variables	ROA	DR	DSC	SG	Firm size	CR
ROA	1.000					
DR	-0.135	1.000				
DSC	0.132	-0.086	1.000			
SG	-0.007	0.015	-0.000	1.000		
Firm size	0.176	-0.146	0.014	-0.014	1.000	
CR	0.197	-0.007	0.015	-0.017	-0.315	1.000

The Hausman test and the modified Wald test are shown in Table 4. The model rejects the null hypothesis (Probability = 0.0000), indicating that the fixed effect model should be selected. The calculated modified Wald statistic for group heteroscedasticity in the residuals of the fixed-effect regression model, following Green (2000) we evaluate this model assuming homoscedasticity.

Table 4. Hausman test and modified Wald test

	The Null Hypothesis	Coefficient
Hausman test	H0: Difference in coefficients not systematic	Chi2 (733)=228.832 Prob. > chi2 = 0.0000
Modified Wald test	$Ho: sigma\ (i)^2 = sigma^2$ for all (i)	Prob. > chi2 = 0.0000

The model was evaluated in Stata 15.1. The parameters, estimates and statistics of the model are shown in Table 5. Due to the presence of collinearity between the dependent and one of the explanatory variables – the age of the examined farms (LN Age), it was excluded from the model. The F statistic for the overall significance of the parameters is large enough to reject the hypothesis that the parameters do not explain changes in the dependent variable ROA.

Empirical results show that high indebtedness of farms has a negative impact on their profitability and financial performance. This conclusion is supported by the study of Ferjani, Koehler (2007), who also report the negative impact of high levels of debt on the income of Swiss farmers. The high values for micro farms confirms the hypothesis that they are forced to function with a high degree of indebtedness and difficult access to financing. Given the fact that the reported average levels of short-term assets in the total asset structure is over 50%, we expected a negative impact on economic profitability. We assume that the reported positive relationship is due to the specifics of crop farms, but the relationships between different types of assets are not of primary importance in the formation of farm profitability. On the other hand, analyzing the financial position on the basis of assets in agriculture has a number of disadvantages. Part of the assets are not liquid; their balance sheet value is conditional, etc., which implies the inclusion of other indicators in the models in order to have a good range of assessment factors.

The results of additional explanatory variables are consistent with expectations and previous empirical research (see Pokharel et al. (2020)). For example, farm size has a negative effect on profitability. We assume that this is due to the characteristics of the population – micro and small farms that cannot realize economies of scale. Thus presented, the size does not assess real investment opportunities and/or financial condition, all else being equal.

Table 5. Regression results of the model

ROA	Coef.	Std. Err.	t	p>|t|	[95% Conf.	Interval]	Sig
DR	-0.056	0.008	-7.05	0.000	-0.072	-0.041	***
SG	0.002	0	-0.21	0.830	-0.001	0.001	
DSC	0.001	0	7.13	0.000	0.001	0.001	***
Firm size	-0.016	0.004	-3.83	0.000	-0.024	-0.008	***
CR	0.276	0.014	19.21	0.000	0.247	0.304	***
Constant	0.106	0.037	2.87	0.004	0.034	.178	
Mean dependent var		0.109	SD dependent var			0.179	
R-squared		0.062	Number of obs			9041	
F-test		110.524	Number of groups			733	
rho		0.338	Prob > F			0.000	

*Notice *** p<.01, ** p<.05, * p<.1*

Borrowers' liquidity as measured by debt servicing capacity (DSC) is positively correlated with return on assets and indicates that farms manage to cover their loans and liabilities with a portion of profits.

The annual growth rate of sales is taken as a factor positively correlated with farm profitability. In the empirical study, this factor is not statistically significant. We control for growth opportunities using net sales growth. Inevitably, the high growth rate of sales is a prerequisite for higher profit and a generator of growth.

The obtained results for the unexplained variance (rho) postulate that 34% of the result is due to the individual characteristics of the crop farms.

If we assume that the degree of digitization will largely depend on the enterprise's ability to invest, which in turn depends on its profitability, then the factor that would favor it is monitoring the level of indebtedness and taking adequate measures by the farm management.

Conclusion

In this paper, we aim to evaluate a fixed-effects regression model of determinants of return on assets. We attempted to analyze the direction and power of influence of the capital structure, the size of the farms, their liquidity as borrowers and the growth of their net sales in order to highlight the factors that inevitably influence the result, but are also a prerequisite or a barrier for the upcoming digitalization of the sector.

The obtained results showed positive and significant influences of the debt servicing capacity (DSC) and the value of short-term assets in the total asset structure (CR). We found negative and significant effects on return on assets for farm size (lnTA) and financial leverage.

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Author contact information:
Assoc. Prof. Desislava Ivanova, Trakia University, Stara Zagora, e-mail: desislava.ivanova@trakia-uni.bg
Assoc. Professor Evgeni Genchev, PhD, Trakia University, Stara Zagora, e-mail: evg_gen2000@abv.bg

POTENTIAL FOR DIGITALIZATION OF AGRICULTURE IN BULGARIA

Rumyana Angelova[37], Georgy Zhelyazkov[38], Dimitrina Stoyancheva[39]

ПОТЕНЦИАЛ ЗА ДИГИТАЛИЗАЦИЯ НА ЗЕМЕДЕЛИЕТО В БЪЛГАРИЯ

Румяна Ангелова, Георги Желязков, Димитрина Стоянчева

Abstract

The level of digitalisation in society, and particularly in agriculture, is a focus that attracts the attention of many researchers. The results of their research are transformed into programmes and strategic documents aimed at overcoming the digitisation gap by creating conditions for the implementation of digital technologies in agriculture. This report presents some of the results obtained with respect to a survey carried out among companies in the agricultural sector, and mainly the livestock sub-sector. The data show a relatively low level of digitization and readiness for investments in this area. There is also a direct correlation between the size of enterprises in terms of staff number and the pursuit of digital transformation.

Key words: digitalization, digital technologies in livestock production

JEL: Q01, Q12

The digitalization of society has attracted the attention of the global political and economic elite since the beginning of the second decade of the 21st century. The European Union has developed a number of strategic documents concerning artificial intelligence and cybersecurity, which are subordinate to the Digital Single Market Strategy for Europe (European Commission, 2015). They are all united by the general objective of developing the economy by facilitating the use of big data and the uptake of digital technologies in all spheres of public life. The European Commission has issued a Declaration on Digital Rights and Principles of the Digital

[37] Chief Assistant, PhD, Department of Industrial Business and Entrepreneurship, Trakia University, Bulgaria, rumi2002@abv.bg

[38] Professor, PhD, Department of Industrial Business and Entrepreneurship, Trakia University, Bulgaria, george-zh@mbox.digsys.bg

[39] Associate Professor, PhD, Department of Industrial Business and Entrepreneurship, Trakia University, Stara Zagora, Bulgaria, dimitrina.stoyancheva@trakia-university.bg

Decade, where the period from 2020 to 2030 is seen as the "Decade of Digitalisation" (European Commission, 2022).

The assessment of the level of digitisation and digital transformation of the countries of the European Union is performed every year and is subject to a strictly defined methodology (OECD, 2008) developed by the Organisation for Economic Cooperation and Development (OECD), that includes four main indicators: connectivity, digital public services, human capital and integration of digital technologies. Each of them has separate sub-indicators that are part of the general index – DESI (European Commission, 2021). For example, the 'Human capital' indicator examines: the availability of basic digital skills, software skills, specialists with skills in the field of information and communication technologies (ICT specialists), etc. The 'Connectivity' indicator examines the overall prevalence of broadband internet access among households, fixed broadband internet access with a speed of at least 100 Mbps, mobile broadband with a coverage rate of 4G, etc. The 'Integration of digital technologies' refers to the availability of digital infrastructure, the use of social media, the analysis of big databases, the issuance of electronic invoices, distance selling by electronic means, etc. Research on 'Digital public services' concerns e-government, digital e-services for citizens and businesses, etc. Depending on the objectives of the annual surveys and in view of the dynamics of the above indicators, some of them are amended, removed or new ones are added.

The latest data from the Digital Economy and Society Index (DESI) from 2021 rank Bulgaria as one of the last among the countries of the European Union (European Commission, 2021), although the data show some progress in terms of digitalisation and competitiveness. For instance, persons with at least basic digital skills amount to 29% of the total population of Bulgaria. At EU level, this percentage is 56%. For the 'Integration of digital technologies' indicator, the data are presented in Table 1:

Table 1. Comparative analysis by the Integration of Digital Technologies indicator for Bulgaria vs. the EU – DESI, 2021

Indicator	Bulgaria – DESI, 2021	EU-DESI, 2021
1. Electronic sharing of information	23%	36%
2. Social Media	10%	23%
3. Big Data	6%	14%
4. Cloud Computing Services	8%	26%
5. Electronic Invoices	10%	32%
6. SMEs selling online	8%	17%

Source: European Commission, Digital Economy and Society Index (DESI), 2021, Bulgaria https://ec.europa.eu/commission/presscorner/detail/en/ip_21_5481

For the other two indicators ‘Connectivity’ and ‘Digital public services’, there is also a significant lag. The applied digitization assessment methodology is applicable to all areas of public life. Its indicators have also been used in connection with a study on the level of digitisation in the agricultural sector, in particular the livestock sub-sector. For this purpose, in 2021 a survey of 80 Bulgarian SMEs and large enterprises operating in it was carried out regarding some of the sub-indicators of the indicator ‘Integration of digital technologies’. In this report, we present some of the obtained results, which introduce us to the process of digital transformation of agricultural holdings. Micro-enterprises are excluded from the study, although their share is highest – nearly 98% (they are both legal and natural persons), due to a lack of specific statistical information that concerns them[40]. The figures show that:

39.29% of the surveyed companies inform about an active website or page on social media. Another 17.86% report that they currently do not use one, but plan to create one in the future. A considerable part – 42.86% – claim that they do not have and do not plan to set up their own website or page on social media. The analysis of the survey carried out according to groups of enterprises on the basis of the criterion 'Number of employees' provides additional information. For example, 16.7% of companies with "up to 5 employees" respond that they have their own website. As the number of staff increases, there is an increase in the percentage of respondents, i.e. those who already have or are planning to create their own social networking site or page – see Figure 1 . The conclusion is that there is a direct correlation between digitisation and the size of enterprises on the basis of 'Number of employees' and the livestock sector. As staff numbers increase, the level of digitization improves.

- With regard to the functionalities of the available website, the requested enterprises reply as follows:
  - Most of them – 90.91% say that they provide a description of the goods or services offered, and also price lists which can be found on some of their pages.
  - Some of them -12.12% – report about an opportunity for online orders;
  - Tracking the status of orders placed also has about 12.12%, i.e. all those who have the option of online orders also have this functionality;
  - Links to the company's social media accounts make 42.42% of the web pages;

[40] According to the latest NSI data from 2020, the number of agricultural holdings in Bulgaria is 132400, and it is not specified whether they operate in the crop cultivation, or livestock sector (Ministry of Agriculture, Food and Forestry, 2020)

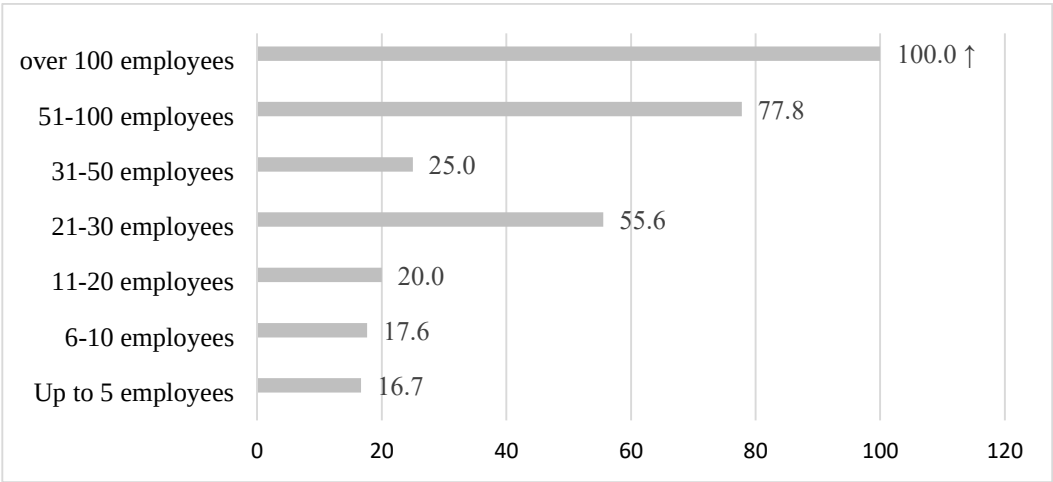

Figure 1. Availability of an active website or social media page

➢ Online sales are poorly represented among the surveyed companies in the livestock sector. Those who target such sales most often use their own websites and less often electronic platforms for trading goods and services over the Internet or social networks – Table 2:

Table 2. Online Sales Channels

	Regularly	**Sometimes**	**Never**
Own e-commerce website or app	3,75%	8,75%	87,5%
Electronic platforms for trading goods and services over the Internet (e.g. eMAG, eBay, Amazon, Alibaba, etc.)	1,25%	2,5%	96,25%
Social media – Facebook	1,25%	8,75%	90%

➢ The use of cloud technologies is a common practice among the representatives of SMEs from the livestock sector. The most widespread is the use of e-mail – for 95% of companies, followed by specialized software – 23.75% and hosting of the enterprise database – 22.5%. Some of the companies surveyed indicated the use of more than one of the cloud computing services. The detailed analysis of the indicator Enterprise size also presents a direct relationship between the number of staff and the level of digitization – Table 3:

Table 3. Use of cloud technology – percentage distribution by staff number

	Up to 5 employees	**6-10 employees**	**11 – 20 employees**	**21-30 employees**	**31-50 employees**	**51-100 employees**	**over 100 employees**
Email	100,0	100,0	93,3	100,0	83,3	88,9	100,0
Specialized software	0,0	11,8	20,0	44,4	25,0	33,3	66,7
Enterprise Database Hosting	8,3	0,0	13,3	22,2	33,3	44,4	83,33

Companies with fewer employees rarely use more than one cloud technology. As the number of employees grows, so does the rate of using two or more cloud computing services.

When comparing the areas of application of digital solutions, more than 90% of farmers indicate that they would invest in process automation and remote communication solutions with clients and counterparties – see Figure 2. Only 8.8% of the producers surveyed would incur more investment costs to increase the level of digitalisation at this stage. The relative share of respondents of 16.3% can be described as low for their willingness to invest in the training and development of IT skills of their employees.

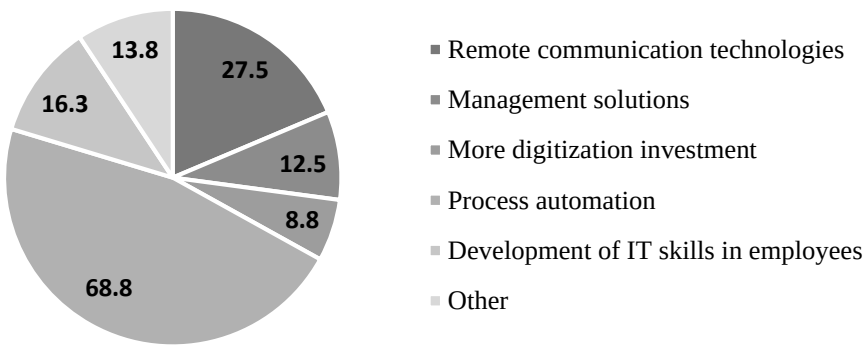

Figure 2. Readiness to implement selected smart solutions

In the survey, part of the questions is focused on the readiness of farmers to integrate digital solutions into their management activities. The initial results show a high willingness of the surveyed enterprises to implement smart solutions for the financial management of the activity, which is most pronounced in managers of medium and large enterprises – see Figure 3. Small businesses are experiencing an increase in readiness corresponding to the growth rate of their employees. With an average staff list of up to 20 people, 40% of managers indicate that they would

rather use a digital approach for management solutions, while following a rise in staff number of up to 50 people, the relative share of positive responses with complete confidence increases to 58%.

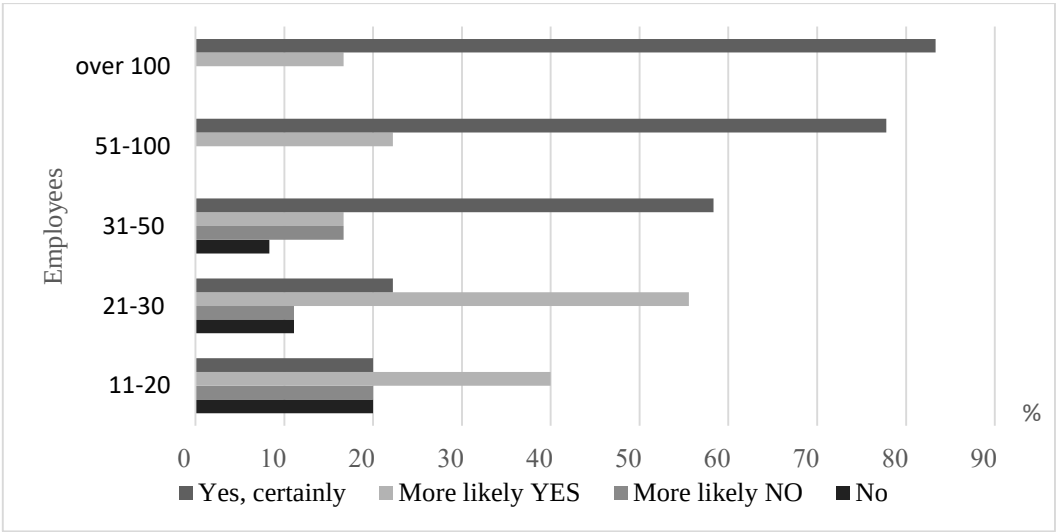

Figure 3. Readiness to use IT for financial management

Also, medium and large enterprises have taken steps to invest in digital technologies in the medium term – see Figure 4. The most prominent investment activity is observed in enterprises with an average staff number of over 100 employees – nearly 90% of them already implement and have planned costs related to the use of digital technologies.

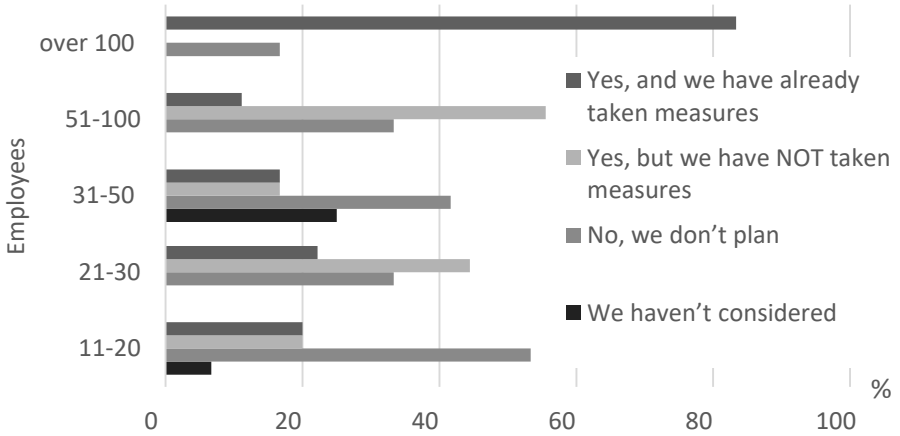

Figure 4. Availability of planned IT investments in the next three years

It is noteworthy that small enterprises do not plan to make investments in digital solutions in the next 3 years, and to the greatest extent this result applies to enterprises with personnel of up to 10 employees. We can assume that together with other factors (availability and speed of Internet connection, IT trained employees, etc.), the low propensity to introduce digital solutions is manifested due to a weak need to optimize the sharing of information with counterparties, as well as within the organization.

Conclusion

The performed study on the readiness of farmers to apply and use digital technologies is an attempt to clarify the process of digital transformation of farms, in the context of insufficient public data.

In conclusion, we can point out that medium-sized and, above all, large companies are reaping the benefits of digital technologies and are ready to increase their investment in this area in a mid-term perspective. A high percentage of companies – over 90% maintain a website with a description of the goods offered, but only 12% of them currently offer the opportunity to place online orders. There is a clear need to implement digital solutions for remote communication with clients and counterparties. Also, of the cloud technologies used, only one in five enterprises uses a hosting database of the enterprise. As an effect of the initial phase of digital transformation, there is also a weak willingness of agricultural enterprises to invest in the IT skills of their employees.

The level of digitalization of agriculture is at its initial stage, with the implementation of digital transformation lagging behind the countries of the European Union. In order to overcome the lag in the field of digitalisation, compared to the EU average, Bulgaria is taking a number of steps, such as: adoption of the "Strategic Framework for the Development of Education, Training and Learning for 2021 – 2030" (Ministry of Education, 2021), the strategic document "Digital Transformation of Bulgaria in 2020 – 2030" (Council of Ministers, 2020), establishment of digital innovation centres under the Digital Europe programme (European Commission, 2021), Draft program "Competitiveness and Innovation in Enterprises 2021 – 2027" (OPIC, 2021), etc. These documents clearly seek to create conditions and accelerate the introduction of digital technologies in agriculture, with a need for greater refinement of the instruments through which this policy will be implemented.

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Contact person information: Chief Assistant Rumyana Angelova, PhD, Department of Industrial Business and Entrepreneurship, Trakia University, Bulgaria, rumi2002@abv.bg

THE PRICE OF AGRICULTURAL LAND IN BULGARIA – SELECTED FACTORS

Ventsislav Perkov[41], Radka Nenova[42]

ЦЕНАТА НА ЗЕМЕДЕЛСКАТА ЗЕМЯ В БЪЛГАРИЯ – ИЗБРАНИ ФАКТОРИ

Венцислав Перков, Радка Ненова

Abstract

The main goal of the report is to build a model to highlight the significant factors affecting the price of agricultural land in Bulgaria. Panel data for 9 years and 25 districts were used. Fixed-effect panel regression and stepwise regression were applied. The empirical results prove that the price of agricultural land in Bulgaria, for the considered period, is influenced by: the relative share of households with access to the Internet, the length of first-class roads and the average annual salary of employed persons. The existing differences in the variables by area also have a strong influence.

Key words: agricultural land price, factors, stepwise regression, panel regression, fixed effect model

JEL: C23, Q11, Q15

1. Introduction

Agricultural land is the main and indispensable factor for agricultural production. Together with its limitations as a natural resource, the issues and problems related to determinants influencing its price are the subject of intensified controversy in the economic literature and do not lose their relevance in the present, and are likely to have a corresponding projection in the future. The main goal of the report is to build a model to highlight the significant factors affecting the price of agricultural land in Bulgaria.

Agricultural land, in addition to its value and irreplaceability, has another important characteristic, namely dispersion. This feature is related to the influence of a set of heterogeneous factors, arising and changing depending on the specific location. For this reason, in order to conduct a worth scientific study, it is necessary to group the data ensuring maximum consideration of any spatial difference. For the territory of Bulgaria, it is expedient for the data to be differentiated by districts, as at the level of geographical areas the aggregation is large. In addition, for the purposes of the present study, at the district level, the geographical features of the

[41] Assoc. Prof., PhD, Tsenov Academy of Economics, Svishtov, Bulgaria.

[42] Head Assist. Prof., PhD, Tsenov Academy of Economics, Svishtov, Bulgaria.

land parcels can be distinguished well enough. The time scope of the study is limited to nine years (2010–2018), in order to avoid disturbances in the agricultural land market, as a result of the Covid-19 pandemic.

2. Materials and methods

In recent years, agricultural land prices in Bulgaria have risen at record levels (The Price of Agricultural…, 2018). Along with the traditional factors on which the price of the land depends (size of the parcel, location, access to road infrastructure, electricity, water and irrigation opportunities), the influence of the income that the property brings is also mentioned. The highest amount of rent in some places corresponds to the highest price of land there. Higher prices are also associated with the fact that agricultural land in Bulgaria is a limited resource. The forecast is that after 2020, according to the new reform of the Common Agricultural Policy, in case of change in the operation of direct payment schemes, or their replacement with other instruments, the current effect on the land and rent market, for a constant increase in prices, may change.

Feichtinger and Salhofer (Feichtinger & Salhofer, 2011) clarify the approach to hedonic price and the groups of factors that influence price. The hedonic approach[43] is based on the consumption theory, assuming that the price of goods, in the case of agricultural land, can be explained by certain characteristics that describe it (quality of agricultural land).

K. Kocur-Bera (Kocur-Bera, 2016) expresses a similar opinion about the hedonic models of agricultural land pricing. According to her, the main directions of using hedonic price models in the field of agricultural land pricing are rooted in three functional forms: linear, logarithmic and a combination of both. Donosoa, Cancino and Foster (Donosoa et al., 2013) apply a log-linear model, taking into account that logarithmic and linear models, used separately, give similar results, with the main advantage being the smaller relative error.

S. Johansson and P. Nilsson (Johansson & Nilsson, 2013) categorise theoretical and empirical research in the field of agricultural land pricing in two directions. The first direction is characterised by the capitalization of the standard income from agricultural land, where the expected return is capitalized in the land price. The second one focuses on asset pricing and has a hedonic basis, as the different prices of agricultural land cannot be explained only by its production capacity and the resulting income and payments from national agencies to farmers for its use. According to these authors, other factors that are included in the regression equations also influence here, and those taking into account the location of agricultural land

[43] The terms "hedonism" and "hedonistic" are derived from the word hedonic. In the present study, it is preferable to use the term "hedonic".

are among the most significant. In addition, a mix of the two approaches has been observed in recent years.

Czyżewski, Kułyk and Kryszak (Czyżewski et al., 2019) focus on land prices and its role in the sustainable development of the economy. The sources studied by them help the authors to come to the conclusion that the agricultural land prices cannot be well explained by the models for capitalization of rent and the use of present or future value for their calculation.

Devadoss and Manchu (Devadoss & Manchu, 2007) determine that rising land prices have both positive and negative effects on farmers. For existing farmers, the rising price of land is a positive factor, because in this way the value of their business increases, while for those entering the field of agriculture, this growth has a negative effect, as there is a need for large investments. The main factors influencing the price of land are economic, including the net income of a farmer, the level of production, the total productivity of the factors, government support, macroeconomic factors (land taxes, interest rates, inflation) and the number of population.

Duvivier, Gaspart and de Frahan (Duvivier et al., 2005) performs an analysis based on a hedonic price model and a capitalized rent model, including the price per hectare of land, rent from land sales on the market and rent from government support, population density per square kilometre, price increase of land, density of pigs per hectare of agricultural land, size of the agricultural land market and average size of farms in the surveyed municipality. They studied a panel of 42 municipalities over a period of 22 years from 1980 to 2001. The results of their study show that for the analysed period the sensitivity of the price of agricultural land to compensatory payments increased after 1993. When using a fixed-effect panel regression, it was found that the rent from the sale of agricultural land on the market has a large effect on its price. The price of agricultural land is not sensitive to changes in rents for a short period.

Nickerson and Zhang (Nickerson, Zhang, 2013) advocate the use of a spatial hedonic model to determine the factors influencing the agricultural land value. They examine the different types of hedonic models to study the factors influencing the agricultural land price and bring out the main problems in each of them.

Baylis, Paulson and Piras (Baylis et al., 2011) develop a hedonic panel model explaining the impact of climate change on agricultural land price. After applying a panel regression model, districts-fixed effect model, random effect model with fictitious variables, and a model with a spatially fixed error effect, as well as models for lag effects, the authors reach the following conclusions: a strong spatial effect is observed in the data used; climate change has different effects on the price of land near urban areas and remote areas and the effect of precipitation and temperature change is negligible.

Wang (2018) considers a simplified hedonic model for the formation of agricultural land price. Following four tested models, the authors highlight the following

significant dependencies: there is a strong spatial dependence; the factors reflecting the influence of human resources, temperature, payments made by the state and the distance to the nearest metropolis are among the leading independent variables that strongly influence the land price.

Shin and Kim (Shin & Kim, 2020) consider the impact of direct government payments as a prevention against the abandonment of agricultural land by its owners and link them to sustainable development in rural areas. A similar view is expressed by Levers et al. (2018).

Czyzewski, Przekota and Poczta-Wajd (2017) use a hedonic approach to study the factors influencing the agricultural land price in Poland. This approach is based on the inclusion of variables with qualitative data reflecting the potential significance of agricultural land to buyers in a given region, as a result of their purchase and sale transactions. The main quality indicators influencing the agricultural land price are distance from the town and distance from buildings. The building permit and the type of rural area are among the leading variables.

As a result of the conducted theoretical analysis, some summaries can be formulated on the existing formulations for the determinants of agricultural land price.

In the economic literature there is no single opinion about the influencing factors. This is somewhat understandable, because the agricultural land is not homogeneous and has different characteristics, according to its location, and the determinants are numerous and are grouped according to separate criteria, depending on the natural, production, demographic, social and economic characteristics of the specific objects of research. From this point of view, when analysing the factors influencing the price of agricultural land, a complex approach should be applied, combining separate elements from the indicated groups.

From the review of the literature sources, the conclusion which follows is that in determining the factors influencing the agricultural land price, there are two approaches – that of the capitalized rent and the hedonic approach. In the present paper, the influence of rent is not covered as a factor, because when it is included in the model, a very large part of the explained variation is due to it. The hedonic approach is used to highlight other factors that affect the agricultural land price. It is important that the constructed theoretical model must be adequate and proved empirically, therefore, the choice of variables is extremely significant. Many of the existing studies use many specific factors. The idea of the present study is to limit their number and to make the factors themselves universally valid. By using official statistics, comparability of the results is ensured, and in case of periodic conducting – it allows monitoring of the changes. In the present study, the focus is on the factors characterising the demographic, social and economic development of the districts.

From a methodological point of view, due to the specifics of the data, it is appropriate to use fixed-effects panel regression. In addition, because presumably the

influencing factors are many, it is necessary to reduce their number in an appropriate way. For this purpose, stepwise regression should be applied (Magnus et al., 2004).

It is important to justify how the number of factors influencing the dependent variable (the price of agricultural land) is reduced and only the significant ones remain in the model. To simplify the regression equation, it is appropriate to apply stepwise regression by the sequential elimination method (Makridakis et al., 1983). This means that all independent variables are initially included in the model, after which the one with the highest value of the F-criterion (or F>0,10) is removed. The process is repeated until only significant variables remain in the model (with F<0,10).

Due to the fact that the present study focuses on the factors influencing the price of agricultural land by geographical area, it is necessary that the data analysed be comparable and grouped appropriately. The National Statistical Institute (NSI) has a section "Regional Statistics", which provides data on key indicators by district and a sample of them is used here. Of these, eight variables were selected for the period 2010–2018 (NSI), for 25 districts (see Table 1).

Table 1. Variables for hedonic model

Group	Variable	Definition and Unit
Demographics	P^{total}	Population as of 31 December – Total (number)
Labour market	$AANELC$	Average Annual Number of Employees under Labour Contract (number)
	$AAWSELC$	Average Annual Wages and Salaries of the Employees under Labour Contract (BGN)
	EAR	Economic Activity Rate – 15 – 64 completed years (%)
	UR	Unemployment Rate (%)
Non-financial corporations	O	Output (million BGN)
Transport	$LCIR$	Length of Category I Roads (km)
Information society	$RSHIA$	Relative Share of Households with Internet Access (%)

The first variable characterises the demographic development by districts. Its inclusion is justified, as it is present in most of the studies in which a hedonic approach is applied. The other seven variables express the socio-economic development of the districts. Particular attention should be paid to the last two variables – Length of Category I Roads and Relative Share of Households with Internet Access. In the Strategy for the digitalisation of agriculture and rural areas of the Republic

of Bulgaria (Strategy for the digitalisation of agriculture and rural areas of the Republic of Bulgaria, 2019) it is stated that at EU level the gap between broadband internet coverage in rural and urban areas is large. With regard to Bulgaria, the European Commission reports that the total coverage with fixed broadband networks covers 95% of households, which is below the EU average. Another official document (Digital transformation of Bulgaria for the period 2020-2030, 2020) states that broadband internet access is one of the cornerstones of the digital revolution. Therefore, the transition to fourth-generation agriculture faces a serious challenge and the indicator by which its trends are observed (Relative Share of Households with Internet Access) must be present in the models, taking into account the impact on the main factors of production, such as agricultural land.

In the statement above, one of the main characteristics of agricultural land was mentioned – dispersion. In order to avoid its negative effect, the hedonic models include a factor related to the localisation of agricultural land. In this sense, through the variable "Length of Category I Roads", it is possible to take into account the growing need for transport connectivity in all districts of the country (Integrated transport strategy for the period until 2030).

The data on the price of agricultural land by districts are also extracted from the NSI, under the heading "Agricultural land market and rent in agriculture". The information on prices for individual years and districts, for the nine-year period of the survey (2010–2018), is marked as confidential. For this reason, three districts are dropped from the list of 28 districts: district Sofia-city, Kardzhali district and Smolyan district, as they are dominated by missing data. In order to obtain a balanced data panel, for three districts (Blagoevgrad, Kyustendil and Pernik districts) only for some years, missing values have been added (same as those from the previous or next period). As a result of combining the data, about 25 districts and for 9 years, a panel with a matrix containing 225 cases is obtained, which increases the possibility of conducting a better study.

The basic hedonic model, taking into account the influence of the selected eight factors on agricultural land price, has the following form:

$$P_{it} = \beta_0 + \beta_1 P_{it}^{total} + \beta_2 AANELC_{it} + \beta_3 AAWSELC_{it} + \beta_4 EAR_{it} + \beta_5 UR_{it} + \\ + \beta_6 O_{it} + \beta_7 LCIR_{it} + \beta_8 RSHIA_{it} + \varepsilon_{it}. \quad (1)$$

The variables measured in value (dependent P_{it} and independent $AAWSELC_{it}$ and O_{it}), were deflated by Consumer Price Indices (CPI) and adjusted to 2010 by own calculations.

3. Results and discussion

In Table 2, the results of building a hedonic model for the factors influencing the agricultural land price in Bulgaria for the period 2010–2018 are presented.

Table 2. Estimates for variables and statistics of the models

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
$RSHIA$	10,09728 (0.0000)	10,02065 (0.0000)	10,04960 (0.0000)	9,960535 (0.0000)	9,789806 (0.0000)	5,613290 (0.0000)	5,884823 (0.0000)
EAR	-0.440927 (0.9125)						
$AANELC$	-0.002979 (0.2289)	-0.003047 (0.2025)	-0.003495 (0.1180)	-0.000335 (0.3605)			
P^{total}	0.001039 (0.1731)	0.001056 (0.1558)	0.001065 (0.1517)				
O	-0.007936 (0.5892)	-0.007700 (0.5955)					
$LCIR$	-1,332689 (0.0002)	-1,343460 (0.0001)	-1,463904 (0.0000)	-1,403303 (0.0000)	-1,477028 (0.0000)	3,883787 (0.0850)	4,066013 (0.0716)
$AAWSELC$	0.048640 (0.0040)	0.048908 (0.0034)	0.046535 (0.0037)	0.041614 (0.0079)	0.041583 (0.0079)	0.075833 (0.0000)	0.065223 (0.0000)
UR	10,28716 (0.0004)	10,25358 (0.0004)	10,24706 (0.0004)	10,89635 (0.0002)	11,21808 (0.0001)	3,443115 (0.1763)	
β_0	-309,0228 (0,2651)	-335,6794 (0,0123)	-306,1936 (0,0118)	– 226,9887 (0,0360)	– 233,1427 (0,0309)	-815,0213 (0,0045)	-730,5163 (0,0091)
R-squared	0.430785	0.430753	0.430012	0.424600	0.422394	0.796788	0.794878
Adjusted R-squared	0.409703	0.412390	0.414324	0.411463	0.411892	0.767757	0.766765
F-statistic *Prob (F-statistic)*	20,43373 (0.000000)	23,45790 (0.000000)	27,41065 (0.000000)	32,32100 (0.000000)	40,22060 (0.000000)	27,44675 (0.000000)	28,27428 (0.000000)
Durbin-Watson stat	0.707475	0.704456	0.705006	0.701922	0.697050	1,587726	1,571089
S.E. of regression	220,9187	220,4153	220,0523	220,5890	220,5087	138,5696	138,8653
Sum squared resid	10541898	10542488	10556219	10656436	10697299	3763502	3798865
Akaike info criterion	13,67264	13,66381	13,65622	13,65678	13,65172	12,82041	12,82088

Source: own calculations (The calculations were made with the program GRETL).

As it can be seen from Table 2, Model 1 includes all eight factors. Although the model as a whole is significant (Fisher's criterion is 20.43373 with a significance of 0.000000), it is noticed that the coefficients for four of the variables are insignificant. These are: EAR, $AANELC$, P^{total} and O. For this reason, they need to be consistently excluded from the equation. At the first stage, the variable for the economic activity ratio (Model 2) is dropped, because its significance in Model 1 is the highest (0.9125). In the next step (Model 3), the variable for the output is dropped. In Model 4, the variable for the population is also excluded, and in Model 5 the last insignificant at this stage variable – average list number of employees under labour contract, is excluded.

As a result of the stepwise regression performed by the successive elimination method, the hedonic model of the factors influencing the agricultural land price in Bulgaria for the period 2010 – 2018 has the form (Model 5):

$$P_{it} = -233{,}1427 + 0{,}041583AAWSELC_{it} + \\ + 11{,}21808UR_{it} - 1{,}477028LCIR_{it} + 9{,}789806RSHIA_{it} + \varepsilon_{it},$$

i.e. with error probability of less than 5%. It can be argued that the influencing factors are: Average Annual Wages and Salaries of the Employees under Labour Contract, Unemployment Rate, Length of Category I Roads and Relative Share of Households with Internet Access. The statistics for the model show that 42% of the influencing factors are covered.

The next stage of the analysis is to take into account the spatial structure of the data. Model 6 is a panel regression with fixed effect included by districts. From the statistics of the model, Table 2 shows that the coefficient of determination increases, compared to the models not reporting a fixed effect, by 37% and is ≈80%. This shows that the spatial structure of the data has almost the same influence as the impact of other factors combined. At the same time, there is an increase in the significance of the coefficient for the variable "Unemployment rate" (0.1763), which requires it to be excluded from the model. In its final form, the hedonic model acquires the form (Model 7):

$$P_{it} = -730{,}5163 + 0{,}065223AAWSELC_{it} + 4{,}066013LCIR_{it} + \\ + 5{,}884823RSHIA_{it} + \varepsilon_{it}.$$

Interpreting the calculated coefficients, it can be summarised that the relative share of households with Internet access has the strongest impact on the agricultural land price, followed by the length of category I roads and the average annual number of employees under labour contract has a relatively smaller influence. The empirically proven results fully correspond to the modern development of agriculture and the agricultural land market in Bulgaria. The introduction of innovations related to the transition to "fourth generation" agriculture is unconceivable without internet access and a developed road infrastructure. Naturally, the higher amount of the average salary is associated with an increase in consumer attitudes to purchase various assets, incl. agricultural land, which reflects on the rise in its price.

The value of the Durbin-Watson Criterion for Model 7 indicates that there is no autocorrelation of the residues, i.e. the established regression is not false. The value of the Akaike information criterion indicates that Model 7 describes well the change in the studied variables.

The last stage of the analysis includes checking the appropriateness of including a fixed effect by districts in Model 7. The values of the parameters (F-statistic = 16,583765 (0.0000), Cross-section Chi-square = 248,709393 (0.0000)) show that they are significant and therefore the inclusion of a fixed effect in the model is justified.

In the Table 3, the results for the districts-fixed effect for Model 7 are presented.

The values confirm the presence of large spatial differences in the studied variables and once again prove that their consideration is necessary.

Table 3. Districts-fixed effect (Model 7)

District	Fixed effect	District	Fixed effect
Vidin	272,7711	Shumen	– 275,6287
Vratsa	182,3816	Burgas	-712,2919
Lovech	– 2,546358	Sliven	195,1512
Montana	372,2211	St. Zagora	-419,2894
Pleven	220,4169	Yambol	107,3425
V. Tarnovo	-88,96823	Blagoevgrad	333,3805
Gabrovo	– 212,5001	Kyustendil	42,21093
Razgrad	365,7987	Pernik	-118,2921
Ruse	139,7054	Sofia district	-1437,986
Silistra	520,6288	Pazardzhik	111,1154
Varna	-103,7033	Plovdiv	– 266,1975
Dobrich	801,9682	Haskovo	-312,7542
Targovishte	285,0654		

Source: own calculations (The calculations were made with the program GRETL).

4. Conclusion

In the present study, through a complex theoretical approach and application of stepwise regression by the elimination method and panel data regression, a model has been built that proves empirically that from a pre-selected group of eight factors, on the price of agricultural land in Bulgaria for the period 2010–2018, three factors have a significant impact: the relative share of households with internet access, the length of category I roads and the average annual wages and salaries of the employees under labour contract. Another important result is that the model for including a districts-fixed effect leads to an increase in the percentage of covered factors almost twice, which in turn confirms that its consideration in such studies is mandatory. The proposed methodology can be successfully adapted for other similar studies using panel data, and the basic hedonic model can serve as a starting point in searching for the factors determining the agricultural land price at different levels.

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Contact person information: Ventsislav Perkov, Assoc. Prof., PhD, Tsenov Academy of Economics, Svishtov, Bulgaria, Department of Commerce, e-mail: v.perkov@uni-svishtov.bg

Radka Nenova, Head Assist., Prof., PhD, D. A. Tsenov Academy of Economics – Svishtov, Department of Agricultural Economics, e-mail: r.nenova@uni-svishtov.bg

SPATIAL DISTRIBUTION OF IRRIGATED AREAS BY PLANNING REGIONS

Radka Nenova[44]

ПРОСТРАНСТВЕНО РАЗПРЕДЕЛЕНИЕ НА НАПОЯВАНИТЕ ПЛОЩИ ПО РАЙОНИ ЗА ПЛАНИРАНЕ

Радка Ненова

Abstract

The main objective of the paper[45] is to analyse the spatial structure of irrigated areas by planning regions and by categories of the utilised agricultural area in Bulgaria. Statistical data from the census of agricultural holdings were used for the empirical study, and from a methodological point of view, the correspondence analysis was applied. The results of the research can be used in the preparation of regional strategies covering the possibilities of mitigating the effects of climate change on Bulgarian agriculture through irrigated agriculture.

Key words: irrigated area by category, planning regions, correspondence analysis

JEL: Q12, Q15, C38

1. Materials and methods

The difficulties related to irrigated agriculture in Bulgaria and the need to develop a long-term vision for its development are recognised at the state level (Council of Ministers, 2016). On the other hand, the growing challenges to agriculture resulting from climate change can be overcome, towards adaptation, through irrigated agriculture. In scientific literature (Petkov Pl. et al., 2005), (Zagorova, 2008), attention is mainly paid to the problems with the legislation, the activity and the financing of the irrigation associations. The purpose of the paper is to analyse the spatial structure of irrigated areas by planning regions and by categories of utilised agricultural area in Bulgaria, for the period 2010 – 2016.

Actions until 2030, in the field of hydro-melioration in Bulgaria, must be implemented in two stages (Council of Ministers, 2016, p. 13):

- legislative – adoption of the Hydro-meliorations Act, regulating the transformation of "Irrigation Systems" EAD into Regional Hydro-melioration Enterprises;

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[44] Head Assist. Prof., PhD, Tsenov Academy of Economics, Svishtov, Bulgaria.

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- institutional – amendment to the Hydro-meliorations Act, with the aim of transforming the Regional Hydro-melioration Enterprises into Regional Hydro-melioration Management Authorities.

As of July 2022, the Hydro-meliorations Act has not been adopted yet. There are 14 branches of "Irrigation Systems" EAD (Irrigation Systems EAD, 2022). The available statistical information on the irrigated areas in Bulgaria is available from the Censuses of agricultural holdings (MAF, 2022), but in them it is presented by planning regions. The branches of "Irrigation Systems" EAD can be grouped by planning regions for the needs of the analysis, and the obtained results can be used according to spatial correspondences.

The branches of "Irrigation Systems" EAD fall within the boundaries of the planning regions, as follows:

- in the Severozapaden (Northwest) Planning Region – Vidin, Mizia and the Sreden Dunav (Middle Danube), while the boundaries of the Sreden Dunav (Middle Danube) include Gabrovo province, which by zoning falls into the Severen tsentralen (North-Central) Planning Region;
- in the Severen Tsentralen (North-Central) Planning Region – only one branch – Dolen Dunav (Lower Danube);
- in the Severoiztochen (Northeast) Planning Region – Shumen and the Black Sea;
- in the Yugoiztochen (Southeast) Planning Region – Gorna Tundzha (Upper Tundzha), Sredna Tundzha (Middle Tundzha) and Burgas;
- in the Yuzhen Tsentralen (South-Central) Planning Region – Topolnitsa, Maritsa and Haskovo;
- in the Yugozapaden (Southwest) Planning Region – Struma, Mesta and Sofia.

From a methodological point of view, the correspondence analysis (Michael, 2007) was chosen as a suitable statistical tool for two-dimensionally grouped data by category characteristics, because a reduction in the dimensionality of the source data is ensured through the relationships between the studied variables (Zhekova, 2008), in this case – planning regions and irrigated areas by crops.

2. Results and discussion

In order to trace the change in the spatial distribution of irrigated areas by planning regions, for the period of the three[46] censuses of agricultural holdings in Bulgaria, the correspondence analysis was carried out sequentially for each of the years – 2010, 2013 and 2016. The results are presented in Table 1.

[46] At the time of writing this publication, only preliminary data from the 2020 census of agricultural holdings has been released, which does not contain the necessary information for the needs of the current analysis.

Table 1. Summary of Correspondence

Dimension	2010			2013			2016		
	Inertia	Proportion of Inertia		Inertia	Proportion of Inertia		Inertia	Proportion of Inertia	
		Accounted for	Cumulative		Accounted for	Cumulative		Accounted for	Cumulative
1	0,131	0,661	0,661	0,116	0,573	0,573	0,125	0,601	0,601
2	0,042	0,211	0,872	0,055	0,272	0,846	0,057	0,275	0,876
3	0,013	0,064	0,936	0,025	0,124	0,970	0,018	0,084	0,960
4	0,009	0,045	0,981	0,004	0,021	0,991	0,008	0,038	0,998
5	0,004	0,019	1,000	0,002	0,009	1,000	0,000	0,002	1,000
Total	**0,198**	1,000	1,000	**0,203**	1,000	1,000	**0,208**	1,000	1,000
χ^2	170340,347			191321,424			17958,870		
Sig.*	0,000			0,000			0,000		

* 25 degrees of freedom

The number of dimensions depends on the number of active rows and column categories and is one fewer than the number of categories (Meulman & Heiser, 2005, p. 75). In this case all six variables have six categories. The maximum number of dimensions is five.

The coefficients from Table 1 are interpreted as follows:

✓ The total Inertia for all three years is about 20%;

✓ The part of the total Inertia that is due to the first Dimension is respectively: 66% for 2010, 57% for 2013 and 60% for 2016;

✓ After taking into account the second dimension as well, Cumulative Inertia reaches respectively: 87% for 2010, 85% for 2013 and 88% for 2016, indicating that the first two dimensions accounted for a significant proportion of the total variation;

✓ The significance of χ2-characteristic is below 0.000 for all three years, which proves that there is statistically significant relationship between the studied variables.

Table 2 shows the results of the participation of each of the six planning regions in the formation of the overall Inertia and the two Dimensions for the entire period.

Table 2. Overview Region Points[a]

Region	2010			2013			2016		
	Iner-tia	Contribution by Dimension		Iner-tia	Contribution by Dimension		Iner-tia	Contribution by Dimension	
		1	2		1	2		1	2
Severozapaden	0,020	0,060	0,152	0,028	0,048	0,158	0,010	0,002	0,028
Severen tsentralen	0,008	0,002	0,070	0,009	0,002	0,005	0,012	0,017	0,034
Severoiztochen	0,014	0,006	0,048	0,012	0,055	0,035	0,008	0,022	0,005
Yugoiztochen	0,027	0,002	0,584	0,032	0,029	0,456	0,045	0,044	0,649
Yugozapaden	0,112	0,849	0,029	0,096	0,824	0,002	0,108	0,861	0,006
Yuzhen tsentralen	0,017	0,082	0,117	0,024	0,042	0,344	0,025	0,054	0,278
Total	0,198	1,000	1,000	0,203	1,000	1,000	0,208	1,000	1,000

[a] Symmetrical normalization

✓ *The Yugozapaden Region* has the largest share in the total Inertia in all three years under consideration and dominates in the first Dimension;

✓ *The Yugoiztochen Region* ranks second in terms of share in the total Inertia and dominates in the formation of the second Dimension;

✓ *The Yuzhen Tsentralen Region and the Severozapaden Region* occupy the third place in terms of share in the total Inertia and significantly participate in the formation of the second Dimension;

✓ *The Severen Tsentralen Region and Severoiztochen Region* have a low share in the total Inertia and expectedly have no contribution in both Dimensions.

The participation of each category of irrigated crops in the total inertia in both dimensions is presented in Table 3.

✓ With the largest share in the total Inertia are potatoes, as this crop, grown under irrigated conditions, dominates in the formation of the first Dimension;

✓ The irrigated areas with *permanent crops* and *cereals* are ranked second in terms of share in the total Inertia, influencing the formation of the second Dimension. It should be noted that the areas with permanent crops show a tendency towards an increase in their share in the total variation, while in the case of cereals – the trend is the opposite;

✓ Third place is occupied by irrigated *fodder crops*, which also participated in the second Dimension;

Table 3. Overview Crop Points[a]

Irrigated crops	2010			2013			2016		
	Iner-tia	Contribution by Dimension		Iner-tia	Contribution by Dimension		Iner-tia	Contribution by Dimension	
		1	2		1	2		1	2
Cereals	0,032	0,159	0,199	0,026	0,084	0,258	0,021	0,028	0,247
Industrial crops	0,007	0,000	0,005	0,018	0,103	0,037	0,004	0,003	0,011
Fodder crops	0,009	0,000	0,109	0,035	0,019	0,371	0,016	0,001	0,056
Fresh vegetables and Strawberries	0,011	0,007	0,010	0,008	0,023	0,061	0,013	0,022	0,091
Potatoes	0,111	0,819	0,096	0,087	0,739	0,004	0,115	0,918	0,000
Permanent crops	0,028	0,015	0,581	0,029	0,032	0,268	0,040	0,028	0,594
Total	0,198	1,000	1,000	0,203	1,000	1,000	0,208	1,000	1,000

[a] Symmetrical normalization

✓ The irrigated areas with *fresh vegetables and strawberries, grown in the open air*, and with *industrial crops* have a small share in the total variation, and their participation in the formation of Dimensions is visible for industrial crops in 2013 in the first Dimension, and for fresh vegetables and strawberries, grown in the open area, in 2013 and 2016 in the second Dimension.

The situation annually can be traced through a graphical representation of the positioning of the regions and areas with irrigated crops in the two-dimensional space.

In 2010 (see Figure 1), closest to the average profile (the centre of gravity, or origin of the coordinate system) is the Yuzhen tsentralen region. With relatively close profiles and less distant than the average one, are: Severoiztochen, Yugoiz-tochen and Severen tsentralen. Severozapaden and Yugozapaden regions can be characterised as distant from the average profile.

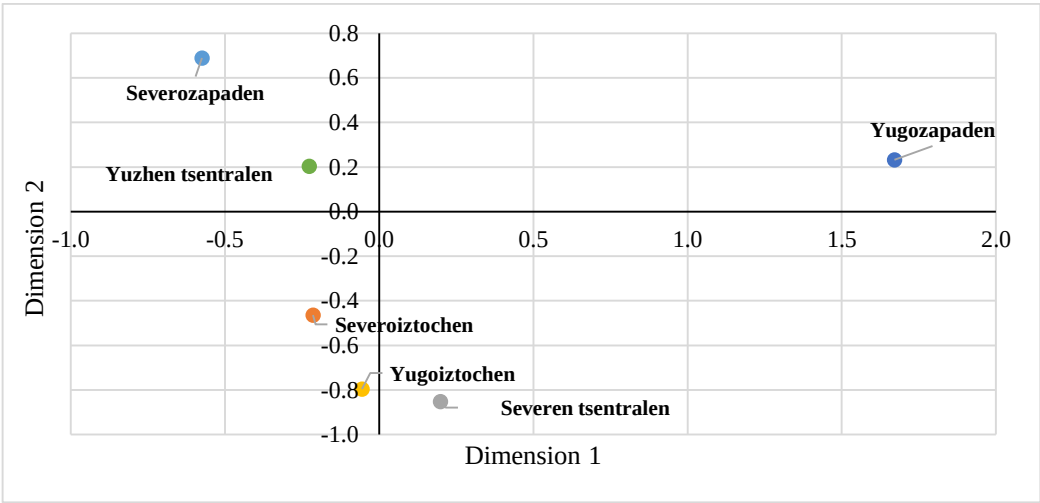

Figure 1. Row Points for Regions (2010)

Regarding the irrigated areas in 2010 (Figure 2), the average profile is described by industrial crops and fresh vegetables and strawberries, grown in the open area. Cereals are slightly distant, while the other three categories are more distant, with potatoes being the most distant.

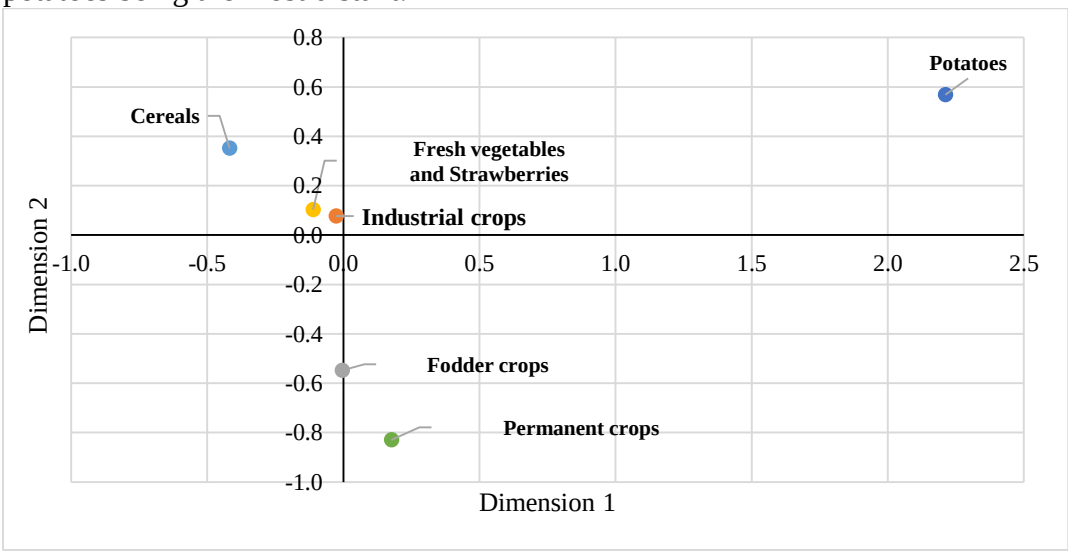

Figure 2. Column Points for Crops (2010)

In 2013 (see Figure 3 and Figure 4) the average profile changes, with the Severen tsentralen region being positioned closest to it. The Yugozapaden region remains remote. Convergence is observed in the profiles of the Yuzhen tsentralen and Severoiztochen regions, as well as of the Yugoiztochen and Severozapaden regions.

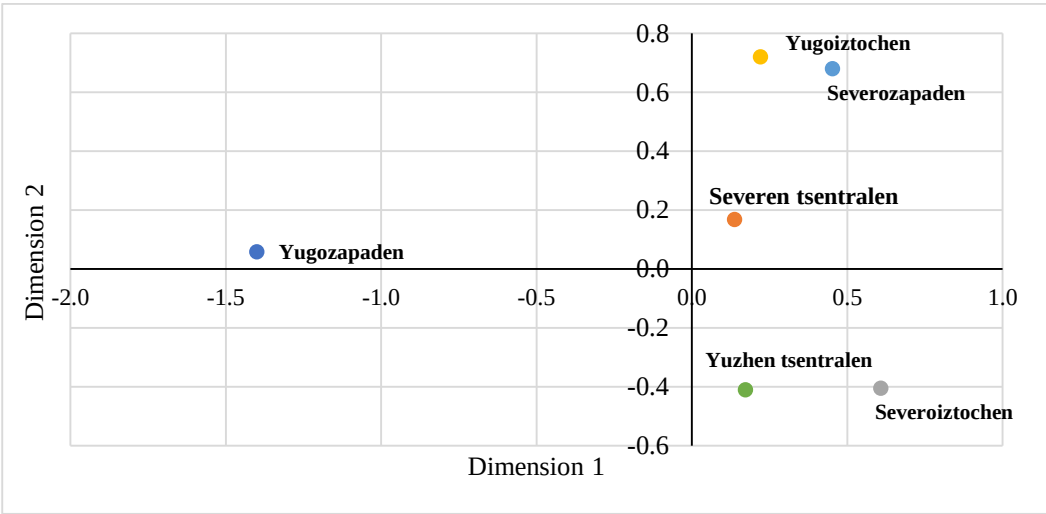

Figure 3. Row Points for Regions (2013)

When comparing the positions of the irrigated categories of agricultural crops in the two dimensions, it can be seen that despite the change in the quadrants, the proximity to the average profile is maintained. There is an exception for permanent crops, which are approaching the average profile, compared to their position in 2010.

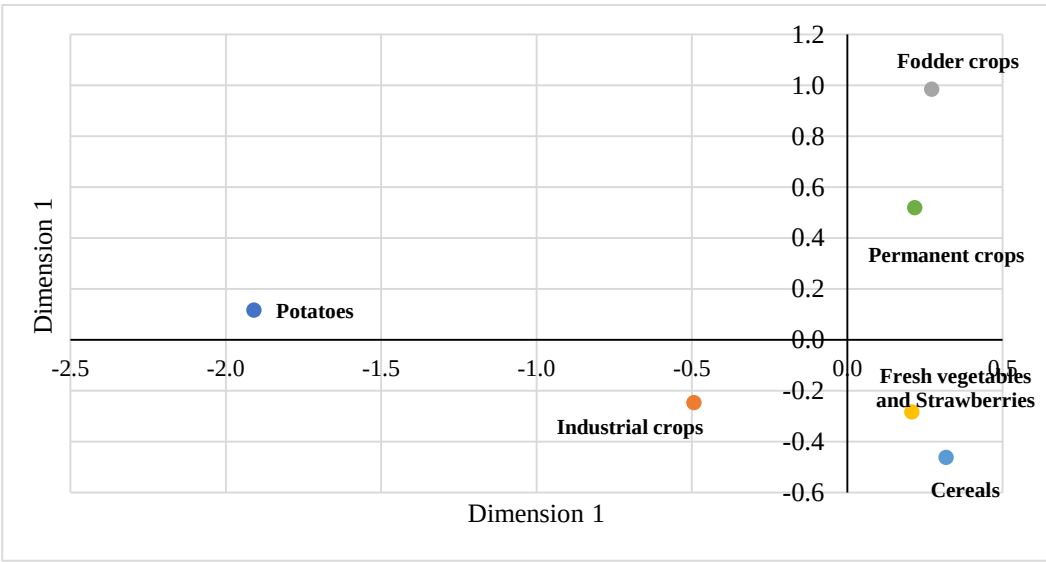

Figure 4. Column Points for Crops (2013)

The data for 2016, presented graphically in Figure 5 and Figure 6, testify to stabilisation in the profiles both by regions and by irrigated crops. Among the regions,

the Yugozapaden, the Yugoiztochen, the Severen tsentralen and the Yuzhen tsentralen retain their positions. The change is for the Severoiztochen region, which is closest to the average profile in 2016. The other change is for the Severozapaden region, which from a profile close to the Yugoiztochen region in 2013, shifts and approaches the Yuzhen tsentralen region.

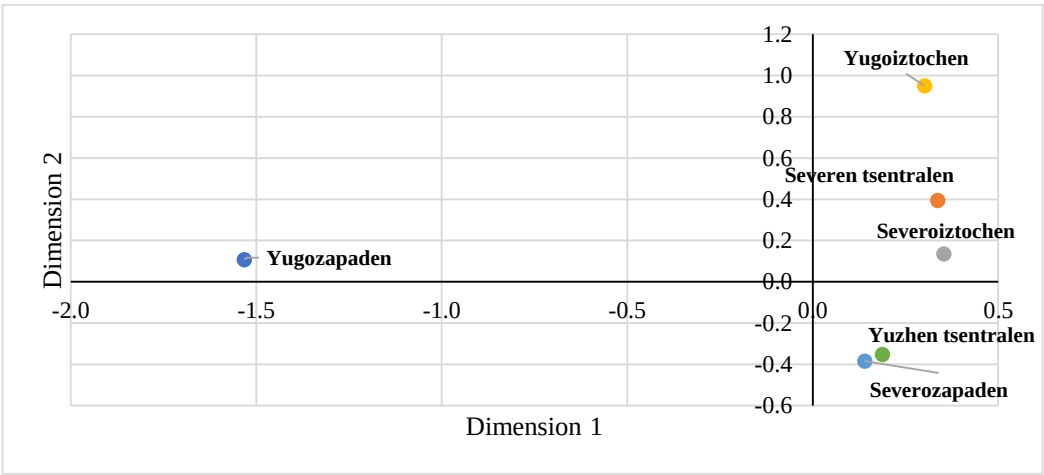

Figure 5. Row Points for Regions (2016)

Regarding the area of irrigated crops, the changes in the profiles in 2016 compared to 2013 are minor – namely, fodder crops are approaching the average profile.

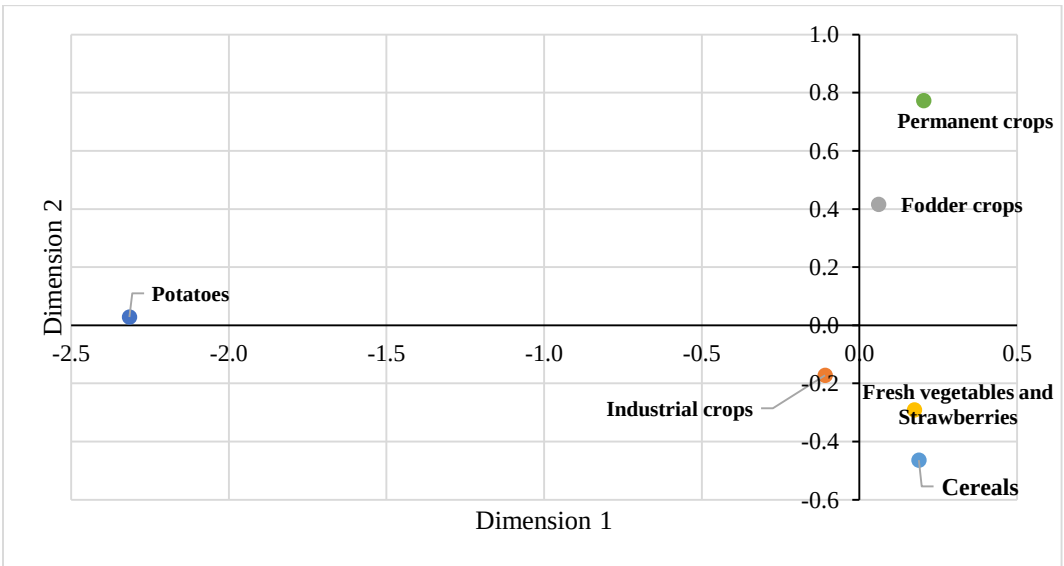

Figure 6. Column Points for Crops (2016)

From the correspondence analysis conducted, with data on the irrigated areas by types of crops and by planning regions, in Bulgaria for the period 2010 – 2016, the following generalisations can be made**:**

1) The largest share of irrigated crops in Bulgaria is formed by the Yuzhen tsentralen region. It is dominated by irrigated cereals, fresh vegetables and industrial crops, which characterise the average profile. These results correspond spatially to branches of "Irrigation Systems" EAD: Topolnitsa, Maritsa and Haskovo.

2) The Yugozapaden region is distant from the average profile, which is due to the high share of potatoes grown under irrigated conditions, which corresponds spatially to branches: Struma Mesta and Sofia. The position of the Southeast region is determined by the size of the irrigated areas with permanent crops and corresponds to branches: Gorna Tundzha (Upper Tundzha), Sredna Tundzha (Middle Tundzha) and Burgas.

3) The Severoiztochen region (corresponding to branches: Shumen and the Black Sea) has a similar profile to that of the Severen tsentralen (corresponding to the Dolen Dunav (Lower Danube)) in terms of the predominant crops, but the size of the areas is much smaller. The same conclusion applies to the proximity of the profiles between the Severozapaden (corresponding to branches: Vidin, Mizia and Sreden Dunav (Middle Danube)) and the Yuzhen tsentralen region.

Conclusion

The conducted analysis of the spatial distribution of irrigated areas by planning regions indicates to stabilisation in the profiles. The future persistence of these profiles should be followed by replaying the same analysis with data from Census '2020, etc. The results can be useful in the preparation of regional strategies for the development of irrigated agriculture both at the level of the planning region and at the level of regional hydro-melioration management authorities. The results of the analysis show the average profile by region and by irrigated crops and the deviations from it. Bulgaria needs to increase the size of irrigated areas to reach the average level for the EU. This can be done through a balanced regional approach, taking into account the geographical conditions and the characteristics of the cultivated crops.

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Contact person information: Radka Nenova, Head Assist., Prof., PhD, D. A. Tsenov Academy of Economics – Svishtov, Department of Agricultural Economics, e-mail: r.nenova@uni-svishtov.bg

DIGITALIZATION LEVEL OF RURAL AREAS IN BULGARIA

Violetka Zheleva[47], Emil Mutafov[48]

СТЕПЕН НА ДИГИТАЛИЗАЦИЯ НА СЕЛСКИТЕ РАЙОНИ В БЪЛГАРИЯ

Виолетка Желева, Емил Мутафов

Abstract

Rural development in Bulgaria is key to sustainable economic growth. Digital technologies implementation and digitization in the management of agricultural processes are important factors for successful development. An interesting aspect is to review the level of digitalization and the attractiveness of rural areas as a place to increase the flow of people and their opportunities for realization. The return of the population to these areas is a way to deal with one of the main problems of urbanization, namely the depopulation of large areas of the country. The main goal of this article is to define the level of digitalization, which includes access to the Internet and its usage in rural areas. Also, it will be beneficial to make a connection with migration processes and, in particular, the rate of mechanical growth.

Key words: rural areas, digitization, migration

JEL: J10, R23

Introduction

Migration is important for the development and progress of each region. It is important to set the exact line of the Rural Areas (RA) and what we will consider as such region. After Bulgaria's accession to the EU in 2007, the "Rural Development Program" was re-adopted nationally (RDP) in a programming period of seven years. On this basis, there is an accepted definition, which defines the respective territory for "rural municipality" or "region" (Georgieva, 2018). We have defined 7 regions in Bulgaria that can be considered as rural type and they are: Vidin, Razgrad, Silistra, Targovishte, Smolian, Kardzhali and Sofia province. The study aims to review the level of digitalization and coefficient of mechanical movement for a period of 6 years (2015 – 2020).

[47] Asst. Prof. PhD, Department of Regional Development, Faculty of Economics, Trakia University.

[48] Ch. Asst. Prof. PhD, Department of Regional Development, Faculty of Economics, Trakia University.

Methods

The definition of rural areas is determined by the districts in which they are located. They are grouped according to their administrative territorial division in the respective planning regions. Based on the Law on Regional Development in force since 31.08.2008 (Regional development act, 2022) – the regions, which form level 2, are regions for planning, they do not represent administrative-territorial units, but have territorial scope. The aim of the study is to examine and analyze the mechanical growth and digitalization of rural areas for the period 2015 – 2020, and in the context of migration processes to compare migration and whether the direction of movement is in areas with higher access to digital services (internet). The research is based on a mathematical approach and analysis in the processing of statistical information by the National Statistical Institute (NSI).

Results

Internet access in rural areas may be key to the decision of certain population groups to migrate and relocate. Regarding the development of these areas, the introduction of technological applications implies a transformation in the institutional and community culture, as they offer an opportunity to participate in the management of local affairs. Due to the problems existing in rural areas, the European Commission pays special attention to the study of how information and communication technologies (ICT) can facilitate the implementation of strategies for the development of rural areas, by reducing the distances to the centers where decisions are usually made, and increasing access to information and support for both the availability of services and training for using new technologies (Chapman, 2002). The EU has already published the Europe 2020 strategy, which includes the Digital Agenda for Europe (A Digital Agenda for Europe, 2022).

In recent years, there has been a significant increase in the relative share of households with Internet access in rural areas. In a period of 6 years (2015 – 2020), 7 regions on the territory of Bulgaria were studied, namely – Vidin, Razgrad, Silistra, Targovishte, Smolian, Kardzhali and Sofia province. The results show a significant increase in Internet access, especially at the end of the period under review. The highest values have the regions of Targovishte and Silistra with over 80% of the population with access to the Internet. The only district with a negative result and a lower step at the end of the period is Vidin. The rest of the districts are within the limits of the national average, but on the other hand the values for Internet access are lower than those observed for the same type of districts in the EU.

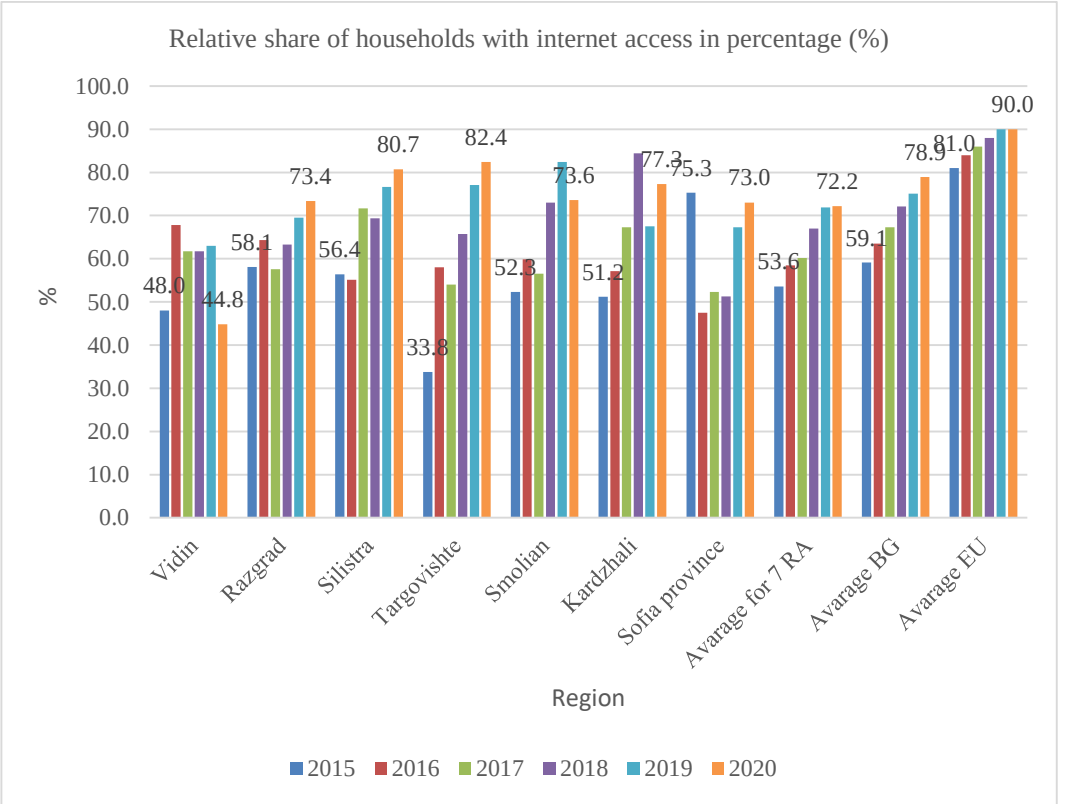

Figure 1. Internet access

Source: Regional statistics (NSI, 2022) and authors' calculation.

The availability of a certain type of service does not automatically mean that it is actively used, and therefore it is reasonable to trace this availability over the same period and compare it to the extent of regular Internet use in the same areas. Graph 2 shows that regular use of the Internet has a lower value than that of people having access to this service. Again, Vidin region has the lowest result for this indicator with about 40-45% during the considered period, while Sofia region is above the national average with 72.3%.

It is a fact that the use of digital technologies by individuals or households requires relevant resources. For their clarification, we can refer to the concept of digital capital presented by Ragnedda (2018), as well as to the definition proposed by the author: "accumulation of digital competencies (information, communication, safety, content creation and problem solving) and technology" (Ragnedda, 2018). The higher age and lower education levels of human capital in rural areas make the areas poorer than urban areas. In addition, rural areas have lower average income

than urban areas, so internet service and digital equipment tariffs can be a barrier to access.

In a study carried out in 2021, Kostadinova notes that "despite the possibility of using the Internet, outside the home or workplace – a mobile phone, laptop or other mobile device – as such are used by about 70% of the population of this age – in the group aged 16 to 74, only about 8% did not use such devices. It can be assumed that a significant proportion of farmers and members of their households use such devices to access the Internet" (Kostadinova, 2021).

All considered regions have a lower score than the EU average, which reaches 87%.

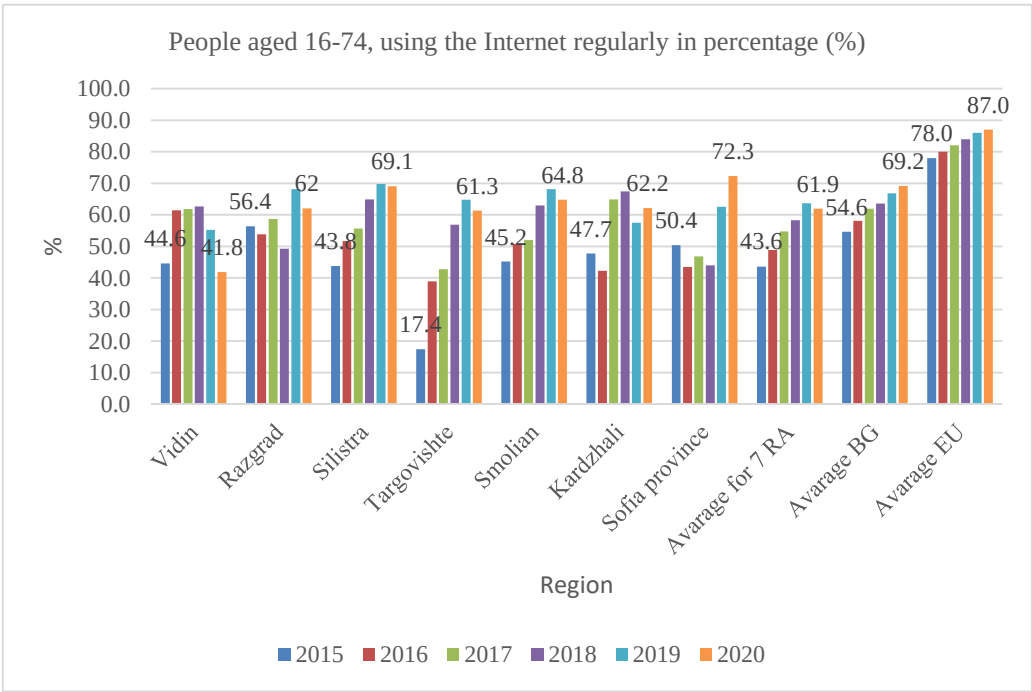

Figure 2. Internet usage

Source: Regional statistics (NSI, 2022) and authors' calculation.

At the coefficient of mechanical growth in rural areas, an increase is observed at the end of the considered period, as only in Sofia region for 2020, it is above the average for the country and the EU. The largest margin for this indicator is in the Vidin region, where a positive result and an increase of 8.4% compared to the beginning of the period can be seen for the last year under review. Razgrad, Silistra,

Targovishte and Kardzhali are below the average for the country, but still with positive values at the end of the period. Only in the Smolyan region did the mechanical growth remain negative throughout the studied period.

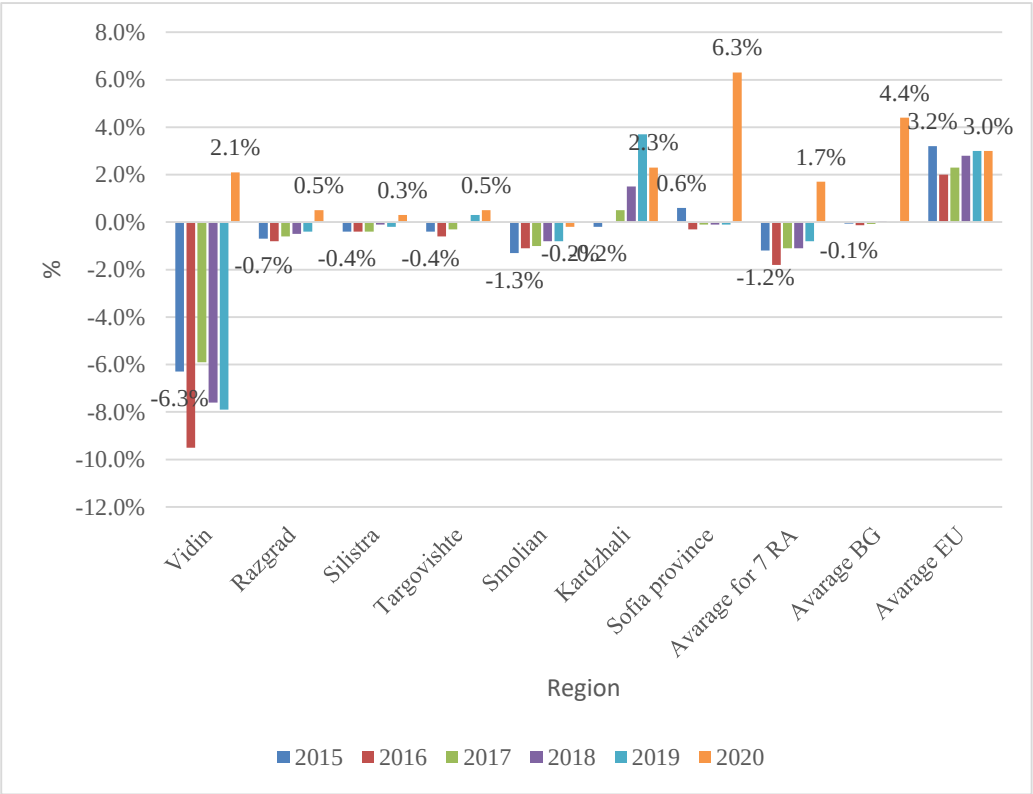

Figure 3: Ratio of Mechanical movement, %

Source: Regional profiles (Demographic statistical data, 2022), https://www.regionalprofiles.bg/bg/

According to the results presented by the European Commission for the Digital Economy and Society Index (DESI) (DESI, 2022), Bulgaria ranks 26th out of the 27 EU member states in the European Index for 2022. It was found that this index has grown by an average of 9% per year over the past five years. Based on the data presented, it can be concluded that it will be very difficult for the country to catch up with the other member countries, as this growth rate is not sufficient.

In addition, it should be noted that in Art. 68 of Council Regulation (EU) No. 1698/2005 it is stipulated that each EU member state creates its National Rural Network, uniting all organizations and administrative bodies working in the field of rural development (COUNCIL REGULATION (EC) No. 1698/2005). Innovation in rural areas faces challenges such as lower education, infrastructure deficiencies

and a lack of digital skills. To solve these problems by 2040, the European Commission has proposed the creation of a Rural Pact and a Rural Action Plan, which aims to make rural areas stronger, connected, sustainable and prosperous (European Commission, 2021). This initiative of the European Commission is an opportunity for a new impulse for rural areas, where 30% of the EU population lives.

Conclusions

In conclusion, it can be summarized that there is an overall increase in the indicators "Internet access" and "Active use of internet" by persons in the age group 16-74. Digitization itself represents a thirst for knowledge in the community. This knowledge creates a prerequisite for searching for a sustainable way to develop the region by creating a healthy socio-economic and educational environment.

The migration processes are also relevant here and comparable to the coefficient for mechanical growth, there is an increase corresponding to higher access to digital services in all rural areas. Only in the Vidin district, it is observed a disproportion of a decreasing share of Internet service users and an increase in the mechanical growth factor. It should also be noted that "Innovation in rural areas" is increasingly being established as policy and practice.

Entrepreneurship through the digitization of rural areas can also prove to be a suitable mechanism for sustainable transformation at the regional level. In summary, it can be said that the increase in the share of digitization in rural areas also leads to a higher degree of migration to smaller villages and towns.

We must not forget additional factors, such as the COVID-19 crisis, which also affects migration processes. Digitalization must be considered as part of the factors responsible for the positive coefficient of mechanical growth.

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Contact person information: Violetka Zheleva, Asst. Prof. PhD, Department of Regional Development, Faculty of Economics, Trakia University, violetka.zheleva@trakia-uni.bg

Emil Mutafov, Ch. Asst. Prof. PhD, Department of Regional Development, Faculty of Economics, Trakia University, emil.mutafov@trakia-uni.bg

DIGITAL AGRICULTURE – BASICS AND PREREQUISITES FOR DEVELOPMENT

Petia Branzova[49]

ДИГИТАЛНО ЗЕМЕДЕЛИЕ – ОСНОВИ И ПРЕДПОСТАВКИ ЗА РАЗВИТИЕ

Петя Брънзова

Abstract

Nowadays, the results achieved both from an ecological and an economic point of view are extremely important for the agricultural sector. Higher environmental performance cannot be achieved if the competitiveness of agricultural sectors declines. To increase the sustainability of the sector, better economic results must be achieved, which will lead to an opportunity to increase investments to protect the environment.

This is where the need comes from, in this new, developing era, to think about "new" agriculture responding to the new circumstances. Without turning our backs on the past, both with its mistakes and its achievements. Vast agronomic knowledge can be integrated into digital innovation and mobilized to workforce the r better economic and environmental performance of farms and for the benefit of citizens and consumers.

The report summarizes the main technological innovations. The aim is to outline the parameters and possibilities of modern agriculture to respond to the developing digital world. Based on the definition of the review, summaries and conclusions are made about the development of digital agriculture in the world.

Key words: agriculture, digital agriculture, environment, innovation

JEL: Q10, Q15, Q55, Q56

Introduction

The projected increase in the Earth's population of 10 billion people by 2050 poses a huge challenge to food security systems, thanks to the fact that the resources needed to do so are already limited.

Unsustainable use of resources (arable land, water and energy reserves) and climate change threaten food security. To satisfy these new challenges, food security must under go a change towards sustainable food for 10 billion people.

Currently, farmers make decisions supported by available data, experience and proposals from various sources. However, the results of those decisions may not be known until the end of the production cycle. Given the varied variables that shape agricultural indicators and extremely difficult to extract knowledge from these isolated empirical observations. (Harizanova-Bartos, Dimitrova, 2018) Using new and

[49] Chief assist. PhD, Economic research institute at Bulgarian academy of sciences.

advanced technologies that independently collect, integrate and transmit information, digital agriculture creates new tools and provides practical solutions to enhance effective real-time decision-making on farms and at many points in food systems.

Digital agriculture has the potential to gather data more frequently and more accurately, and supply real-time feedback to farmers that provides value to their operations. Digital technologies include sensors, robotics, unmanned aerial systems, communication networks, Artificial intelligence (AI), machine learning and other advanced systems and devices. The power to integrate data from different technologies and deliver it to the right people in an easy-to-understand format is critical to supporting informed decision-making at many different points in agricultural operations. Agricultural policies evolve with technological progress. Building on these past advances, the present wave of technological advances is based on the creation, use, combination, analysis and exchange of agricultural and other data in digital format to enhance the sustainability and productivity of agriculture and food systems. The report summarizes the most technological innovations in this latest wave, also as the main drivers for the adoption of digital technologies in the agricultural sector. the most goal is to outline the parameters and possibilities of modern agriculture to respond to the developing digital world.

Results and discussion

1. Development of the theory of digital agriculture

"Digital agriculture refers to tools that digitally collect, store, analyze and share electronic data and/or information along the value chain in agriculture." (European Commission, 2013.)

According to the UN's Project Breakthrough, "digital agriculture is the use of new and modern technologies integrated into a system to enable farmers and other stakeholders within the value chain in agriculture to improve food".

The Cornell Institute for Digital Agriculture (CIDA) initiative offers a digital agriculture research agenda, such as interdisciplinary collaborations, that will modernize the sector and offer a new kind of innovation. CIDA defines digital agriculture as "a holistic systems-level approach to agriculture that includes tools and devices for monitoring and automating activities at various scales and leveraging information and computing technology (ICT) in a systems analysis framework." Digital agriculture affects all components of the food system and provides new methods and tools to provide relevant, timely and targeted information and services to farmers, consumers and policy-makers to improve the productivity, profitability and social, economic and environmental sustainability of agriculture, which makes it possible to provide safe, nutritious and affordable food for all.

The terms "smart agriculture" or "e-agriculture" are included in digital agriculture, but also exist as a separate terms, for example, farm technologies such as yield

mapping, GPS tracking systems and others fall under the scope of "smart agriculture" or "e-agriculture ". On the other hand, the digital technologies used for e-commerce, e-network extension services, warehousing systems, food tracking systems, tractor rental applications and others fall under the umbrella of digital agriculture and not precision agriculture.

2. Barriers of implemention of digital agriculture

Over the years, agriculture has undergone a series of "revolutions" that have brought efficiency, yields and profitability to very high levels. In the coming years, the "digital agricultural revolution" is expected to be the latest change to help meet the growing needs of agriculture to feed the world's population. (World Bank, 2016)

Digitalization is resulting in a change in the entire food chain. The full system can be managed optimized, individualized, intelligent and advanced. It works in real-time, driven by data. Value chains are often tracked and coordinated in detail. Everything within the crop sector and in the livestock sector can be precisely managed according to its optimal requirements. (European Parliament, 2015a)

The thought of digital agriculture is to create high-performance systems that anticipate and adapt to change (European Parliament, 2015b). This, in turn, can cause stronger sustainability and profitability in the sector and greater food security. (Nestorov, 2021). If we consider digital agriculture as a tool to realize the goals of sustainable development, it is the potential to provide:

- economic benefits – by increasing production, cost- effectiveness and market opportunities;
- social and cultural benefits – through increased communication and inclusion;
- environmental benefits – through optimized use of resources and adaptation to global climate change (Kirechev, 2021).

All the listed benefits of digitization of the food sector are compelling, but it requires an enormous change in agricultural systems as well as in the management of natural resources (FAO, 2017b). This is often challenging and requires a systematic and comprehensive approach to achieve the full potential benefits.

At the identical time, there is a risk that the potential benefits of digital agriculture will be unevenly distributed between rural and urban areas, gender and youth. Urban areas often have better developed "digital" ecosystems (resources, skills, networks) than rural areas. (Stoyanova, 2020) Including global trends of urbanization and more educated and able-bodied people settling in cities, there's a potential risk that digitalization will exacerbate existing inequalities in rural areas (UN DESA, 2018a) and hold the population back in the process of digital transformation (FAO, 2018).

3. Main areas where digital agriculture can be applied

There are a unit some primary conditions that possess to exist for the utilization of digital technologies and so for the digital transformation of the agricultural and food sectors. These include infrastructure and property (mobile subscriptions, network coverage, net access and electricity supply), accessibility, academic attainment (literacy, ICT education) and institutional support (World Bank, 2017).

Access to digital technologies offers important advantages to sodbuster farmers and rural businesses by providing links to suppliers and data and enabling customers to take advantage of the workforce, build strategic partnerships, receive support services like coaching, finance and legal services and reach bent markets and customers (Doitchinova, Stoyanova, Harizanova-Bartos, 2019).

However, introducing digital technologies in rural square measures is typically a challenge. Worldwide, the rural populations' area unit declining and education and employment opportunities square measure restricted. There's typically a deficiency of infrastructure, also as basic IT infrastructure, particularly in remote rural communities and other people with massive rural populations. Expenditure there on infrastructure is also a significant challenge in rural areas, wherever poorness rates are unit high, particularly in developing and least developed countries (Ruscheva, Grozdanova, 2021).

In addition to the basic conditions, there are important factors that facilitate digital agricultural transformation. Three key opportunities are the utilization of the Internet and mobile and social networks among farmers and employees to expand agriculture, digital skills among the agricultural population and a culture that promotes digital agriculture and innovation. With the expansion of high-speed Internet connections and smartphones with the ability to the web, mobile applications, social media, VoIP3 and digital engagement platforms, there's significant potential to improve access to information and services for these rural areas. However, many small farmers in developing countries remain isolated from digital technologies and lack the talents to use them.

Creating a "digital agricultural ecosystem" requires a positive environment for innovation on the part of farmers and entrepreneurs. There is already increasing funding and cooperation on digital agriculture projects and startups are beginning to attract the attention of international investors and the media. The younger population have a special role to play in this process. They often have the advantage of digital literacy and therefore the ability to make innovative decisions. When digital topics are integrated into educational programs, they will also gain an understanding of the use of digital tools and the skills to create them (Miteva, 2020).

There is great potential for digital transformation to achieve significant economic, social and environmental benefits. Below are some examples that aim to show how digital technologies can be applied to improve the efficiency and functioning of agri-food systems: (OECD and Bridging the Digital Divide)

- Using a mobile application, for example for farmers' price information, can help farmers plan their production processes more easily. In Kenya, for example, through the M-Farm application, a change in farming patterns was achieved and as a result, some of them received higher market prices (Baumüller, 2015);
- Agricultural robots ("agrobots") are seen as a key trend in digital agriculture, which will have a profound impact on agriculture in the future. Agrobots are already on the ground actively helping farmers measure, map and optimize water and irrigation use. Fleets of small light robots are now being seen as a replacement for traditional high mass tractors, allowing gradual reduction of compaction, soil reaeration and benefits to soil functioning;
- Also, digitization can help farmers, through timely, time-based agri-advisory communications, anticipate and respond to pest attacks, crop failures and climate change;
- Precision agriculture (PA) is an example of the application of the Internet of Things (IoT) in agriculture. By using systems that determine when to plant and fertilize, you can save on seed, fertilizer and tractor fuel costs, as well as reduce field hours. Drones and variable rate technologies (VRT) can help to more precisely determine the required amounts of water and pesticides and reduce labor and resource costs;
- The use of ERP software in agriculture is extremely important as it has the potential to help streamline every process, from procurement to manufacturing to distribution. ERP can enable the economy (or related business) to respond adequately to environmental challenges, adjust systems accordingly, and develop into an economically efficient business;
- The development of artificial intelligence (AI) has helped agribusiness to operate more efficiently. Companies using AI help farmers scan their fields and monitor each stage of the production cycle. AI technology is transforming the agricultural sector as farmers can rely on data provided by satellites or UAV recordings to determine the condition of the farm instead of travelling the entire distance. AI can improve resource utilization, support early decision-making through predictive models, and support 24/7 monitoring systems;
- Block chain technologies have also been shown to provide advantages in agribusiness development. For example, block chain provides consumers with information about the origin of their food, creating a competitive advantage for those who use it.

Digital technologies require financial resources, large farm sizes and close integration with other technologies and processes in the agricultural chain. Therefore, it is more challenging for small farmers to adopt such technologies, while larger farmers and agribusinesses will be able to implement them more easily.

Conclusions

In the future, the digitalization of agriculture can cause major changes in agriculture and food production. The advantages related to finding the challenges facing factory farms, associated with the surroundings, economic and social issues area unit vital, however, there are a variety of challenges.

There is a spot in access to digital technologies and services, which means there's a risk of a digital divide. The foremost vulnerable in this area unit tiny farmers and rural areas. The danger is especially associated with digital skills and access to digital resources. However, there's conjointly a risk in terms of productivity and aspects of economic and social integration.

The introduction of digital technologies is not enough condition for generating results. Social, economic and political systems have to be compelled to give the fundamental conditions and opportunities for digital transformation. Per the law of destruction (Downes, 2009), economic and social systems amendment bit by bit and have maintenance issues, and technology changes exponentially. The work to confirm the required conditions for digital transformation in rural areas is very necessary.

Digitization in agriculture and rural areas needs plenty of laborers to start functioning properly and with the required result. There is a unit many necessary factors to consider: initial of all, the dearth of formal and systematic knowledge on the topic could be a vital challenge in understanding the digital agricultural transformation.

Neither here area unit vital variations in readiness to maneuver to digital agriculture between developed and developing countries and between international corporations and native, community or family businesses. Factors like the accessibility of economic resources and level of education influence the adoption of recent agricultural technologies.

Another issue to think about is that digital agriculture technologies are unit plagued by economies of scale. As we said, tiny farmers' area unit at a drawback compared to massive farmers, they need way smaller resources (financial, social, academic, etc.), the scale of operation and chance for development. This once more creates inequality between massive and little farmers and a corresponding inequality between developed and developing countries. Innovation and digital technologies are units it sometimes not simply filmable to the size of farmer farmers.

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Contact person information: Chief assist.Petya Branzova, PhD, Economic research institute at Bulgarian academy of sciences, e-mail petia.branzova@gmail.com

DIGITAL MARKETING IN WINE TOURISM – INNOVATIVE APPROACH TO DEVELOPMENT OF THE ACTIVITY

Vladimir Dimitrov[50], Daniela Dimitrova[51]

ДИГИТАЛНИЯТ МАРКЕТИНГ ВЪВ ВИНЕНИЯ ТУРИЗЪМ – ИНОВАТИВЕН ПОДХОД ЗА РАЗВИТИЕ НА ДЕЙНОСТТА

Владимир Димитров, Даниела Димитрова

Abstract

Strong competition on the wine market provokes the search for new approaches in the marketing of the product, such as wine tourism. The difficult situation in the last two years, expressed in a series of lockdowns and restrictive measures in the conditions of the COVID-19, has necessitated the use of innovative solutions to ensure profitability in wineries. The aim of the present study was to establish the degree and forms of application of digital marketing in Bulgarian wine enterprises, practicing wine tourism. Data from the official websites of forty Bulgarian wineries were summarized and analyzed. The results showed that the majority of wineries use a complex of Internet-based resources to promote their activities, attract customers and make sales.

Key words: wine, wine tourism, marketing, digitalization, Bulgaria

JEL: *M39, O13, Q13*

Development of global markets and the growing competition between individual products necessitates the search and application of new strategies. Market sustainability is based not only on attracting customers and realizing goods and services, but also on the permanent occupation of a certain market niche and greater brand recognition. Tourism and winemaking are industries, operating in a highly competitive environment where key elements such as product quality, brand popularity and destination/region image are essential. Their unification in a common activity – wine tourism, is based mainly on these three elements (Dimitrov, 2014; Terziyska, 2020). While tourism is significantly more flexible in the implementation and use of new technologies, in winemaking technical and technological renewal occurs at a slower pace. The development of digitization and accelerated access to information gradually create conditions for crossing the boundaries of traditional, static markets, shaping the framework of digital markets of goods and services. Projection

[50] Chief assistant, Institute of Viticulture and Enology, Pleven, Bulgaria.

[51] Chief assistant, Institute of Viticulture and Enology, Pleven, Bulgaria.

of the changed conditions of the market environment on marketing, and above all the need to offering goods in a new and at the same time faster way in the conditions of intensifying competition, forms the new concept of "digital marketing" (Yasmin et al., 2015, Girchenko and Ovsiannikova, 2016, Sawicki, 2016, Olson et al., 2021). As a part of the more general process of digital transformation of the business, digital marketing is an element of the company's marketing strategy, which uses modern information and communication technologies to attract and retain users based on building lasting relationships with them (Slavova, 2016). According to Visser et al. (2018), digital marketing can be more effective than traditional marketing for two main reasons – it provides opportunities to share a large amount of information at relatively lower costs and allows for a more targeted allocation of the marketing budget due to the easier measurement of the effects of marketing communications.

In recent years, the tourism industry, including wine tourism, has increasingly relied on digital technology. They have established themselves as the main marketing platform for attracting customers, promoting and advertising both individual tourism products and entire destinations. Wineries are realizing the increasingly important role of digital marketing as a valuable and appropriate tool to reach consumers (Murphy, 2006, Begalli et al., 2009, Alonso et al., 2013, Pivacet al., 2020). In a study by Thach and Cogan-Marie (2018), related to the supply of wine tourism and the attraction of customers in region Burgundy, France states that wineries need to improve their digital marketing strategies to attract more tourists and create a more positive brand perception. According to Levitskaia et al. (2020) new marketing tools applied in a digital environment acquire a particularly topical importance in the activities of wine enterprises in connection with overcoming the consequences of the COVID -19 pandemic. In Bulgaria, according to data from Kodzhaivanova (2022), out of 350 functioning wineries, nearly 100 offer wine tourism, but according to the estimates of representatives of the industry, only 50 are those with good service and regular guests. The pandemic situation, albeit temporarily, closed their doors to visitors, which also negatively affected wine sales. In the changed situation, the use of the possibilities of the digital environment proved to be extremely important for maintaining the market positions of the wine makers.

The aim of the present study was to establish the degree and forms of application of digital marketing in wineries practicing wine tourism.

Material and methods

The object of the study was the application of internet marketing in wine enterprises in Bulgaria. Internet marketing is one of the main elements of digital marketing, along with marketing in other non-internet digital channels. Different types of internet marketing are known in scientific theory and practice – website, search engine marketing, social networks, mobile marketing, email marketing, online banners (Slavova, 2016). Considering the specific importance for wine tourism of the

new marketing methods applied in the Internet environment – promotion, attraction of new customers, creating a specific wine culture, increasing sales on the domestic and international market (Levitskaia et al., 2020), focus of the research is the marketing activities systematized in the websites of the wineries, as well as the use of social networks and video channels for marketing purposes. By means of a random selection in the Google search, a sample of 40 Bulgarian enterprises producing wine and offering wine tourism was formed by Key words on Bulgarian language "*wine tourism*", "*wine cellar*" and "*wine estate*". The data have been processed using the methods of statistical grouping, comparative and structural analysis and synthesis.

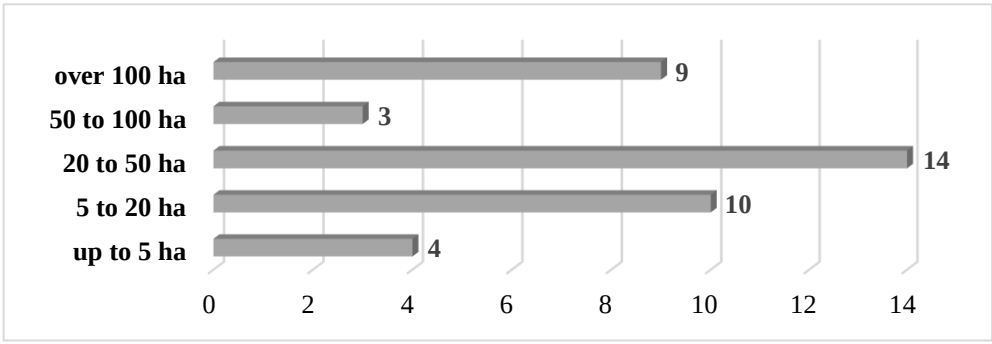
Results and discussion

Main characteristics of wineries

The study covered 40 Bulgarian wineries, which are mostly family companies. The winemaking in the enterprises is oriented towards the production of small series, boutique wines, with a grape processing capacity between 20 and 100 tons (Figure 1).

They produce white, red and rosé wines, and several wineries now also offer orange wine. The majority of them sell their products both on the domestic and international markets. The wineries grow their own vineyards and a part of the wine production is realized at a place, through wine tourism. In the vineyards of the farms, the introduced wine grape varieties are more widespread, but a significant part of the enterprises grow local varieties as well. Some of the wineries buy grapes, thus providing opportunities to diversify the offered assortment of wines.

The greater number of wine cellars are located in the valley of the Struma River, Southwestern Bulgaria and in the region of Plovdiv and region. Haskovo, South Central Bulgaria (about 70%). The rest of the wineries are located in Northwest Bulgaria (1), North Central Bulgaria (3), Northeast Bulgaria (3).



Source: authors based on online survey data, August 2022.

Figure 1. Distribution of the number of wineries depending on the cultivated area with vineyards

Product of wine tourism in the studied enterprises

The main activity offered by wineries in Bulgaria is wine tasting, led by a specialist oenologist or a specially trained guide (Table 1). Other main activities are a walk among the vineyards, which most often, depending on the season, includes getting to know the terroir and the varietal structure, cultivation and grape harvesting. An interesting activity for the visitors is to introduce them to the stages of wine production – from grape processing, through vinification, maturing/aging rooms to bottling and labeling. At the end of the tour, the best wines are offered for tasting, grouped in different tasting packages with three, five or more wines, accompanied by bites and appetizers of regional dairy and meat delicacies, and the prices per visitor are between 15 and 45 BGN. After the tasting, the guests are given the opportunity to buy from the production of the wine cellars for consumption, as a souvenir or as a gift. These activities, with few exceptions, are offered by almost all the wineries surveyed. A positive point observed in the majority of enterprises is that the product of wine tourism is not limited only to those activities typical of its scope. A long time ago, many wine producers around the world, and also in Bulgaria, have discovered the great opportunities provided by tourism. Inclusion of additional activities helps to diversify and enrich the product of wine tourism, and besides added value, they also create opportunities for synergies. Most often this is realized through the typical tourism activities such as catering and accommodation. The cellars that have built restaurants offer mainly local cuisine with local foods and delicacies (24 wine cellars). Most of them, which have a restaurant, offer accommodation in luxury hotels, bungalows or guest houses, where overnight stays for one person are priced between BGN 80 and 150 (23 wine cellars). Recently, it has been noticed that some company products offer Spa- services and areas for relaxing (16 of the wine cellars). In addition, quite a few offer various attractions for their visitors (14 of the wine cellars) – a walk in nature and cultural and historical sights, bicycle rental, horse riding, various types of sports, attractions for children, for adults and other activities.

Wineries that offer food and accommodation increasingly successfully organize various events – celebrations, family and company parties, team building, and conferences. There are also wine cellars that, together with other like-minded wineries, organize joint wine tours, such as the "South Sakar 4x4" that has become traditional in the Harmanli region, "Open doors", holiday celebrations, fairs and concerts. Offering as many activities as possible and organizing different events predispose visitors to extend their stay, ensuring a more complete recreation, which brings more income to the wineries. According to Atanasova et al. (2021), the linking of the main service – growing grapes and wine production, with the benefits of wine tourism and the attributes of the wine region should be carried out in such a way that it provides greater utility for consumers when compared with other types of benefits or destination characteristics when deciding to visit, re-visit or recommendation by

an winery or wine region. Eleven of the surveyed wineries have the full set of activities and have a complete complex product – "Villa Yustina", "Uva Nestum", Complex "Midalidare", "Eduardo Miroglio", "Villa Velis", "Zornitza Family Estate", "Zaara Estate", Complex "Seven Generations", "Villa Ovcharovo", "Salla Estate", "Chateau Copsa".

Table 1. Offer of basic and additional activities forming the product of wine tourism in wineries

Activities of the wine tourism product	**Number of wineries**	**% of the total number of wineries**
Basic activities		
Vineyard tour	37	92,5
A visit to the production	37	92,5
Wine tasting	40	100,0
Wine and souvenir shop	40	100,0
Additional activities		
Food – restaurant, catering, BBQ	24	60,0
Accommodation – hotel, guest house, bungalow	23	57,5
Spa and areas for relaxing	16	40,0
Attractions	14	35,0
Sport	13	32,5
Sightseeing	26	65,0
Visiting other wineries	18	75,0
Organizing events	24	60,0

Source: authors, based on online survey data, August 2022.

The results indicated in the table 1 show that a significant part of the wine-producing enterprises operating in the country offer a quality wine tourism product. However, there is still a large number of wineries which, due to lack of funds, poor management or lack of a marketing concept for development, are limited only in offering tastings and tours of vineyards and production premises.

Application and elements of Internet Marketing

The research activity primarily focused on internet marketing and the types of digital platforms that wineries, offering wine tourism, have targeted to advertise and attract customers to their company products. It was implemented in the period July-August, 2022 in the Google search. In the search process, two Key words were entered: "*wine tourism*", as a result of which the search offered 10 pages, each of

which shows 10 web addresses, i.e. 100 web addresses in total. Of these, they only show web pages of 12 wineries. When entering the Key words *wine cellar* and *winery*, the results showed significantly more official websites of specific businesses, but it was not clear whether they offer wine tourism. Based on a thorough review, wineries that offer wine tourism and maintain their own web pages with up-to-date information were included in the scope of the study.

When browsing the web pages, it is noticeable that the enterprises advertise their main activity, in most cases, illustrating photos of their vineyards and the winery's production building. Consumers are influenced by things as, "Historical data" on the company's activity – creation of vineyards, varietal composition, construction of production premises. Getting to know the company team, even if from a distance, also provokes a special feeling towards the wine cellar on the part of the current and potential customers, given the fact that the majority of the enterprises are family-owned. The availability of places to eat and stay is also presented visually. All enterprises provide photographic material of the wines produced, grouped according to the series, offered on the market. The majority of the wineries covered in the study maintain an "Online store", which, in addition to being a great convenience for customers and driving sales growth, provides an opportunity for producers to collect data and analyze consumer demand.

As a main disadvantage it can be pointed out that on the majority of cellar web pages, in the "Wine tourism" section usually only two to three types of tasting packages are listed, without detailing what visitors can see and expect further on the visit. There are no more suggestions for activities that can be further offering and organizing. There are a few photos that shows the tasting rooms, most of them lack shots of other activities of the company's tourist product.

Presence of a "Blog" section in official pages of the companies is also important for maintaining image and popularity of the brand. It turns out that just over half of the surveyed wineries have such a section on their websites. There is the place where data of the most different nature is placed – from possibilities of visits; upcoming events to rich photo and video material.

The possibilities of advertising through social media show that almost all wineries, with the exception of only one, use at least one social media. Most often it is Facebook – 39 wine cellars, followed by Instagram – 26 and Twitter – 21 (table 2). Facebook is establishing itself as the most popular social network for advertising and reaching customers among wineries. A similar conclusion was reached by Levitskaia et al. (2020), according to which social media is increasingly being used as a communication tool in the wine business. The authors point out that Facebook is the most used social network, including in the wine industry. In a study by Canovi and Pucciarelli (2019), it was found that 16 out of a total 20 studied wineries in the North Italian region of Langhe use Facebook, 11 use Instagram, and only 10 use

Twitter. The authors explain winery owners' preference for Facebook with the more limited features of micro blogs, such as Twitter.

Table 2. Application of Internet Marketing

Types of Internet Marketing	Number of wineries	% of the total number of wineries
Web page	40	100,0
Social media		
Facebook	39	97,5
Instagram	26	65,0
Twitter	21	52,5
Blog	21	52,5
Video channels		
You Tube	27	67,5

Source: authors, based on data from online survey, July-August 202

Under the conditions of the present study, it was found that in order to realize the search on *Instagram* and *Twitter* of a specific winery, its name must be entered in Latin letters. Searching for Cyrillic did not yield results for some of the cellars. This would probably create difficulties for some Bulgarian users. For this reason, website development and social media presence should be based on both the Cyrillic and the Latin alphabet.

Video channels on the Internet are among the most popular media for direct communication with the customer. The most used are *YouTube* and especially among the youngest users preferred *TikTok*. The data from the present study shows that 27 of the wineries use *YouTube* to promote their activities, relying on the potential of the video channel to reach a wider audience.

Conclusion

The survey showed that the Bulgarian winemaking enterprises are increasingly successfully using the Internet, both to advertise their wine production, and for direct communication with customers and offering wine tourism. Most of the surveyed entities offer a quality product of wine tourism, the basis of which are tastings, visits to the vineyards and the production premises, complemented by dining and accommodation options. Only eleven of the wineries, covered by the study, offer a full range of the listed main and additional activities, including Spa and relaxation areas, attractions, sports, sightseeing, visiting other wineries, organizing events. The websites of these enterprises, offering a diverse tourism product with all activities from grape harvest, wine tasting with gourmet, to accommodation in luxury hotels with spa and relaxation areas, as well as many other entertainments and attractions, are the best developed. Practically, these sites include everything –

from the history of the cellar, presentation of the wines, online store, to a blog with rich photo and video material. In addition, the sites of these wineries have options to view the content in English and, in fewer cases, in other languages (French, German and Russian). This provides access to a much larger range of potential customers, both in the domestic and international markets. Advertising and communication in social networks is a widely applied means of contact with consumers by almost all wineries studied. *Facebook* is the most frequently used social media, and the fewest wineries advertise on *Twitter*. All this shows that internet marketing is being used more and more successfully by wineries. For most of them, there is potential to improve the application of marketing activities in the online space, especially in terms of the maintenance and layout of the web pages and facilitating access to them in social networks. It is necessary to expand the presence of wine producers in video channels, by publishing videos and advertising messages.

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Contact person information: Chief assistant Vladimir Dimitrov, PhD, Institute of Viticulture and Enology, Pleven, Bulgaria, e-mail:vladimitrov@abv.bg

LEGAL AND REGULATORY ASPECTS OF OWNERSHIP AND USE OF AGRICULTURAL LANDS

Sonya Todorova[52], Todorka Atanasova-Kalaydzhieva[53]

ПРАВНО-НОРМАТИВНИ АСПЕКТИ НА СОБСТВЕНОСТТА И ПОЛЗВАНЕ НА ЗЕМЕДЕЛСКИТЕ ЗЕМИ

Соня Тодорова, Тодорка Атанасова-Калайджиева

Abstract

The aim of this project is to explore and to analyse the current legal framework regarding the right to property and the right to use agricultural land in Bulgaria, the economic and legal consequences of the practical application of the legal institutes governing the right to use agricultural land, to draw conclusions and recommendations for improvement. Methods: The main methods of application for research and analysis are: systematic analysis, logical approach, normative method, synthesis, etc. Results**:** The research and analysis carried out on the legal framework regarding the use of agricultural land identifies significant contradictions and weaknesses which hinder the appropriate use of agricultural land and limit the possibility of concluding leases. Guidance is given for changes to help solve specific problems. Conclusion: The legal analysis of the regulations governing land relations reveals the need for a legislative initiative to address gaps and contradictions in legislation in this field in order to fully protect the rights and interests of individuals

Key words: land relations, regulation, the right of use, regulations, law enforcement, analysis
JEL: Q24; K39

Introduction

The economic reform effected in the 1990s in Bulgaria liberalized economic relations in all sectors, including the agrarian sphere. As a result, a significant step was made towards a radical change to implement land reform and restore ownership of agricultural land, as well as to restructure the existing labor-cooperative form of agrarian production organization. The transformation of land ownership in the agricultural sector, this main production factor, created an opportunity for the origination of new forms of its use, as well as for the emergence of a new type of agricultural holdings (family farms, associations built on the capital principle, new agrarian cooperatives).

Despite the new land relations established in Bulgaria as a result of the completed land reform, one should not ignore the fact that the land is not only a subject

[52] PhD student, Trakia University, Stara Zagora.
[53] Professor, PhD, Trakia University, Stara Zagora.

of land property relations and a place for investing capital, but also a real natural resource for human habitation for millennia, which must to be preserved for future generations.

The purpose of the present work is to research and analyze the current legal and regulatory framework in Bulgaria, regarding the right to own and the right to use agricultural lands, the economic and legal consequences of their practical application, in order to draw conclusions and make recommendations for their improvement.

The primordial right of ownership of land and its three forms of manifestation

In the course of the main changes that have occurred in the social and economic relations in society in recent decades, land relations and their dynamics are at the epicenter of legislative activity. This is because, in a social aspect, there is a need to create a legal framework for the regulation of agricultural land ownership and its use, given the fact that land relations are directly related to the establishment of private ownership of land and ways of disposing of it. In its legal essence, the right to property is a fundamental real, absolute and unlimited right.

The legal regulation of the right to property is contained both in the Constitution of the Republic of Bulgaria /adopted on July 12 1991 by 7th Grand National Assembly/ and in a number of other legal acts. These include the Property Law, the Law on the Ownership and Use of Agricultural Lands and the Agricultural Lease Act. They are fundamental in relation to the acquisition and use of agricultural land in the country.

Pursuant to the provisions of Article 17 of the main legal act – the Constitution (adopted on July 12 1991 by 7th Grand National Assembly), property in Bulgaria is of two main types: public and private, where private property is declared to be an inviolable and sacred right.

In its essence, the right to property is a combination of three large groups of powers: *right of* possession, right of use and right of disposal.

A right of possession is a power that is expressed in the actual physical control that the owner exercises over the physical thing. This power can also be exercised by another person who currently holds the owner's possession.

The right of use is expressed in the legal possibility of the owner to use the physical thing and receive benefits from it. The owner, unlike the user, is not limited to use the thing according to its purpose. Moreover, if they find it necessary, they can also change the purpose of the item. This change is always done within the framework of the law, and in some cases there are strict rules established. Such examples can be seen in the Bulgarian economic practice when changing the purpose of agricultural land into non-agricultural land, which is carried out according to the Law on the Protection of Agricultural Lands.

The power of disposition is the power which is most wide-ranging in nature. By virtue of it, the owner may lose his right. In view of this power, the legislation divides the transactions into two large groups – transactions of management and transactions of disposal. In the case of the latter, higher requirements are set for the entities that can disposed of the land.

Subjects of the right to property according to the legislation of both the Republic of Bulgaria and the European Union can be: natural persons, legal persons, the state and municipalities.

For the purposes of this article, the right to property will be analyzed in the aspect of the acquisition of agricultural land in Bulgaria and the legally regulated possibilities for its use. In the provisions of Art. 3a of the Law on Ownership and Use of Agricultural Land (LOUAL) /SG. issue 17 of 01.03.1991/ It is stipulated that citizens of the member states of the European Union – self-employed farmers who wish to settle and permanently reside in the Republic of Bulgaria and are registered as such under the provisions of the BULSTAT Register Act, may acquire the right of ownership of agricultural and forest properties for agricultural use as of the day of entry into force of the Treaty of Accession of the Republic of Bulgaria to the European Union.

The same law also states that foreigners who acquire the right of ownership of agricultural land by inheritance, but do not meet the terms and conditions provided for in the Treaty of Accession of the Republic of Bulgaria to the European Union, or if anything else is not provided for in an international treaty, ratified in accordance with Art. 22, para. 2 of the Constitution of the Republic of Bulgaria (adopted on July 12 1991 by 7th Grand National Assembly), are obliged, within three years from the discovery of the inheritance, to transfer the property to persons who have the right to acquire such properties. This rule also applies to persons (foreign citizens) to whom the right of ownership of agricultural land has been restored.

In the event that these persons do not fulfill their obligation to transfer the ownership of agricultural land within the three-year period, the state is entitled to buy back the agricultural land at prices determined by an ordinance of the Council of Ministers.

Pursuantto the provisions of Article 3 of the same law, natural or legal persons, who have resided in the Republic of Bulgaria for more than 5 years, may acquire the right of ownership of agricultural land. For legal entities, registered under Bulgarian legislation for less than 5 years, it is stipulated that they can acquire the right of ownership of agricultural land when the partners in the company, the members of the association or the founders of the joint-stock company meet the above requirements.

The acquisition of the right of ownership of agricultural land in Bulgaria occurs on the basis of inheritance (both by law and by will), through a dispositional trans-

action – sale or donation; by acquisition of property rights after the statutory limitation period has expired, the so-called acquisition by prescription; acquisition on the basis of a legal provision – restoration of ownership and/or on the basis of a court decision/.

Lease and lease agreement – the basis for the use of agricultural land in Bulgaria

The use of agricultural land in Bulgaria is legally regulated in two ways: by concluding a lease agreement or by concluding a rental agreement.

1. The lease agreement in agriculture finds its legitimate definition in Art. 2 of the Agricultural Lease Act (ALA) /SG, no. 82 of 27 September 1996; ed. and add., no. 35 of 16.04.1999/. Pursuant to its provisions, with the lease agreement, the lessor undertakes to provide the lessee with the subject matter of the agreement for temporary use, and the lessee – to make a certain rent payment. The crop yield from the leased land shall become the property of the lessee from the moment of their separation. From this definition, the main characteristics of this contract can be deduced – bilateral, remunerative and consensual. It creates rights and obligations for the parties from the moment of agreement. This contract is formal. The valid conclusion of such a contract requires that it be done in writing with notarization of the signatures of the parties simultaneously participating in its signing.

A lease agreement, as well as an agreement on its amendment or termination, may be concluded with an owner or a co-owner of agricultural land, whose property amounts to more than fifty percent ideal parts of co-owned property; or with a person, authorized by the owner or co-owners who jointly own more than fifty percent ideal parts of the co-owned property. The authorization must be done by an express power of attorney, attested and certified by a notary.

Subject matter and types of the lease contracts in agriculture.

The subject matter of the lease agreement in agriculture is the bond right of use on the leased object. This contract has no material effect. Its specific subject, explicitly defined in Art. 1, para. 3 of ALA, is what distinguishes it from other lease contracts. Its subject can be agricultural land and/or immovable and movable property for agricultural production, including agricultural buildings, equipment and domestic animals. The legal definition of a lease agreement indicates its closeness to a rental agreement. Unlike it, however, in the case of a lease, the subject matter of the contract must necessarily be a productive object. This is necessary due to the characteristic feature of the lease to be concluded in order to receive the fruits of a given thing, for which the lease fee is also due. The lease agreement presupposes the transfer of ownership of the separated or newly created fruits to the patrimony of the lessee.

Rights and obligations of the parties to the agricultural lease agreement

The main obligation of the lessor under a lease agreement in agriculture is to transfer to the lessee the possession – the actual power over the thing, to ensure its unimpeded use and to allow the lessee to receive the fruits from it. The lessee has a counter-right to ask them to allow the lessee to receive the fruits that the thing gives – subject matter of the contract. In this case, the principle rule that the fruits belong to the owner of the fruitful thing is derogated (arg. from Art. 2, Para. 2 of the ALA). The lessor must hand over the subject matter of the contract to the lessee in a condition that corresponds to its use under the contract, and maintain it in this condition for the duration of the lease. The handover is carried out with an inventory protocol. The parties who have signed the inventory protocol cannot dispute its content before the court. The drawing up of such an inventory protocol, however, is not a basis for the validity of the lease agreement. The legislator introduces a presumption that if the subject is not handed over by inventory, it is assumed that it was accepted in a proper condition. This presumption is rebuttable, the burden of proof lying on the person contesting it. (Determination No. 12/2011 of the Supreme Court of Cassation). The distribution of the costs of maintaining the contractual subject basically follows that of the rental relationship. Current maintenance required due to the ordinary use of the subject matter of the contract, including residential and farm buildings, roads, ditches, irrigation and drainage systems and other service objects of the contract facilities and fences, is to be paid by the lessee.

The lessee is obliged to pay the taxes and fees, related to the use of the leased subject of the contract, and the lessor – the taxes and fees, related to their property. The lessor also owes the amount by which the value of the contract subject has increased as a result of the improvements made with their consent. In order to protect the lessor, who is often the economically weaker party, the legislator grants them the right of lien on the yields from the leased subject and the imported items to secure their claims under the lease agreement for the relevant year. This right can be exercised in accordance with Art. 310 – 314 of the Commercial Law (CL). (SG. No. 48 of June 18, 1991)

The lessee has two main obligations. The first of them is to use the leased subject matter of the contract with the care of a good owner according to the purpose defined by the contract. This can be regulated by explicitly listing or excluding certain purposes – to plant a certain plant crop, not to plant genetically modified varieties, etc. The second main obligation is to pay rent. The law provides that, unless otherwise agreed, the rent payment is due on the first business day after the end of the business year – the time from October 1 of the current year to October 1 of the following year. In principle, lease payments are made on an annual basis, and unless otherwise agreed, the payment is due on the first working day after the end of the business year, which occurs on October 1st. The parties can agree for the payments to be made in shorter periods, and there is no obstacle to agree on a single payment for the entire period of the contract. The payment itself can be in value, in kind or

a combination of both. In order to protect the rights of the lessee in case of the lessor's carelessness, the legislator provides for the lessor to be burdened by an objective liability for defects, with no existing exemption from liability clause. This liability will exist even in cases where the defect is unknown to the lessor. If the defect is due to a reason for which the lessor is responsible, the lessee may seek compensation for damages under the general rules for non-performance under the Obligations and Contracts Act (OCA). (SG. No. 2 of December 5, 1950, publ. DV. No. 275 of November 22, 1950, amended. SG. No. 35 of April 27, 2021).

Peculiarities of the agricultural land lease

A peculiarity of the agricultural land lease is the term for which the contract can be concluded. What is specific here is that its minimum duration of five economic years has been introduced in an imperative manner (Article 4 of the ALA). The parties cannot agree otherwise contrary to this provision. There is no limit to the maximum duration of the contract. It is possible to conclude a lease agreement without a term or for an indefinite term (for example, for life). Due to the permanence of the binding relationship between lessee and lessor, which can last for tens of years, and due to the significant limitation of the rights that the owner of the agricultural land or property has to endure, the legislator provides a special form for the conclusion of the lease agreement – written with notarial certifications of signatures. It is entered in the notary books and registered in the relevant municipal agricultural office. When registering the agreement, a sketch of the leased subject of the contract, issued or certified by the municipal office of agriculture, is submitted. Usually, the entry is made by the lessee, being an interested party. Proceedings before the municipal office are formal and do not allow the registration authority to assess whether the contract filed for registration has been validly concluded. (Decision No. 3469/2012 of the Supreme Administrative Court). Not only the initial lease agreement, but also the one with which the term of the lease is extended, is subject to entry in the register. (Decision No. 3910/2012 of the Supreme Administrative Court). The non-registration does not invalidate the concluded lease agreement, but only its irreconcilability with another entered agreement. (Decision 672/2011 of the Supreme Administrative Court). The hypothesis of re-leasing is also possible (Article 11 of the ALA), but only when it is expressly stipulated in the lease agreement. The lease agreement must be concluded in writing, the signatures must be certified by a notary, the agreement must be entered in the notary books and registered in the relevant municipal office for agriculture. (Decision No. 2312/2007 of the Supreme Administrative Court).

Termination of an agricultural lease agreement

The grounds for termination of a lease agreement under the ALA are listed in Art. 27 of the Act. The first ground for termination relates to fixed-term leases.

They are terminated with the expiration of the term for which they were concluded. A contract entered into without a fixed term may be terminated unilaterally by either party with written notice given after the expiration of the fourth year. Unless otherwise agreed, the notice period is two business years. It must be sent at the latest by the end of the business year preceding the beginning of the two-business-year period. The parties may agree on a notice period other than the mentioned two business years. In the event of non-fulfillment of a contractual obligation, the party in good standing may terminate the lease agreement in accordance with the general rules of the ALA – with notice. This possibility exists to the extent that the ALA provides otherwise. Termination of the lease agreement can be carried out with unilateral notice from the parties and when there is no culpable failure to fulfill contractual obligations, as long as the possibility is regulated in the ALA. Such unilateral termination is available when the lessee becomes permanently incapacitated. The legislator assumes that in this case the preservation of the contract loses its meaning, since the lessor will not have the opportunity to actually exercise their rights under the contract and receive yields from the leased property. ALA regulates the lease agreement in agriculture as a contract with regard to the personality of the lessee. The death and placement under judicial disability of a natural person, as well as the termination of a legal entity – lessee, is grounds for termination of the contract without fault. The provision is dispositive and the parties may agree otherwise – the heirs or legal successors of the incapacitated party shall replace them.

Another hypothesis of no-fault termination of the lease contract under the ALA is in the case of forced expropriation of leased land for state and municipal needs in accordance with the Law on State Property and the Law on Municipal Property. The special thing in this case is that, although there is no fault, the lessor owes the lessee compensation for the damages caused to them. The cancellation of a lease agreement, concluded for a term longer than 10 years or for life, is effected by court order, regardless of the reason for cancellation. In all cases, the cancellation of the contract is subject to entry in the notary books and the municipal agricultural office. A notice of termination, even if sent as a notarial summons, is not subject to such entry. (Decision 672/2011 of the Supreme Court of Cassation).

Rental Agreement – an alternative form of use of agricultural land in Bulgaria

The other form of using agricultural land is the conclusion of a rental agreement. According to the Law on the Ownership and Use of Agricultural Lands, /SG, issue 34 of 30.04.1991/ agricultural land can be rented out by the owner, or by a person authorized by them, by a person who has rights over the agricultural land, including in their content the authority to use or manage the land granted by the owner or by a person authorized by them; by a co-owner or co-owners of agricultural land, or by a person authorized by them.

An agricultural land rental agreement with a term of more than one year is concluded by a co-owner or co-owners of agricultural land, owning more than twenty-five percent of the ideal parts of the co-owned property, or by a person authorized by them. The authorization to enter into an agricultural land rental contract must be done with an express power of attorney with notarial certification of the signatures of the authorized persons. If agreed in the contract, the tenant can subrent part or all of the object of the contract. When the subrent is for the entire term of the contract, the tenant is obliged to immediately notify the lessor in writing about the subrent.

Agricultural land rental agreements with a term longer than one year, as well as agreements for their amendment or termination, shall be concluded in writing with notarial certification of the signatures of the parties executed simultaneously (Petrova N., 2012., Organization and management of land relations., Monograph., Ed. Iskra-IM, Stara Zagora).

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Conclusion

To summarize the analysis made, it should be stated that the legal regulation of the conclusion and cancellation of agricultural land lease and rental agreements, provided for by the legislator in Bulgaria sufficiently secures the legal interest of the parties to the contract. Through the research and analysis of the regulatory framework governing the use of agricultural land, significant contradictions and weaknesses were identified, which prevent the appropriate use of agricultural land and limit the possibility of entering into lease contracts.

This conclusion is made on the basis of the introduced imperative form for the conclusion and contracts – namely, the mandatory notarial form, where the certification of the signatures of the parties guarantees their will and is a prerequisite for the absence of abuse of rights.

The legal analysis of the normative provisions, regulating land relations, reveals the need for a rulemaking initiative to overcome gaps and contradictions in the legislation in this area, with the aim of fully protecting the rights and interests of legal entities.

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Contact person information: Prof. Todorka Atanasova –Kalaydzhieva, PhD, Trakia University, Stara Zagora, e-mail: tatanassova@abv.bg

EVOLUTION OF APPLE PRODUCTION IN THE POST-MACROSOCIAL TRANSFORMATION PERIOD

Monika Kabadzhova[54], **Iliyana Krishkova**[55]

ЕВОЛЮЦИЯ НА ПРОИЗВОДСТВОТО НА ЯБЪЛКИ В ПЕРИОДА СЛЕД МАКРОСОЦИАЛНАТА ТРАНСФОРМАЦИЯ

Моника Кабаджова, Илияна Кришкова

Abstract

The apple is the most widespread fruit species of the temperate climate and has great economic importance. It is characterized by high productivity, good transportability and storability of the fruits. The apples can be offered on the market all year round with a good organization of the assortment and ensure a refrigerated base. The apple production ensures much healthy benefits of people like food, vitamins, fiber, etc. Also it could be seen as an activity that achieves good economic results. The greater return on resources invested in this production will facilitate an increase in the standard of living of employed in this activity. Also, many authors examine apple production, both on a global and national scale. Leading producers of apples in the world are China, USA, Poland and Turkey. In the EU – 27 are Poland, Italy and France in 2021. The aim of the study is to examine the evolution of apple production in Bulgaria for the period after the 1990s. We analyzed apple harvested areas, average yield and production through descriptive statistics methods. In adition we did correlation analysis with follow indicators: export and import quantity and value, production, as well as prices and quantity of export. It was founded that the transition to a market economy in Bulgarian agriculture also had a negative impact on foreign trade in fresh fruit. As a result of all these Bulgaria had turned from an exporter into an importer of fruit.

Key words: Apple production, Export, Import, Correlation

JEL: Q10, Q13, Q17

Introduction

There are many scientific works reviewing conventional apple production in literature (Vannoppen et al., 2002; Krishkova, 2015; Dimitrova, 2016; Krishkova et al., 2018; Sotirov et al., 2018). Increasing production costs, heavy reliance on non-renewable resources, reduced biodiversity, water contamination, chemical residues in food, soil degradation and health risks to farm workers handling pesticides all bring into question the sustainability of conventional farming systems (Reganold et

[54] Assist. Prof. PhD, Institute of Agriculture – Kyustendil, Agricultural Academy – Sofia.

[55] Assos. Prof. PhD, Institute of Agriculture – Kyustendil, Agricultural Academy – Sofia.

al., 2001). As a result of all these factors, organic farming became one of the fastest growing segments of US and European agriculture during the 1990s (Alföldi et al., 2000; Greene et al., 2003). Nowadays, there is a lot of emphasis on the preservation of biodiversity in this production (Borovinova et al., 2014; Weekers et al., 2022).

Along with organic production there is also conventional apple production for the mass market.

There are studies in the literature that analyze reforms in 1970s and 1980s and their effects on agriculture, as well as policies during post-communist transition and European Union (EU) integration, and their consequences for agricultural development (Bachev, 2008). Land relations in Bulgaria are transformed with the advent of democracy (Yovchevska, 2015; Yovchevska, 2016), as a result land fragmentation period occurs. The agricultural land was broken up and distributed to many owners. Many socio-economic problems, changes in harvested areas and agricultural crops production also arise from this.

The study aims to examine evolution of apple production in Bulgaria for the period after the 1990s. In addition, import, export and price of apple production will be analyzed.

Methodological framework

In the article we study the post-macrosocial transformation period including 3 stages: (1) The advent of democracy in Bulgaria; (2) The period before the accession of Bulgaria to the EU; (3) The period after the accession of Bulgaria to the EU. The sudy covers 30-year period data.

Object of research is changes in harvested areas, production, average yields, import, export and price of apple production in Bulgaria. The analysis and evaluation of state and development of apple production is done based on use of descriptive statistics methods: collection and processing of official statistical data. Correlation analysis aims to enhance the methods used by examining relationships between two variables to establish correlation degree between causes and effects. Correlation analysis provides a solution to the relationship and strength between two or more phenomena (Tosheva, 2012; Kalinov 2013).

Results and discussions

In the research, we report data for a 30-year period, which is divided into 3 stages.

I. The advent of democracy – 1989-1998:

An important moment in agriculture from this period turns out to be the changed socio-economic system which leaves a significant imprint on land relations in Bulgaria (Yovchevska, 2015). This leads to the development potential of agriculture, through the so-called "meeting" of private property with the free market in other words returning the land to real limits. As a result, apple production meets with

serious changes which led to a quick reduction in the area of apples, average yields and total fruit production. Areas of 23.9 thousand ha in 1989 decreased to 13.6 thousand ha (43.1% less) in 1997 (Figure 1).

The main reason for the condition is deterioration of age structure and slow rate of creating new apple plantations. For a long period, the majority of plantations have been left without the necessary care which led to massive premature senescence and dying of fruit trees. Losses from the liquidation of plantations with an unexpired depreciation period are particularly large. During the period, the same trend was observed in apple production – from 398.7 thousand tons, it decreased to 77.8 thousand tons which is five-time less (1989-1991). At the end of the period, apple production reached 129.1 thousand tons (Figure2). The growth is primarily due to an increase in yields per hectare, due to entry into fruiting of the young apple plantations and application of modern cultivation technologies.

II. The period before the accession of Bulgaria to the European Union – 1999 – 2006:

During period 2000 – 2006, a Special Accession Programme for Agriculture and Rural Development (SAPARD) was created under Regulation 1268/1999. The aims were to develop efficient agricultural production with a competitive food processing sector, achieve sustainable rural development and increase the income-earning and employment opportunities of people living in rural municipalities. The turning point of reduction in harvested areas and increase in average yields in 2002 is of interest (Figure1). Historically this is normal because the harvest is the result of fruiting apple trees planted on lands returned to people at the end of the 20th century. The period for fruiting stage of the orchard is 10 years.

III. The period after the accession of Bulgaria to the European Union – 2007 – 2020:

Rural Development Programme (RDP) was created based on the SAPARD program. Common Agricultural Programme (CAP) was still working through learning to implement Pillar 1 and Pillar 2 until 2013.

After the lessons learned and efforts to correct the mistakes, a new CAP was created in 2014. As a result, the policy has been improved in some relations and others – not. Despite the participation of thousands of farmers in CAP support, it does not have visible results of a more significant increase in harvested areas. The effect of support in the previous program period measured by average yield of apples is obvious (*Figure 1).*

In addition, we take to review the period after Bulgaria's accession to the EU. Since 2013 apple production growing but looking further back it is found that production decreasing over 30 years. There was a total collapse in the production of apples with 320.9 thousand tons during period 1989-1991 and a more permanent decline with 65.5 thousand tons during period 2000 – 2008. There was an increase in production with fluctuations in individual years after 2008. A reaching of 58.4

thousand tons in 2015 is related to climate change (*Figure 3).* Until 2020 almost constant production of 40 thousand tons per year was maintained.

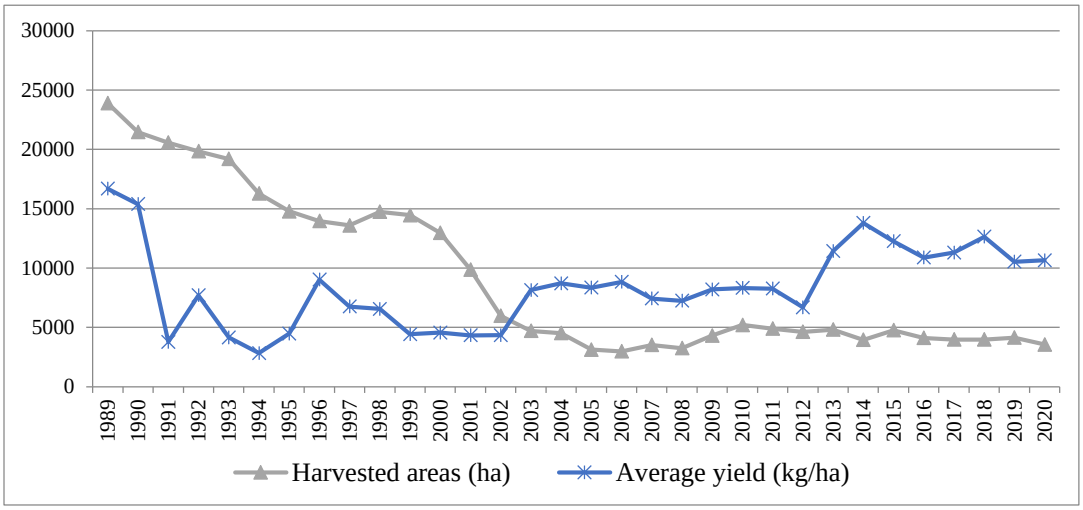

Figure 1. Apple harvested areas and average yield. 1989 – 2020

Source: Agrostat

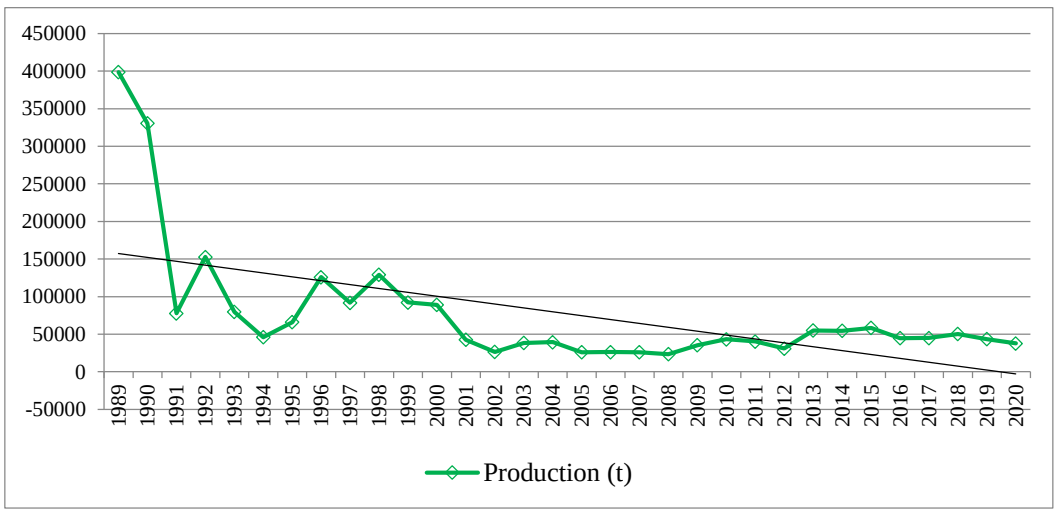

Figure 2. Apple production. 1989 – 2020

Source: Agrostat

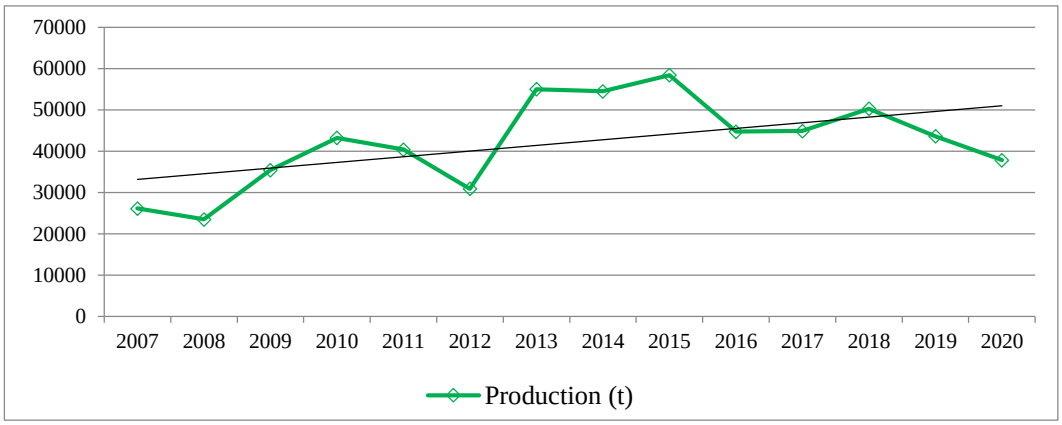

Figure 3. Apple production. 2007 – 2020

Source: Agrostat

The transition to a market economy in Bulgarian agriculture began at the end of the 1980s, has had a negative influence on foreign trade in fresh fruit. The transition to a market economy began at the end of the 1980s in Bulgarian agriculture had had a negative influence on foreign trade in fresh fruit. The quantity of apple exported was 48.7 thousand tons in 1989 also there was a sharp decline to 3.9 thousand tons in 1991 and reaches 1.6 thousand tons in 2020 (Figure 4). Bulgaria was a converter from exporter to importer of fruit. The apple import began with quantities of 2.3 thousand tons in 1992 and reached 68 thousand tons in 2019 (Figure 5). Since 2009, there has been a gradual and almost constant increase in imports until 2018. There is a sharp increase in import by 37% which is explained by lower import prices in 2019.

The unit prices for apple import and export are presented in detail for the period 1989 – 2020 (Figure 6). The average export price reached the highest value at $1.10 in 2006 and the lowest value at $0.17 in 2016. The average import price starts at $0.10 in 1992, increases to $0.57 in 2011 and comes to $0.30 in 2020.

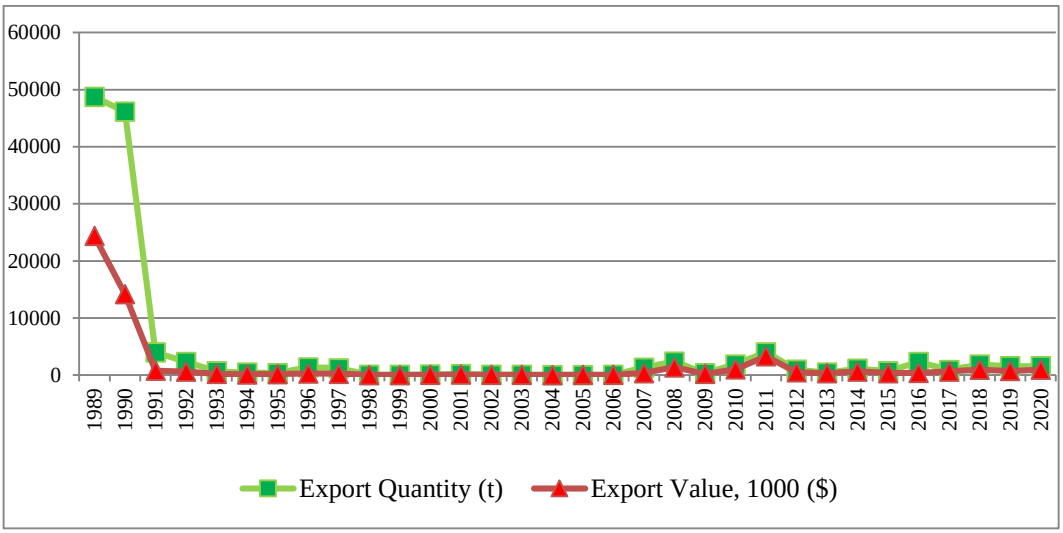

Figure 4. Export of apple, 1989 – 2020

Source: FAOSTAT

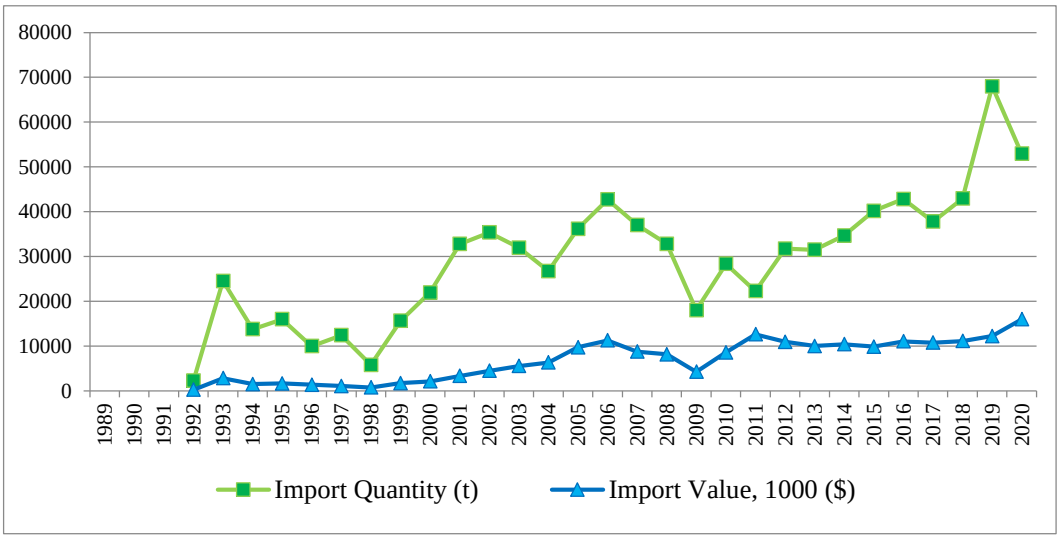

Figure 5. Import of apple, 1989 – 2020

Source: FAOSTAT

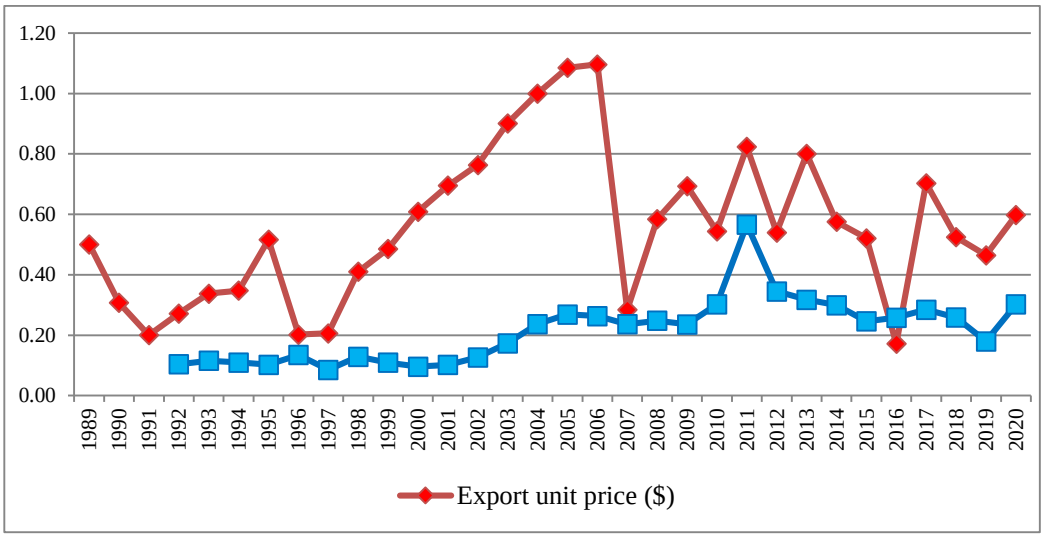

Figure 6. Export and Import unit price, 1989 – 2020

Source: FAOSTAT, Own calculation.

It was found that prices did not influence export and import from 2000 based on the correlation analysis of price, export and import (Table 1). Also, it was found that prices also did not influence export and import from 1998 based on produced output and exported production (Table 1).

Table 1. Correlation

Import (t), price from 2000	Export (t), price from 2000	Import ($), price from 2000	Export ($), price from 2000	Production (t), export (t) from 1998	Production (t), export ($) from 1998
-0,618	-0,038	-0,561	-0,251	-0,535	-0,547

Source: FAOSTAT, Infostat.

Conclusions

During the first stage, apple production underwent serious changes that led to a strong area reduction, average yields and fruit production after the democracy introduction in Bulgaria.

During the second stage, we observe decreased harvested areas and increased average yields, which are result of fruiting apple trees planted during the land reform at the end of the 20th century.

During the third stage, we notice increased apple production with fluctuations in individual years related to climate changes after the accession of Bulgaria to the

EU. Apple production reached a level of 58.4 thousand tons in 2015 and constant production of 40 thousand tons remained per year.

The transition to a market economy in Bulgarian agriculture also had a negative impact on foreign trade in fresh fruit. As a result of all these changes, Bulgaria turned from an exporter into an importer of fruit. It is necessary to pay more attention to the sector, as well as to take adequate measures to overcome the problem.

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Contacts: Monika Kabadzhova, Assist. Prof. PhD, Institute of Agriculture – Kyustendil, Agricultural Academy – Sofia, monika_kabadjova@abv.bg

SUSTAINABLE DEVELOPMENT OF VEGETABLE PRODUCTION VIA INNOVATION

Annie Dimitrova[56], Petia Branzova[57]

УСТОЙЧИВО РАЗВИТИЕ НА ЗЕЛЕНЧУКОПРОИЗВОДСТВОТО ЧРЕЗ ИНОВАЦИИ

Ани Димитрова, Петя Брънзова

Abstract

Bulgaria has a deep tradition in the production and export of vegetables, but in recent decades there has been a gradual but permanently contraction of the sector. Vegetable production occupies a smaller and smaller share of the country's agriculture, the problems in the sector are deepening and hindering its prosperity. The purpose of the report is to focus on innovations that would support the sustainable development of vegetable production in Bulgarian agriculture.

Key words: agriculture, vegetable production, innovations, sustainable development

JEL: Q10, O13, O3

Introduction

Vegetable production occupies an important place in the development of Bulgarian agriculture, vegetables are one of the main components in the diet of consumers, therefore they are also important for achieving food security in feeding the country's population. However, in the last thirty years, the problems in the sector have deepened and it is necessary to find a way to interrupt the negative trend and improve the sustainability of vegetable production as a share of Bulgarian agriculture. One of the possibilities for this is the application and use of innovative solutions of different types – mechanical, chemical, biological, technological, know-how, etc. The need to implement innovations in the production of vegetables is also caused by several main problems: aging of the agricultural population; the finite resource land, which is being used up and cannot be reproduced; environmental pollution and the need for its recovery.

The methodology of the report is in accordance with the main goal – to emphasize that the use of innovations would support the sustainable development of vegetable production in Bulgarian agriculture. Data from the agrarian reports of the Ministry of Agriculture, National Statistical Institute, as well as own studies were used.

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[56] Assistant, Economic Research Institute at Bulgarian Academy of Sciences.

[57] Chief assistant, Economic Research Institute at Bulgarian Academy of Sciences.

Literature review

Vegetable production, as well as the entire agrarian sector of the country, is experiencing difficulties in transforming into innovative and high-tech productions, assistance and support is needed for modernization and modernization in the most effective and sustainable way. With the accession of Bulgaria to the European Union (EU), serious questions arise related to the future development of vegetable production in the conditions of a single market, with strong competition from products and with a higher degree of subsidization (Nencheva-Ivanova at al., 2015).

A number of authors pay special attention to innovation as a factor for the development of the agrarian sector, and also examine policies that are considered innovative in the sector (Doitchinova, Stoyanova, Harizanova-Bartos, 2019) (Doitchinova, Stoyanova, 2014). In addition to the need for innovation in the sector, there are also studies that outline from an economic point of view the effect of cash flows on the activity of some sectors (Harizanova, 2013) as well as the development of sectors and trade in agricultural products from which innovative products are made (Popescu, 2018). In-depth research is also needed due to the impact that the CAP has had on the sector since the 2003 reform, when the subsidy policy changed from a payment for production to a payment per unit of area. The result is that direct payments stimulate much more the development of crops such as wheat, which are grown on large areas. For crops such as vegetables, income support is not sufficient and their production continues to decrease (Doitchinova, 2017). Therefore, during the second program period – PRSR 2014 – 2020. the criteria for receiving direct payments are undergoing changes (Atanasova-Kalaydzhieva, 2017).

In Bulgaria, the cultivation of crops such as wheat, corn, barley prevails, while vegetable production has shrunk to the point where it is necessary to import almost all vegetables, which in the past formed a significant part of the country's export of agricultural products (Kostadinova, 2017; Gorcheva, 2016; Dimitrov et al., 2021). There has been a significant decline in vegetable production, which began as early as 2014. and deepened over the years. One of the reasons for this is the insignificant support during the First Program Period 2007. – 2013 in terms of overcoming structural imbalances in agriculture (Petrova, 2017). The agrarian sector develops mainly resource-wise without adding additional value to the final product. This reflects on the competitiveness of the sector compared to other sectors of the economy, access to credit and foreign investments. Active state intervention is needed, through the financing of operating enterprises, the provision of innovative guarantee schemes and instruments and the implementation of investment programs (Vlaev, 2018). Of all the goods of organic origin, the vegetable market is characterized by a certain instability in terms of consumption and determination of resources (Ruscheva et al., 2022).

Problems in vegetable production are aggravated due to structural weaknesses of specialized farms such as seasonal fluctuations in demand, i.e. significant sales

are mainly in the period May – November (Nencheva-Ivanova et al., 2015). Therefore, it is of great importance to use innovative solutions that are in line with seasonality. The implementation of innovations is determined by factors such as preferences, requirements and income of producers (Stoyanova, 2007). The production and sale of the product require certain labor and material costs. These are socially necessary costs for labor, production, logistics and supply of the product, they find concrete expression in its price. (Yarkova et al., 2017), (Kotseva-Tikova, 2018).

Analysis of survey data

Vegetable production, with its great species diversity, is an important source of products that take a significant part in the nutritional balance. Growing vegetables in different seasons of the year and climatic areas contributes to maintaining a natural conveyor belt for supplying consumers with fresh vegetables. The use of innovations in the production of vegetables is a prerequisite for increasing production, efficiency and market sustainability of farms.

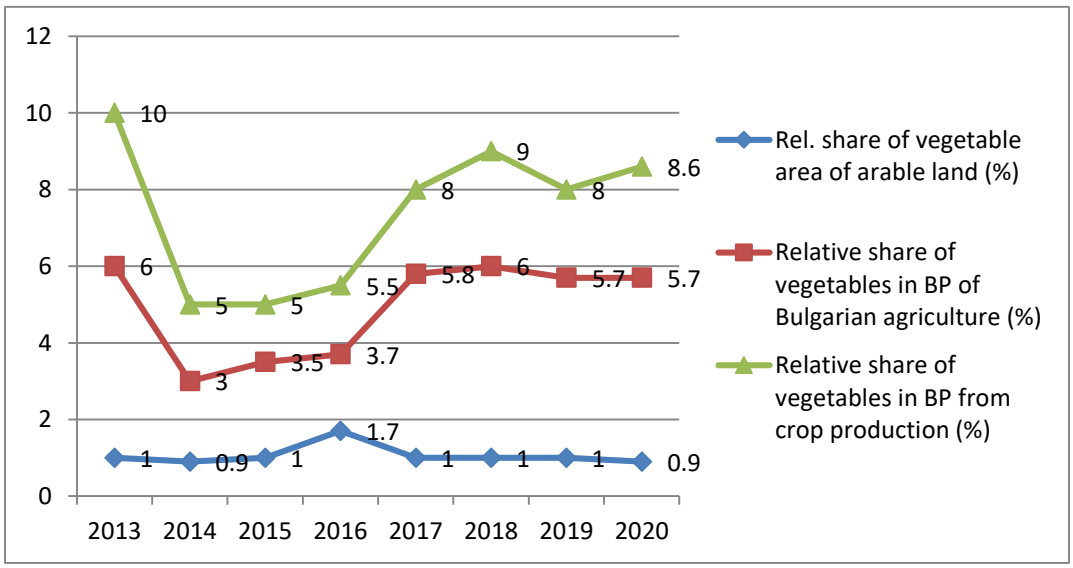

Figure 1. Place of vegetable production in the agricultural sector of Bulgaria 2013 – 2020

Source: Agrarian reports Ministry of Agriculture "Agrostatistics", Own calculations.

Figure 1 presents: the relative share of vegetables in the gross production of agriculture; the relative share of vegetables in the gross production of crop production and the relative share of the area of vegetables from cultivated land for the period of 2013. – 2020.

The relative share of vegetables in the gross production of agriculture for the period is between 3% and 7%. For 2013 the relative share amounts to 6% and in the next three years it decreases by almost half, respectively 3%, 3.5% and 3.7%. Since 2017 the indicator significantly increased compared to the previous years and this trend was maintained until the end of the considered period. The highest relative share of vegetables in the gross production of agriculture was recorded in 2018. – 6%.

The relative share of vegetables in the gross production of crop production for the period is between 5% and 10%. For 2013 the relative share is the highest and amounts to 10%, in the next three years it decreases by almost half and is about 5%. Since 2017 the indicator significantly increased compared to previous years and reached 9% in 2018. The increasing trend of the relative share of vegetables in the gross production of crop production is maintained until the end of the considered period. However, the value of the indicator at the end of the period is nearly 2% lower than at the beginning.

The relative share of the area of vegetables from cultivated land for the period is in the range of 0.8% to 1.7%. For 2013 the relative share amounts to 1.13%, in the following year the lowest value of the indicator is reported – 0.9%. Since 2015 the trend is increasing, with the largest relative share in 2016. – 1.7%. In the last considered year, the relative share of the area of vegetables from cultivated land was 0.9, so 2020 is the second year with the lowest value of the studied indicator for the period.

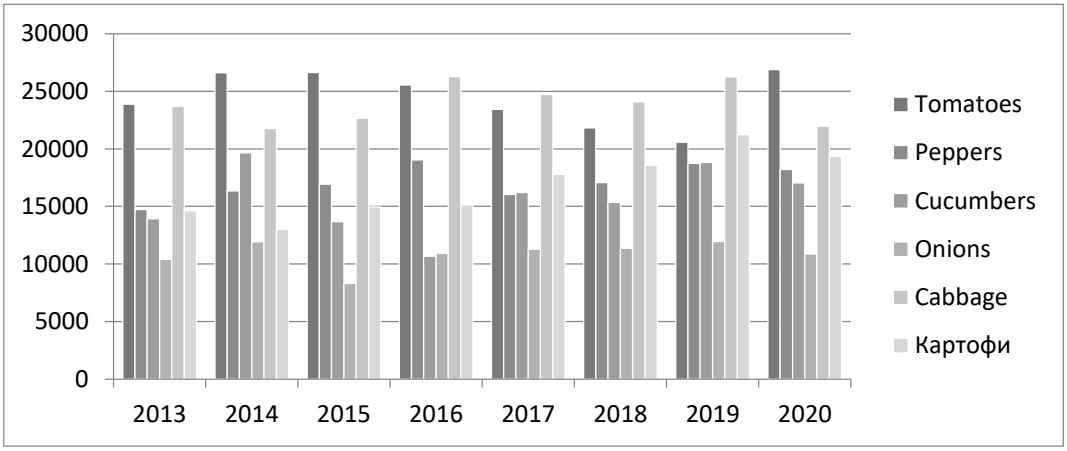

Figure 2. Average yields of main vegetable crops by year (kg/ha) for 2013 – 2020

Source: Agrarian reports Ministry of Agriculture "Agrostatistics", Own calculations.

Figure 2 shows the average yields of main vegetable crops by year for the period 2013. – 2020 The selected vegetables are traditionally consumed in the country and their production is important for the national food supply.

The average yield of tomatoes for the researched period increased until 2015, and in the following years the trend is decreasing. In 2020 the value of the indicator increased by about 6000 kg/ha compared to 2019. In all observed years, the average

yields of tomatoes are in the range from 20000kg/ha to 27000kg/ha, the decrease and increase of the production is not within large limits.

The average yields of pepper at the beginning of the period are 14734 kg/ha and increase every year including 2016, which is also the year with the highest values of pepper yields. In 2017 a decrease of 3019 kg/ha compared to the previous year was observed, but the average yields gradually increased in the following years by over 1000 kg/ha per year. For the last year of the analyzed period, an insignificant decrease in the average yields of pepper is reported.

The average yields of cucumbers for the period 2013 – 2020 are in the range of 10000kg/ha to 20000kg/ha, there are sharp changes in the values of the indicator every year. In 2014 an increase of over 5,000 kg/ha compared to 2013 is reported, and in the following year 2015 yields fall again and reach those of the beginning of the period. The decrease continued in 2016, but in 2017 again a significant increase is reported and average yields reach 16220 kg/ha. In 2018 there is a decline again in 2019. – promotion. In the last year of the period, the average yields of cucumbers are again reduced to 17045 kg/ha.

The average yields of onions during the research period did not change significantly, the values were preserved in all years and ranged from 10,400 kg/ha to 11,960 kg/ha, with the exception of 2015. when they sharply decrease and reach their lowest value for the analyzed period. The largest yield was in 2014 and 2019.

Average cabbage yields were highest in 2016. and 2019, their values were lowest in 2014. and 2020 Cabbage and tomatoes have the highest average yields of the selected vegetable crops for research. The values of the indicator vary between 21000kg/ha and 26500kg/ha for the period of 2013 – 2020.

The average yields of potatoes for the analyzed period are in the range of 12,000 kg/ha and 21,300 kg/ha, at the beginning of the period a decrease was observed in 2014 as well. the yield shrinks to 12999 kg/ha, this is also the lowest value of the considered years. After 2014 the trend is in a positive direction, yields are steadily increasing until 2019. and reach 21244 kg/ha, this is the highest value of the indicator for the period of 2013. – 2020 In 2020 average potato yields decreased by 1906 kg/ha compared to 2019.

Table 1. Reasons, expectations and result of the use of innovations in agriculture

Reasons		Expectations		Result	
Higher yields/more productive farming	82%	Increase profit	88%	Greater protection of the environment	41%
Limit labor costs	55%	Reduce production costs	74%	Reducing the effect of risky events	57%
More competitive farm	42%	Diversification of risk mitigation activity	49%	Distribution in new markets	43%
Reduction of pollution from the activity	29%	Reducing the need for resources	59%	Increase production by 50%	11%
Winning Innovation Project	24%	Environmental protection	45%	Increase production between 30% and 50%	35%

Source: Own survey 2020.

Table 1 presents the reasons, expectations and results of the use of innovations in agriculture. The farm managers who participated in the study are mainly driven by increasing income, reducing costs and minimizing the resources used on their farm in running their business. As the most important reason for implementing innovations on the farm, farmers indicate higher yields/a more productive farm – 82%, the highest expectations are for increased profits – 88%, but the results show that only 11% of farms reported a 50% increase in production. 35% of farms saw production increase by between 30% and 50%.

Another reason that stimulates farmers to implement innovations on the farm is limiting labor costs – 55%. The expectations from the used innovation are also related to limiting costs, but for production – 74%, of which the workers are also a part. A reduction in the need for resources was indicated by 59% of the surveyed farmers as an expected effect of the innovation.

As a less important reason for implementing innovations in the farm, reduction of pollution from the activity is indicated – 29%, the same trend is observed in the expectations from the innovation – 45% indicate the protection of the environment as an important criterion for the contribution of the innovation. The result of the implementation of an innovation in the farm is close to the stated expectations – 41% of the farms that used innovative practices report greater protection of the environment.

In terms of risk, a larger than expected effect was also observed. 49% of farmers expect the innovation used on the farm to diversify the activity to limit the risk, and the result is a 57% reduction in the effect of risk events.

Increasing competitiveness is another reason for implementing an innovation on the farm – 42%. The result of the innovation corresponds to the reason – 43% have spread their production to new markets.

Conclusion

Bulgaria is a traditional producer and exporter of vegetable crops. The geographical location and favorable climatic conditions allow the cultivation of a wide range of vegetables with very good quality characteristics. From the analysis, it can be concluded that in the individual sub-sectors of vegetable production, the degree of implementation of innovative solutions is small. As the most stimulating factors for the implementation of innovations, higher yields from the farm and limitation of labor costs are outlined.

The use of innovations in vegetable production can help increase labor productivity in the sector; increasing the competitiveness of the sector; increasing average vegetable yields; reduction of production costs; technological renewal and innovative production; increasing the quality of Bulgarian vegetables; more targeted use of financial resources by farm managers.

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Contacts: Annie Dimitrova, Assistant Professor, Research Institute at Bulgerian Academy of Science, e-mail: ani1978@gmail

OPPORTUNITIES FOR SUSTAINABLE FOOD PRODUCTION

Iliyana Krasteva[58]

ВЪЗМОЖНОСТИ ЗА УСТОЙЧИВО ПРОИЗВОДСТВО НА ХРАНИ

Илияна Кръстева

Abstract

The COVID-19 pandemic has clearly emphasized the significance of why there has to be a reliable and flexible food system which shall supply the population with sufficient amount of food products at reasonable prices. The economic crisis has made us all realize the relationships among human health, supply chains, the models of production and consumption. The developed Farm to Fork Strategy outlines the transition to a more just, healthy, and sustainable food system directed to the producers, consumers, climate, and the environment.

Key words: sustainable production, food system, food chain, sustainable food

JEL: O13, Q01, Q56

In the year 2020, the European Commission presents the Farm to Fork Strategy as part of the package of documents which shall implement the European Green Deal for achieving climate neutrality by the year 2050. The European Green Deal is a new growth strategy which aims at "transforming the EU into a just and prosperous society with modern, resource-efficient and competitive economy ensuring no net emissions of greenhouse gases by 2050, economic growth decoupled from resource use, no person and no place left behind. (European Green Deal, 2019, p. 2). Despite the transition to more sustainable systems being already a fact, feeding the fast-increasing population in the world continues to be a challenge which the existing production models face. Food production is still a leader in the pollution of air, water, and soil; it contributes to the loss of biological diversity and climate change and uses excessive amounts of natural resources, but at the same time food is wasted. Modern technologies and innovations combined with the increased social knowledge and search for new sustainable foods will benefit all stakeholders. The transition to sustainable food systems provides an enormous opportunity to farmers, fishers, producers of aquacultures, as well as the processors of food and suppliers of services in the food sector.

[58] Head Assist. Prof., PhD, D. A. Tsenov Academy of Economics, Department of Agricultural Economics.

The main goal of the current development is to reveal the possibilities for ensuring sustainable food production. The transition to a fair, healthy and sustainable food system is presented, outlining the main goals for sustainable food production and on this basis, successful examples from practice are considered.

Farmers who cultivate their land are of utmost importance for the preservation of biodiversity. On the one hand, they are among the first affected by the loss of biological diversity, but they are also among the first who benefit from its recovery. Biological diversity allows farmers to produce and provide safe, sustainable, nutritious, and accessible food (EU Biodiversity Strategy for 2030, p. 9). The Farm to Fork Strategy aims at changing the current food system of the EU by turning it into a sustainable model. Among the leading priorities are food security and safety; those lead to outlining the following main goals (https://www.consilium.europa.eu/bg/policies/from-farm-to-fork/):

- ensure sufficient, affordable, and nutritious food within planetary limits
- halve the use of pesticides and fertilisers and sales of antimicrobials
- increase the amount of land devoted to organic farming
- promote more sustainable food consumption and healthy diets
- reduce food loss and waste
- combat food fraud in the supply chain
- improve animal welfare.

The Farm to Fork Strategy is a new comprehensive approach referring to how Europeans value the sustainability of food (Project of the Farm to Fork Strategy, Ministry of Agriculture and Foods of the Republic of Bulgaria, 2020). People have been paying more and more attention to the environment, health care, social and environmental issues and seek value in the field of foods. A sustainable food system will be of major significance for the achievement of the climatic and environmental goals of the Green Deal; at the same time, it shall raise the income of the agricultural producers and increase the competitiveness of the EU. The EU goals are related to the decrease of the environmental and climatic impact of the food system of the EU by preserving its sustainability guaranteeing food security in case of climate changes and loss of biodiversity, which shall lead to a global transition towards the competitive sustainability of the strategy, see fig. 1.

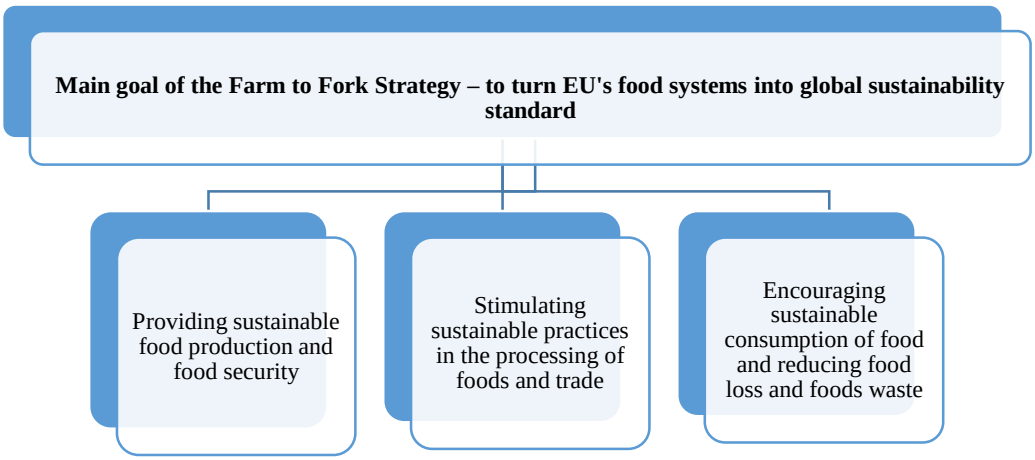

Figure 1. The Farm to Fork Strategy – major part of the European Green Deal

Source: Ministry of Agriculture and Foods of the Republic of Bulgaria, the Farm to Fork Strategy – sustainable food production, 22 June 2020.

The presented figure clearly shows that:

✓ the food chain which comprises the production of foods, the transportation, the distribution, the marketing, and the consumption, has a neutral impact on the environment; it facilitates the decrease of the changes in the climate and its adaptation to its impact; the preservation of the land, soil, water, air, and the preservation of biodiversity;

✓ the food security, feeding and social health guarantee that every citizen has access to healthy and sustainable food, which maintains high standards of safety and quality;

✓ the access to food is preserved, but at the same time, a more just economic return in the supply chain is generated; thus, on balance, the most sustainable food will become the most accessible, which shall encourage the competitiveness in the supply sector in the EU, creating new opportunities for the agricultural business.

Dealing with **the issue of loss and waste of foods** is of key importance for the achievement of sustainability. This is a global issue which is to become even more relevant in the society as it will have a negative impact on the three aspects – financial, environmental, and social – of the system of production and consumption of foods. The production and consumption of foods have a significant impact on the environment because they use intensively the limited natural resources (soil, water, and energy), they cause the formation of greenhouses gases, they pollute with the excessive use of plant protection products; this results in the exhaustion of nutritious properties of the soil such as nitrogen and phosphorus.

According to the evaluation of the Food and Agriculture Organization (FAO), which is an intergovernmental UN organization, annually in the world, almost one

third of the produced foods (about 1.3 billion tons) is lost or wasted on the route from the farm to the fork (National Programme for the Prevention and Reduction of Food Losses (2021–2026), pp. 2-5). In 2015, the General Assembly of the United Nations adopts the Sustainable Development Goals by 2030. One of them, Goal 12.3, states: "*by 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses*".

At the same time, the *prevention and reduction of food loss and food waste* creates opportunities and prerequisites for:

- improvement of food security (i.e., securing food supplies);
- increasing the efficiency of the food chain;
- introducing new technologies in the production of foods;
- reducing the pressure on the environment.

This outlines the necessity of the reduction of the dependency on pesticides and antimicrobial preparations, the reduction of unnecessary fertilization, the increase of organic farming, the improvement of humane treatment of animals and the reverse loss of biological diversity. Thus, **the main goals for securing sustainable production of foods by 2030** are presented in the following fig. 2.

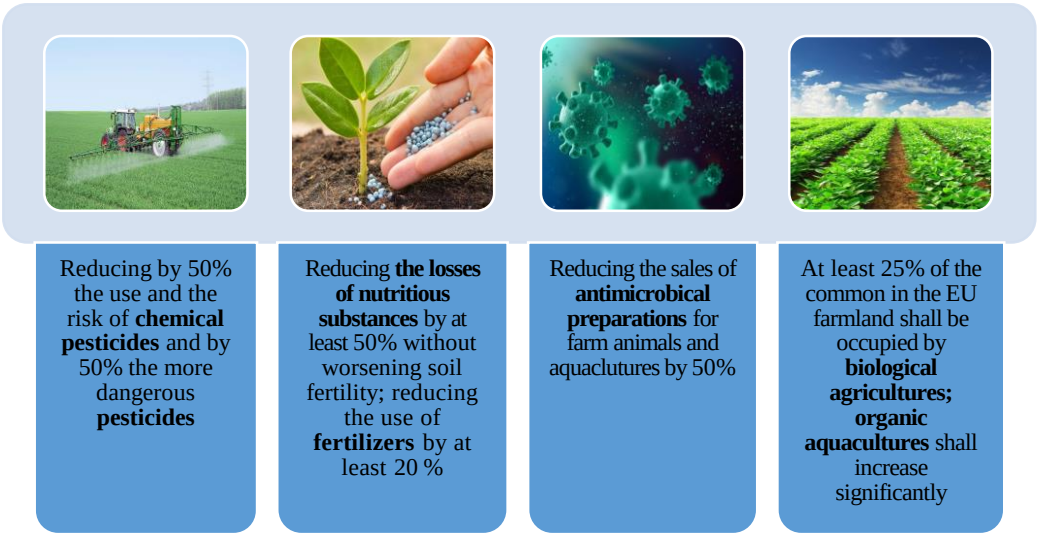

Figure 2. Main goals for the sustainable production of foods

Source: Project of the Farm to Fork Strategy published by the EC on 20 May 2020 https://www.mzh.government.bg/media/filer_public/2020/07/31/proekt_na_strategiia_ot_fermata_do_trapezata_publikuvana_ot_evropeiskata_komisiia.pdf

On balance, all participants in the food chain shall have a stand on the achievement of its sustainability. Agricultural producers, fishers and aquaculture producers

shall transform their methods of production fast and shall make the best use of natural, technological, and digital solutions in order to achieve better climatic and environmental results, which shall lead to increasing climate sustainability and optimizing the use of raw materials, e.g., pesticides, fertilizers, etc.

The use of **chemical pesticides** in agriculture contributes to the pollution of the soil, water and air, results in losses in biodiversity and can damage plants, insects, birds, mammals, and amphibians. The EC has created a harmonized risk indicator for determining the progress in reducing the risk related to pesticides, namely, a 20 % risk reduction of the use of pesticides over the last 5 years. Additional measures will be taken to reduce the whole use and the risk of **chemical pesticides by 50 per cent and the use of more dangerous pesticides by 50 per cent by the year 2030.**

Antimicrobial resistance (AMR), related to the excessive and irrelevant use of antimicrobial preparations for the health of man and animals, costs approximately 33,000 human lives in the EU. Thus, the goal is to take measures which shall reduce the sales in the EU of antimicrobial preparations farm animals and at fish farms by *50 % by 2030.*

The market of ecologically pure food continues to mark its development, by which organic farming shall be additionally encouraged. It has a positive impact on biodiversity, creates work positions and attracts more and more young farmers. In addition to the measures under the Common Agricultural Policy, such as the eco-schemes, the investments and consultancy services, the Commission will develop an Action plan related to organic production. This will guarantee consumer trust and will encourage the demand via promotional campaigns and green procurements. This approach will facilitate the achievement of the goal that at least **25% of farmland in the EU shall be cultivated under the regulations of organic farming by 2030 and organic aquacultures shall be significantly increased.**

We can discuss a number of **good practices and successful examples** for securing sustainable production of foods. A good example of a **new green business model is the extraction of carbon** by agricultural producers and foresters. Agricultural practices which remove carbon dioxide from the atmosphere contribute to the goal of climate neutrality. In the New Circular Economy Action Plan, the Commission will develop a regulatory framework for the certification of the elimination of carbon emissions based on stable and transparent reporting of carbon in order to follow the authenticity of carbon disposal.

Circular economy on biological basis is still, to a large extent, an unused capacity by farmers. For instance, the improved organic refineries, which produce organic fertilizers, protein fodder, organic energy, and organic chemicals, offer opportunities for transition to climate neutral European economy and creation of new work positions.

Another good example of sustainable agriculture is the implementation of the **methods of organic production** by farmers. They search for and implement innovative techniques for sustainable production, which are more favourable to the environment, and, at the same time, encourage circularity and humane treatment of animals.

A new measure will stimulate the digitalization of farms under the Common Agricultural Policy 2023 – 2027. This measure will allow the support of activities such as the implementation of *precise farming, robotization of the production processes in agriculture and digital marketing.* The project of the measure "*Investments in the Digitalization of Farms*" provides for the encouragement of the use of digital technologies in the agricultural sector, as for instance, meteorological stations, sensors, etc., facilitating the making of decisions at farms.

On the territory of Bulgaria and Europe, several **successful innovative projects** have been developed (https://capgreenzone.bg/wp-content/uploads/2021/10/%D0%9A%D0%BD%D0%B8%D0%B6%D0%BA%D0%B0_web 1.pdf, pp. 73-77); they are carried out and financed with funds under the Rural Development Programme 2014 – 2020.

For instance, scholars and farmers have been developing innovative biostimulants for healthy production. The Institute for Criobiology and Food Technologies in Sofia has been a project coordinator of an operative group under submeasure 16.1 of the Rural Development Programme 2014 – 2020; the activities on it have been carried out on the territory of the cities of Varna and Sofia. The project aims at solving several major problems, among which are the reduction of the use of chemical fertilizers, the improvement the quality of production, restricting the negative impact on the soil and increasing the yield by implementing biostimulants as a powerful biotechnological tool for increasing the growth and productivity of plants.

The origin and quality of products are followed with the help of a new blockchain technology. One of the projects under the Rural Development Programme 2014 – 2020 provides for the development and implementation of an integrated blockchain system of work process management allowing transparency of technological production processes and providing relevant information about the process of cultivating agricultural produce. The project gives priority to the implementation of a ***blockchain technology*** to ascertain how the transparency in the ecosystem of the supply chains of products/foods leads to the increase of trust among all participants.

A modern system of making decisions about field cultures and conservation farming. The project has been carried out on the territory of the cities of Varna and Sofia. The main priority is the development of a new organizational model of making decisions in *conservation farming*. The most important task is finding sustainable solutions for preventing the reduction of crops and decreasing the economic

results, which are among the major problems faced by farmers that implement conservation processing. The main goal is increasing the relationship between farmers and science, accelerating the transfer of knowledge and innovations in the practice, increasing the competitiveness and sustainability in the sector grain and oil crops.

In ***conclusion***, we can summarize that the transition to sustainable food systems requires a *collective approach* with the participation of public authorities from all levels of management, participants from the private sector along the chain of foods value, non-governmental organizations, local, regional, national authorities, scholars, and citizens. The Rural Development Programme will continue to be a key tool for the support of farmers in their transition to sustainable food systems. The new, so-called "ecosystems", will offer a larger resource of funds for the encouragement of sustainable development practices, including precise farming, organic production, diverse agricultural practices, which achieve "capturing" carbon dioxide from the atmosphere and its application to the soil. The Farm to Fork Strategy will have a positive impact on the way we produce, buy, and consume food, which shall provide an opportunity for a new better balance among the reliable and flexible food system, the population health, and the preservation of the environment.

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Contact details: Iliyana Krasteva, head assistant professor, PhD, D. A. Tsenov Academy of Economics – Svishtov, Department of Agricultural Economics, e-mail: i.krasteva@uni-svishtov.bg

ECONOMIC EFFICIENCY EVALUATION THEORETICAL FRAMEWORK TO BIOSTIMULANTS APPLICATION ON SPRING RAPE AND OAT

Angel Sarov[59], Ekatherina Tzvetanova[60]

ТЕОРЕТИЧНА РАМКА ЗА ОЦЕНКА НА ИКОНОМИЧЕСКАТА ЕФЕКТИВНОСТ ОТ ПРИЛАГАНЕТО НА БИОСТИМУЛАНТИ ВЪРХУ ПРОЛЕТНА РАПИЦА И ОВЕС

Ангел Саров, Екатерина Цветанова

Abstract

The economic efficiency evaluation approaches of biostimulants' (BS) application in agriculture are a significant challenge. The accepted working hypothesis in the study is that the BS application can significantly increase a specific crop's yield and profit, but it couldn't rise the farm's total profit. It was made an evaluation of foliar application efficiency with biologically active substances with different concentrations. The study aims to build a theoretical framework for economic efficiency evaluation of biostimulants' application to the spring rape and oat-based on linear programming.

Key words: agriculture, biostimulants, economic efficiency

JEL код: B23; C5; Q1

Introduction

The economic efficiency evaluation approaches of biostimulants' (BS) application in agriculture are a significant challenge. Must be taken into consideration different factors that depend on each other. They are not only technological, experimental, or legal constraints but also the diversity of social and behavioral aspects (Belcheva, S., 1989; Brown P. and Saa S., 2015; Looney, Jackson, 2011; Rademacher, 2018; Rademacher, 2015; Izumi et. al., 1984).

The study aims to develop a theoretical evaluation framework for the economic efficiency of the BS application to the spring rape and oat.

The biostimulants' application can significantly increase the profit per specific crop (per unit area) without increasing the farm's total profit. Thus, farms' production structure and business plan can be used to evaluate BS efficiency. Efficient BS

[59] Associate professor, PhD, University of Agribusiness and Rural Development, Plovdiv, Institute of Agricultural Economics, Agricultural Academy.

[60] Assistant professor, PhD, New Bulgarian University.

are those whose application increases the economic efficiency of the farm and vice versa.

Methodology

Data collection

At the beginning of 2021, in the first stage of the scientific project "Use of biostimulants in biological crop cultivation – assessment of the contributions to bioeconomy" there were set both seeds spring rape (sorte lakritz, brassica napus L.) and spring oat (sort Alexa 1). Both crop types are treated with different biostimulants with different concentrations. The BS were developed by the Institute of Cryobiology and Food Technology, Agricultural Academy, Sofia. (AA)

- BS 3 – chitosan
- BS 4 – (GA+GA) chitosan
- BS 5 – (HA) vermicompost extract
- BS 6 – (HA + HA) vermicompost extract
- BS 7 – (HA_IA) vermicompost + nature-identical growth regulator
- BS 5a – (HA_IA+ HA_IA) vermicompost + nature-identical growth regulator.

It was applied two-step treatment with different phenophases. The spring rape was treated two times – in the rosette and in the blooming stages. The spring oat was treated in stages of tillering and inflorescence fully. Harvesting was done mechanized.

The primary data was collected from The Agricultural Experimental Station (AES) in a test (experimental) field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy. The developed linear optimization model is based on the experimental field results, additional factors, and technical and economic norms (TEN). The model was fed up with additionally collected information from the National Statistical Institute, Bulgaria, the "Agrostatistics" department of the Ministry of Agriculture, Technical and Economic Standards for Agricultural Technology (developed by The Institute of Agrarian Economics).

Linear programming method

The economic-mathematical model is a mathematical task that reflects the essential relationships and dependencies which characterize an economic problem (Nikolov, N., et al., 1994).

Taking into consideration some constraints, the optimization model finds the optimal value (min or max) of a function. The function f is called an objective function. The system of equations and or/and inequalities are the system of constraints.

The objective function expresses the optimal criteria (min or max):

$$A_{11}X_1 + A_{12}X_2 + \cdots + A_{1n}X_n \leq B_1$$
$$A_{21}X_1 + A_{22}X_2 + \cdots + A_{2n}X_n \geq B_2$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$A_{m1}X_1 + A_{m2}X_2 + \cdots + A_{mn}X_n = B_1$$

$$F = C_1X_1 + C_2X_2 + \cdots + C_nX_n \rightarrow \max\ (min), \quad (1)$$

where:

- Xj – size (magnitude) of the activities or indicators,
- Aij and Cj – the activities to be performed,
- Bi – quantity resource or activity (constrains).
- Objective function F that determines the optimal criteria.

Results

As it was mentioned before, the primary data was collected from AES in an experimental field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy. Table 1 presents the yield of spring rape in three repetitions of the biostimulants at different concentrations of dry substance and the control – 8 (K). Table 2 presents the biometric indicators after treatment with biostimulants.

Table. 1.Spring rape yield, harvest 2021

№	1st rep., kg	2nd rep., kg	3rd rep., kg	Total	Average on plot	kg/da	% moisture	Mass per 1000 grains, gr.
3	1.300	1.280	1.260	3.840	1.280	128.000	8.8	6.34
4	1.250	1.300	1.240	3.790	1.263	126.300	8.6	6.17
5	1.150	1.200	1.310	3.660	1.220	123.500	8.4	6.00
6	1.300	1.240	1.280	3.820	1.273	127.300	8.8	6.21
7	1.225	1.220	1.235	3.680	1.227	122.700	8.3	5.90
8 (K)	**1.150**	**1.200**	**1.310**	**3.660**	**1.220**	**122.000**	**8.8**	**5.88**
5a	1.245	1.220	1.270	3.735	1.245	124.500	8.7	6.03

Source: The primary data from The Agricultural Experimental Station (AES) in a test (experimental) field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy.

Table. 2. Biometrics – spring rape, 2021

Variant	Plant height cm.	Number of branches per 1 plant	Number of grains in 1 plant	Mass of legumes in 1 plant, gr.	Number of seeds in 1 plant	Mass of seeds in 1 plant, gr.
3	109.0	7.2	259.1	22.876	1213.2	7.691
4	110.0	6.9	246.8	22.381	1118.1	6.897
5	109.4	7.1	248.2	22.562	1265.0	7.593
6	110.8	6.9	247.9	22.231	1232.0	7.645
7	108.8	7.3	248.1	22.391	1284.3	7.581
8 (K)	**109.4**	**7.0**	**238.0**	**22.746**	**1266.2**	**7.440**
5a	111.625	7.1	248.1	22.559	1236.9	7.458

Source: The primary data from The Agricultural Experimental Station (AES) in a test (experimental) field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy.

Both the spring oat yields after foliar feeding with the biostimulants at different concentrations of dry substance and the control 8 (K) and the oat biometrics are presented in Tables 3 and 4.

Table. 3. Spring oat yield, harvest, 2021

№	1st rep., kg	2nd rep., kg	3rd rep., kg	Total	Aver-age on plot	kg/da	% mois-ture	Mass per 1000 grains, gr.
3	1.300	1.280	1.260	3.840	1.280	128.000	8.8	6.34
4	1.250	1.300	1.240	3.790	1.263	126.300	8.6	6.17
5	1.150	1.200	1.310	3.660	1.220	123.500	8.4	6.00
6	1.300	1.240	1.280	3.820	1.273	127.300	8.8	6.21
7	1.225	1.220	1.235	3.680	1.227	122.700	8.3	5.90
8 (K)	**1.150**	**1.200**	**1.310**	**3.660**	**1.220**	**122.000**	**8.8**	**5.88**
5a	1.245	1.220	1.270	3.735	1.245	124.500	8.7	6.03

Source: The primary data from The Agricultural Experimental Station (AES) in a test (experimental) field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy.

Table. 4. Biometrics – spring oat, 2021

№	1st rep., kg	2nd rep., kg	3rd rep., kg	Total	Aver-age on plot	kg/da	% mois-ture	Mass per 1000 grains, gr.
3	1.105	1.300	1.203	3.608	1.203	120.267	13.4	27.32
4	1.555	1.260	1.407	4.222	1.407	140.733	14.7	26.62
5	1.560	1.350	1.455	4.365	1.455	145.500	14.6	29.66
6	1.415	1.150	1.283	3.848	1.283	128.267	14.6	25.57
7	1.370	1.300	1.335	4.005	1.335	133.500	13.3	26.69
8 (К)	**1.220**	**1.000**	**1.110**	**3.330**	**1.110**	**111.000**	**14.5**	**28.12**
5a	0.885	0.850	0.868	2.603	0.868	86.767	16.3	28.74

Source: The primary data from The Agricultural Experimental Station (AES) in a test (experimental) field at the Institute of Agriculture and Seed Science "Obraztzov Chiflik" – Ruse, Agricultural Academy

The construction of the model uses two criteria – max gross margin and max profit. There were build two economic-mathematical models based on these criteria:

First task. A task with optimized production structure of a farm, considering the agrotechnical requirements for crop rotation. The solution gives the most optimal production structure under both criteria of *max gross margin and max profit*. It will allow obtaining a decision on how to optimally combine available resources (land, labor force, size of arable land) and farm constraints; what crops to produce; agrotechnical requirements; which biostimulants to apply; on which cultures and in what concentration to be applied BS; in which phase to treat them to achieve the highest economic effect.

Second task. There were set bounds for the minimal and maximum size of the arable land, including crops treated with biostimulants. The aim is to find an optimal solution, achieving *max gross margin* and *max profit*. The solution gives the optimal combination of the most economically effective productions. The result is the best combination of the available resources (land, labor resources, and various biostimulants), giving specific constraints. Also, what crop to produce and what agrotechnical requirements? All this achieves the highest economic effect.

It was worked on the following hypothesis: Biostimulants, applied in the critical phases of vegetation in the appropriate dose, stimulate the productivity of crops to an extent dependent on the species and variety belonging and increase the economic efficiency of agricultural holdings.

Defined variables and constrains

The subjective restrictions shrink the possible solutions. This is because including more and more different group criteria in the model (e.g., land, crops, BS, land constraints, labor force, etc.) searches for a balance between the defined constraints and often leads to compromise solutions to the task.

There were used three types of biostimulants in different combinations with different concentrations (table 5).

Table 5. Applied biostimulants and their concentration

Biostimulants	Description
BS1_CH	(GA) chitosan 500 ml/ha
BS2_2CH	(GA+GA) chitosan 2*500 ml/ha
BS3_V	(HA) vermicompost extract 500 ml/ha
BS4_2V	(HA + HA) vermicompost extract 2*500 ml/ha
BS5_VR	(HA_IA) vermicompost + nature-identical growth regulator 500 ml/ha
BS6_2VR	((HA_IA+ HA_IA) vermicompost + nature-identical growth regulator 2*500 ml/ha

Source: Institute of Cryobiology and Food Technology, Agricultural Academy, Sofia.

The variables used to evaluate the BS effect on economic efficiency are presented in Tables 6 and 7. It is worth mentioning that the spring rape and spring oat were treated with different BS in different concentrations (table 6). In addition, it was used other factors such as other crops, resources (land, labor force), and financial indicators (gross margin, costs, profit) (table 7).

Table. 6. Variables with biostimulants treatment

Crop	Biostimulants (ha)						
	Control	BS1_CH	BS2_2CH	BS3_V	BS4_2V	BS5_VR	BS6_2VR
spring rape	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
spring oat	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}

Source: Authors' calculations

Table. 7. Other variables

Other crops (ha)		Resources		Finance (BGN)	
x_1	Wheat	x_{18}	Own arable land (ha)	x_{22}	Income
x_2	Corn	x_{19}	Rented arable land (ha)	x_{23}	Material costs
x_3	Sunflower	x_{20}	Permanently employed mechanics (number)	x_{24}	Labor costs
		x_{21}	Permanent employees (number)	x_{25}	Margin
				x_{26}	Gross margin
				x_{27}	Fixed costs
				x_{28}	Profit
				x_{29}	Profit with subsidies

Source: Authors' calculations

Constrains

The constraints of the optimal plan are divided into three groups: land usage (table 8); labor (table 9); and supporting constrains (table 10).

Table 8. First group of constrains related to the land usage (in ha)

Constrains	Formula	
	Optimal production structure task (first)	**Max and min area bounds task (second)**
Area constrains (acres)	$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} + x_{17} = x_{18} + x_{19}$	$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} + x_{17} \leq x_{18} + x_{19}$
Constrain on rented area (ha)	$x_{19} = 11\,000$	$x_{19} \leq 11\,000$
Constrain on owned area (ha)	$x_{18} = 1\,000$	
Autumn cereal crops, minimum 45% of the sowing area (ha)	$x_1 \geq 5\,400$	
Autumn cereal crops, minimum 55% of the sowing area (ha)	$x_1 \leq 6\,600$	
Sunflower, maximum 17% (1/6) of the sowing area (ha)	$x_3 \leq 2\,040$	
Constrains on the land, using BS, minimum (ha)		$x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} + x_{17} \geq 3360$
Constrains on the land, using BS, maximum (ha)		$x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} + x_{17} \leq 4560$

Source: Authors' calculations

Table 9. Second group of constrains related to the labor (number)

Constrains	Formula
Permanently employed mechanics (number)	$x_{20} = 4$
Permanent employees (number)	$x_{21} = 2$

Source: Authors' calculations

Table 10. Third group of constrains, supporting (BGN)

Constrains	Formula
Income	$116x_1 + 136x_2 + 190x_3 + 113{,}46x_4 + 128{,}93x_5 + 117{,}46x_6 + 114{,}86x_7 + 115{,}79x_8 + 118{,}39x_9 + 114{,}11x_{10} + 42{,}18x_{11} + 45{,}70x_{12} + 53{,}48x_{13} + 55{,}29x_{14} + 32{,}97x_{15} + 48{,}74x_{16} + 50{,}73x_{17} = x_{22}$
Variable material costs	$27x_1 + 27x_2 + 26x_3 + 24{,}5x_4 + 39{,}5x_5 + 39{,}5x_6 + 39{,}5x_7 + 39{,}5x_8 + 39{,}5x_9 + 39{,}5x_{10} + 31x_{11} + 46x_{12} + 46x_{13} + 46x_{14} + 46x_{15} + 46x_{16} + 46x_{17} = x_{23}$
Labor costs	$x_{24} = 18000x_{20} + 18000x_{21}$
Fixed costs	$x_{27} = 55x_{19}$
Margin	$x_{25} = x_{22} - x_{23}$
Gross margin	$x_{26} = x_{22} - x_{23} - x_{24}$
Profit	$x_{28} = x_{22} - x_{23} - x_{24} - x_{27}$

Source: Authors' calculations

Objective function

The objective function and the constrained values were added in the following linear programming model, using two optimal criteria – max gross margin and max profit.

$$F = 80x_1 + 102x_2 + 155x_3 + 79{,}96x_4 + 80{,}43x_5 + 68{,}96x_6 + 66{,}36x_7 + 67{,}29x_8 + 69{,}89x_9 + 65{,}61x_{10} + 2{,}18x_{11} - 9{,}30x_{12} - 1{,}52x_{13} + 0{,}29x_{14} - 22{,}03x_{15} - 6{,}26x_{16} - 4{,}27x_{17} - 18000x_{20} - 18000x_{21} \rightarrow \textbf{Max gross margin,} \quad (2)$$

$$F = 80x_1 + 102x_2 + 155x_3 + 79{,}96x_4 + 80{,}43x_5 + 68{,}96x_6 + 66{,}36x_7 + 67{,}29x_8 + 69{,}89x_9 + 65{,}61x_{10} + 2{,}18x_{11} - 9{,}30x_{12} - 1{,}52x_{13} + 0{,}29x_{14} - 22{,}03x_{15} - 6{,}26x_{16} - 4{,}27x_{17} - 18000x_{20} - 18000x_{21} - 55x_{19} + 31x_{18} + 31x_{19} \rightarrow \textbf{Max profit} \quad (3)$$

Conclusion

Based on the results of the empirical test collected from AES in the experimental field at the Institute of Agriculture and Seed Science "Obratzov Chiflik" – Ruse, Agricultural Academy, there was collected and analyzed primary data related to the impact of experimentally developed biostimulants at the Institute of Cryobiology and Food Technology, Agricultural Academy, Sofia, on spring rape and spring oat. On this basis and additionally collected information, it was developed production optimization model.

The construction of the model uses two criteria – max gross margin and max profit. There were build two economic-mathematical models based on these criteria. The first model allows obtaining a decision on how to optimally combine available resources (land, labor force, size of arable land) and farm constraints; what crops to produce; agrotechnical requirements; which biostimulants to apply; on which cultures and in what concentration to be applied BS; in which phase to treat them to achieve the highest economic effect. The second model gives the optimal combination of the most economically effective productions. The result is the best combination of the available resources.

The applied approach is widely used in solving optimization problems. The next step will be to verify constructed methodology in other farms in Bulgaria. Also, to derive conclusions related to the biostimulants' effect on the economic efficiency of the farm.

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Contacts: Assoc. Dr. Angel Sarov, Higher School of Agribusiness and Regional Development, Plovdiv, Institute of Agrarian Economics, Agricultural Academy, angel.sarov@gmail.com

Ch. assistant doctor, Ekaterina Tsvetanova, New Bulgarian University, ecvetanova@nbu.bg

PRODUCER ORGANISATIONS OPPORTUNITIES AND PERSPECTIVES IN BULGARIA

Galina Ivanova[61]

ВЪЗМОЖНОСТИ И ПЕРСПЕКТИВИ НА ОРГАНИЗАЦИИТЕ НА ПРОИЗВОДИТЕЛИ В БЪЛГАРИЯ

Галина Иванова

Abstract

As a result of the economic crisis situation in the country, the need arises for the farmers to look for alternative methods to deal with challenges that they are face in the business environment. In Europe one of the main approach for overcoming crisis situations and increasing the efficiency and development of small and medium-sized farmers is unification in producer organisations. This report aims to reveal important characteristics of producer organisations and to justify their application as an opportunity to improve the agribusiness development in Bulgaria.

Key words: organisations, producers, development, agribusiness

JEL: Q10, Q13

In the 21st century, the development of the agricultural sector is under the influence of various negative factors, which are manifested as a result of rapidly changing business environment, increased competition and the new market order laid down by international agreements. The current unstable economic situation has a negative impact on producers in agricultural sector worldwide. It manifests itself especially strongly in 2020 due to the impact of COVID-19 pandemic and difficulties encountered in agricultural sector. The effects are expressed mainly in production disruption and processing of agricultural products, due to difficulties in the supply of means of production; reduction in the consumption of basic food products (fruits, vegetables, meat, milk, dairy products, etc.) as a result of closure of hotel and restaurant business; lack of manpower, which is necessary to carry out the activities in agricultural sector, etc. Measures to contain the COVID-19 pandemic are bringing global economy to brink of recession. A number of businesses, including the agrarian one, are experiencing difficulties of various kinds as a result of the measures and restrictions imposed by governments in order to stop the spread of the virus. This suppresses economic growth to a high degree and leads to new challenges for agrarian business, such as rising resources prices. In addition, as a result

[61] PhD student, University of economics – Varna, e-mail: yordanova_galina@ue-varna.bg

of the war in Ukraine, prices of energy and raw materials, including wheat and other cereals, have risen significantly. This, in turn, causes further aggravating inflationary pressures from the recovery from the COVID-19 pandemic. All these circumstances have an adverse effect on farmers economic results and may lead to large losses threat and for producers further performance of activity. In order to deal with situation farmers should monitor international prices and their impact on domestic inflation to take appropriate and timely action to change their business management strategies. The effect of all this gives rise to the necessity they look for alternative methods to deal with the challenges that have arisen, which will contribute to reducing losses risk and increasing opportunities for their development in business environment. The purpose of this report is to reveal important characteristics of producer organisations and to justify their application as an opportunity to improve the agribusiness development in Bulgaria.

In European Union it has historically been observed that to deal with crisis situations, producers in agricultural sector unite in networks (unions, associations) through cooperation, thus receiving advantages that help to deal with a number of issues they face. The concept of networks in modern conditions is increasingly used in various fields, but in this report attention is directed to networks in agribusiness. In the studies of authors (Doitchinova et al., 2017) in this field it was concluded that there is no single definition of networks concept. The interpretation depends on different aspects in which they are considered. There are many definitions of term "networks" in the specialized literature, but for purposes of this report, the definition used is that a network is accepted as an intermediate form of organisational management in which a number of business units are interconnected through specific inter-firm interactions (Ford et al., 2011). In the context of this definition, cooperative relationships arise between individual producers in the process of seeking compensation for weak market positions in order to develop and secure a competitive advantage in agribusiness. The main priority of this network type of interconnected business units is to combine interests of the participants to achieve higher production efficiency and competitiveness. There is ample evidence for the existence of strategically important effects of well-built networks on the stability and development of producers in agricultural sector.

For example, the participation of cooperatives in EU countries has led to an improvement in well-being of a part of the producers in agricultural sector. By uniting and cooperating a group of producers in an association, the aim is to ensure stable prices for agricultural goods, expanded agricultural production and development of each participating producer. Uniting producers in agricultural sector is one of the ways to achieve such goals, which are otherwise difficult to achieve. These can be overcoming a crisis period in the market, providing materials necessary for production process, greater participation not only in the Bulgarian, but also in the interna-

tional markets, since the international trade chains are looking for quantities, qualities, in some cases and uniqueness that one or two farmers cannot provide. The formation of cooperatives in many countries, such as Italy, France, Greece, etc. is based on specific legislation. In one form or another, a policy of state support and assistance to the cooperative system is carried out in all countries. Main directions in this regard are, in addition to granting subsidies, loans with low interest rates, also building joint strategies for product sales, support strategies through use of common services needed in production process, etc. For example, in Italy, cooperatives are completely tax-exempt for the first ten years of their establishment. In many countries, networks in the form of cooperative unions represent the interests of agricultural producers before state, municipal and international authorities.

A characteristic form of networks in agribusiness applicable in Bulgaria is producer organisations recognized by the Minister of Agriculture, Food and Forestry. They can be producer groups and producer organisations (GPs and POs). According to Ordinance No. 12 of May 5, 2015 on the terms and conditions for the recognition of producer organisations of agricultural products, associations of producer organisations and inter-branch organisations and producer groups, the general conditions to which producer groups and producer organisations must comply in order to be recognized are following:

- are incorporated as a general partnership, limited liability company, cooperative;
- when making decisions, each member can hold no more than 40 percent of the voting rights and the members democratically control their organisation;
- have personnel, infrastructure and equipment necessary to provide professional, material and technical support to their members;
- a producer of two or more agricultural products can be a member of different GPs and POs for each agricultural product;
- GPs and POs of agricultural products are recognized by the Minister of Agriculture, Food and Forestry in certain sectors.

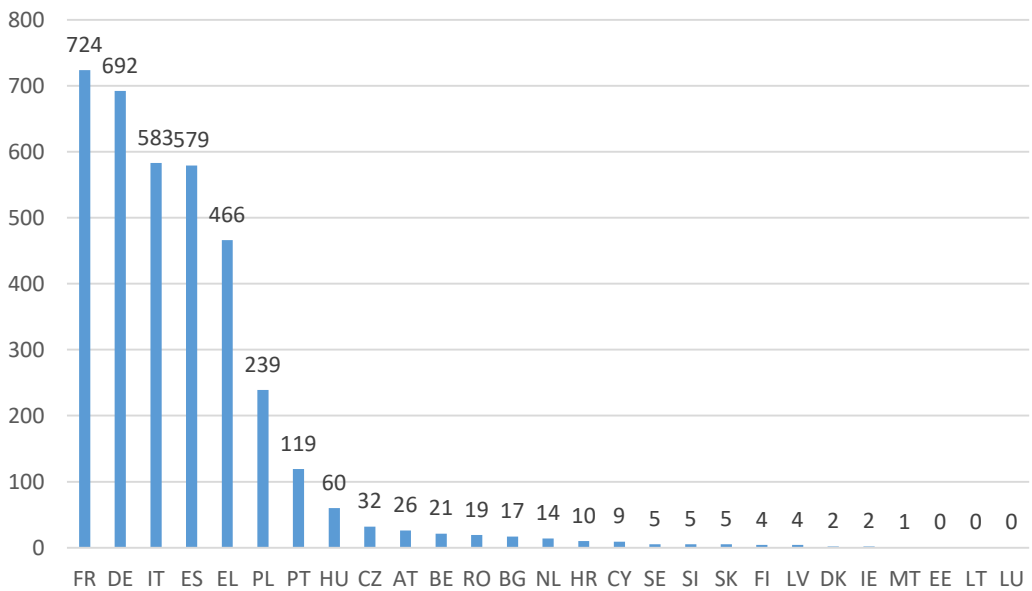
The difference in conditions for recognition by the Minister of Agriculture, Food and Forestry of producer groups and producer organisations consists in the fact that:

- producer organisations must consist of at least 6 producers of agricultural products for which recognition is requested, while producer groups must have at least 4 members;
- producer organisations that apply for recognition each year must offer on the market production worth not less than 50,000 BGN, while producer groups should offer on the market production worth not less than 25,000 BGN.

Producer organisations (GPs and POs) help farmers to cooperate in the processing and marketing of production. Producer organisations can provide farmers with easier market access and greater market power together with other actors in

the food supply chain. They can also contribute to mitigating economic risks by, for example, ensuring payment reliability and investment sharing. The cooperating in GPs and POs also helps to reduce transaction costs. The construction of such business structures is associated with opportunities for producers development in a given agribusiness sector. The popularization of cooperatives in Bulgaria following this method is an attempt to prove that the unification leads to development of producers in agriculture. EU recognizes the special role of producer organisations.

There are many farmers in EU who work on small family farms. This makes it somewhat difficult for smallholder farmers to protect their interests when negotiating with other actors in the supply chain. Accordingly, to strengthen the collective bargaining power of farmers, EU supports them by uniting in producer organisations. Producer organisations, in turn, strengthen producer bargaining mainly by improving marketing, information exchange, assistance in quality management, concentration of supply, etc. There are around 3,400 recognised producer organisations in the EU (as of 2017). They carry out their activities mainly in the sectors "fruits and vegetables", "milk and dairy products", "cereal crops", "oil-bearing crops", "honey and bee products", etc. Only three EU countries do not have any recognised producer organisation: Estonia, Lithuania and Luxembourg (Figure 1).

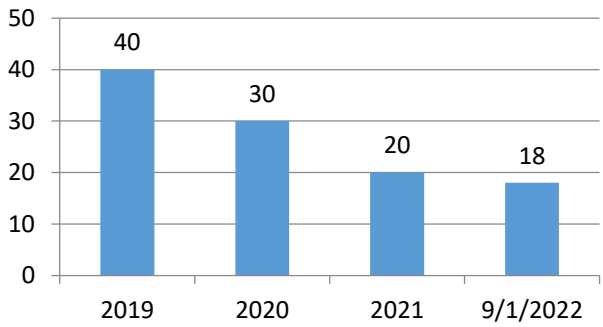


Source: ISAMM, 23 July 2018.

Figure 1. Number of recognized producer organisations by EU country

The chart shows that as of July 2018 France, Germany, Italy, Spain and Greece have the highest numbers of recognized producer organisations. In these countries, the unionization of farmers has a beneficial effect on producers in agricultural sector and its benefits are realized. France has the highest number of recognized producer organisations (724), followed by Germany (692), Italy (583), Spain (579), Greece (466) and Poland (239). In other countries such as Portugal (119), Hungary (60), Czech Republic (32), Austria (26), Belgium (21), Romania (19), Bulgaria (17), Netherlands (14), Croatia (10), Cyprus (9), Sweden (5), Slovenia (5), Slovakia (5), Finland (4), Latvia (4), Denmark (2), Ireland (2) and Malta (1), their application is in more low prevalence.

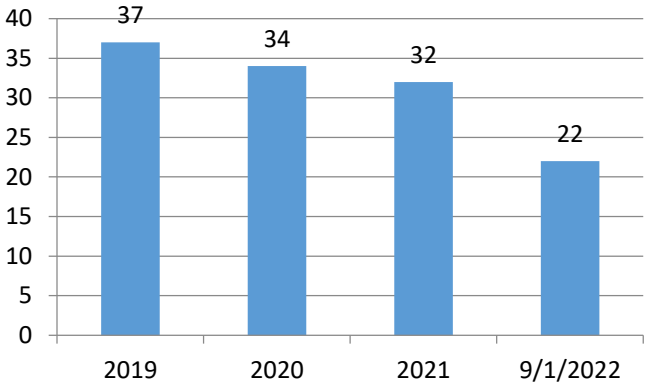
In order to follow the development of producer organisations in recent years in Bulgaria, it is necessary to study their number. The charts below show dynamics in number of both types of producer organisations recognized by the Minister of Agriculture, Food and Forestry in Bulgaria: producer groups and producer organisations (GPs and POs). The period for which changes were observed is for the last four years: 2019, 2020, 2021 and as of 1 September 2022. It is determined based on the latest data for EU countries as of 2018. Based on them, the trend in development of the number of recognized GPs and POs in Bulgaria has been established.



Source: Ministry of Agriculture, Food and Forestry.

Figure 2. Dynamic in the number of recognized producer groups in Bulgaria

Figure 2 shows that the trend for a four-year period in development of number of recognized producer groups in Bulgaria is decreasing. This demonstrates a lack of agricultural producers interest in the country to unite in such kind of producer organisations.



Source: Ministry of Agriculture, Food and Forestry.

Figure 3. Dynamic in the number of recognized producer organisations in Bulgaria

Figure 3 shows that the trend in development of number of recognized producer organisations in Bulgaria over a four-year period is downward, as is also observed in the case of recognized producer groups.

The reasons for a lack of interest in producer organisations in Bulgaria could be different. First of all, one of the reasons could be unstable economic situation in the country due to consequences of COVID-19 pandemic, since the study period covers the beginning of pandemic until now. Decreasing trend could also be driven by other factors such as farmers ignorance about direct benefits of their participation in such type of networks, as well as a lack of trust between farmers, processors and traders. In addition, lack of interest on the part of farmers could be the result of a lack of the necessary legal framework to stimulate association, a lack of up-to-date data on the dynamics of number of recognized producer organisations in the EU, a lack of funding opportunities, a lack of traditions, etc.

In Bulgaria, the State Fund "Agriculture" supports producer organisations by providing financial assistance under the "Operational Programmes" scheme. The support provided is aimed at increasing competitiveness and market orientation, reducing fluctuations in producers' incomes due to crises and increasing the use of environmental technology for cultivation and production. The scheme aims to unite together producers so that they can strengthen their positions in the market. Producer organisations that apply for recognition can apply for support under measure 9 "Establishment of producer groups and organisations" from the Rural Development Programme 2014 – 2020. The last procedure for receiving project proposals under this measure was in 2018.

Conclusion

The research identifies that in Bulgaria there is a lack of interest in the unification of farmers in producer organisations. This may refer the farmers' concerns about their uncertainty in expected results, financing possibilities, mistrust in current system in the country, etc. The importance of commented type of cooperation for the farmers development in other member states of the European Union raises the question of the need for additional research both on factors stimulating farmers unification in producer organisations and on prerequisites for increasing the sustainability of these structures in Bulgaria. It is important, for example, to what extent the provision of support opportunities by the State Fund "Agriculture" would increase interest of producers in agricultural sector in the country in this type of unification. In addition, a new acceptance of project proposals under measure 9 "Establishment of producer groups and organisations" from the Rural Development Programme 2014 – 2020 is suitable for considering impact of already implemented support under the measure on the dynamics in development of the newly created structures.

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Contacts: PhD student Galina Ivanova, University of economics – Varna, e-mail: yordanova_galina@ue-varna.bg

CRAIN MARKET OBSTACLES WITHIN THE BLACK SEA REGION

Desislava Ivanova[62]

ПРЕДИЗВИКАТЕЛСТВА ПРЕД ПАЗАРА НА ЗЪРНО В ЧЕРНОМОРСКИЯ РЕГИОН

Десислава Иванова

Abstract

The Black Sea region is a major producer and exporter of wheat, in addition to being an extremely significant hub for international trade with agricultural goods. In this respect the region's influence on the global grain market is steadily increasing. Ukraine is one of the largest producers of grain commodities not only in the Black Sea region, but also in the world. The physical supply of goods, the disrupted logistics structure, the food security of the population, the damaged port infrastructure, as well as the long-term prospects are only few of the challenges, which are facing the grain market in the conditions of a military invasion. The impact of the conflict within the region is having a lasting influence on global grain trade due to the disrupted international food supply chain.

The purpose of the publication is to present key aspects of the impact of the grain market in the Black Sea region on the world economy with an emphasis on the challenges arising from the interaction between the participating countries, including Russia and Ukraine. The subject of the research are the trends and challenges facing the grain market in the Black Sea region. The subject of the publication is the Black Sea region with a focus on Ukraine.

Key words: grain, market, Black Sea region, Ukraine, influence

JEL: F1, Q02; Q17

1. Introduction

The Black Sea region is one of the most dynamically developing sectors of the world economy. The specificity of the region is that "the strategies of the big countries are concentrated on controlling small-scale, but important for world trade and communications geographical locations" (Vasilev, Zlatev, 2019).

The main objective of this report is to present the importance of the grain market in the Black Sea region on the global economy, emphasizing the challenges of interaction between the participating countries, among them Russia and Ukraine

The geographical position of the Black Sea region covers about 0.3% of the territory of the EU, stretching from "Romania and Bulgaria, through northern Turkey and reaching Georgia" (Natura 2000, 2010). The countries that are included in the region are "countries with immediate access to the Black Sea (Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine), and those that are strongly influenced in

[62] PhD student, University of Economics – Varna.

terms of history and geography, even if they do not have direct access to Black Sea (Greece, Armenia, Moldova and Azerbaijan)" (Dimitrova et al., 2017).

The importance of the Black Sea region is due to the fact that Russia, Kazakhstan and Ukraine are the largest grain exporters in the region. In the period since the 1990s, world grain trade has increased by 10%, reaching record high levels due to increased imports from other developing countries. The main wheat importers are China and Pakistan, along with expanding imports from countries such as: Iran, Brazil, North Africa and Egypt. The development of animal husbandry in Mexico and North Africa also resulted in the increment of grain imports. Since the beginning of the 21st century, the share of the main exporting countries in the international grain trade is steadily descending, due to the constantly growing Black Sea exports, South Asia (for wheat) and Brazil (for corn). In this regard the Black Sea region influence over the global grain market is progressively perceptible (Lytvun, 2007).

The Black Sea region is a major producer and exporter of wheat, in addition to being a center from great significance in reference to world trade in agricultural goods. The region's influence on the global grain market is continuously growing. In respect of the global nourishment security of the world, Ukraine is considered as world's major granary. The weather and soil conditions are favorable for the production of numerous commodities. Ukraine has achieved a great share of the export market in the following countries – North Africa, Europe, the Persian Gulf area, etc. Between 2008 and 2010, both Russia and Ukraine exported an average of 29 million tons of wheat annually, which totaled 21.3% of the world wheat exports for the period and more than any other major exporter – USA, Canada, EU – 27 and Australia (Goychuk, Meyers, 2011).

In 2018, 49.3 million tons of grains and pulses were harvested from an area of 11.7 million hectares in Ukraine. This resulted in abundant exports of agricultural goods: wheat – 28.2 million tons, corn – 9.5 million tons, sunflower – 11.5 million tons. Further more the record grain harvests for Ukraine in 2019 (70 million tons) accounted to historic high exports of 50.4 million tons (Voicilas, Kalaman, 2020).

2. Significance and impact of the grain market on the world economy

The Black Sea region is a major world producer and exporter of wheat, sunflower oil and, to a lesser extent, maize. Both Russia and Ukraine produce 14% of world wheat production and provide 28.5% of the annual world wheat exports. The production of wheat and corn from Russia and Ukraine for the period 2017 – 2021. and their comparison with the US is presented in Figure 1.

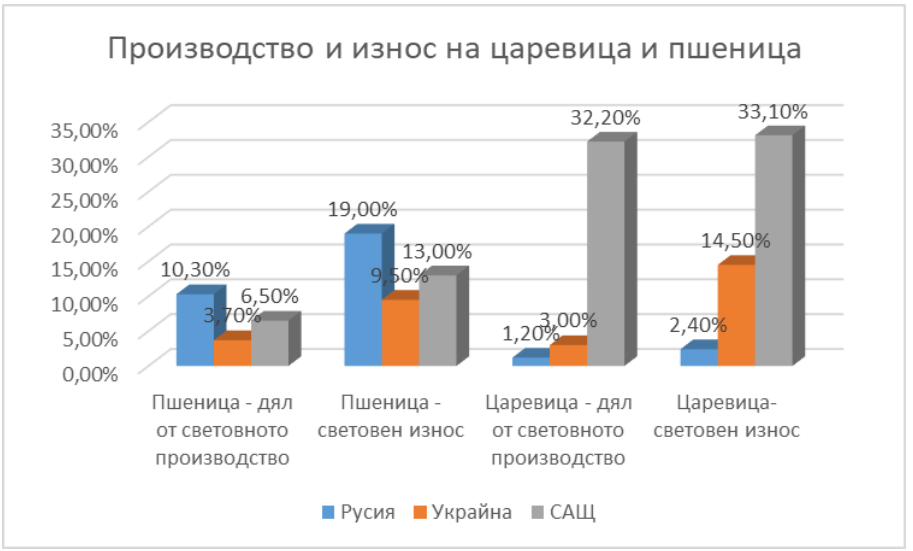

Figure 1. Corn and wheat production for the period 2017 – 2021 (according to data from CoBank Report (2022)

Ukraine is the second largest country in Europe after the Russian Federation with about 42.2 million hectares of agricultural land, which is 70% of the country's total area. The agricultural sector has an essential role in the country's economy, as the agricultural potential and the favorable geographical location, with access to the Black Sea and direct access to key markets in the EU, the Commonwealth of Independent States, the Middle East and North Africa, are a prerequisite for Ukraine to remain for decades among the ten largest exporters of wheat, corn and sunflower oil in the world. With the collapse of the Soviet Union and the Declaration of Independence in 1991, Ukraine began reform in terms of changing its legislation to provide private ownership of agricultural land and to favor the activities of local farmers (Nykolyuk et al., 2021).

According to Eurostat data, in 2021, Ukraine supplied more than a quarter of its total cereal imports from countries outside the EU. In addition to being one of the largest producers and exporters of grains, Ukraine is also considered key supplier of two other agricultural products – fats and oils (15% of all imports from outside the EU) and oilseeds (10%). The Ukrainian exports of grains crops and oilseeds for the period 2011 – 2021 is presented in Figure 2.

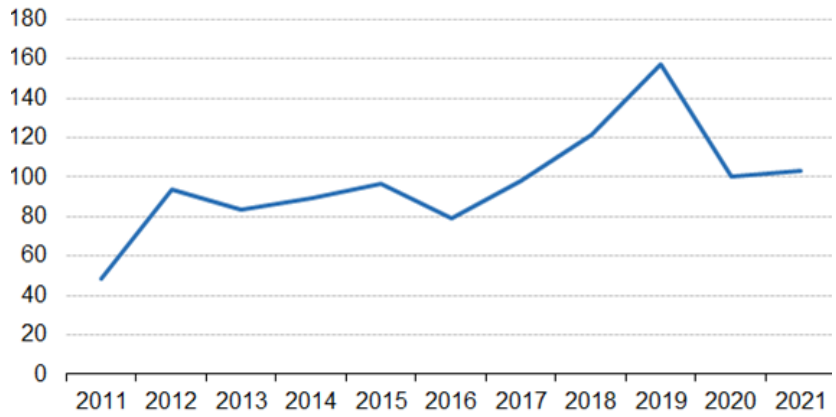

Figure 2. Export of grains from Ukraine for the period 2011 – 2021 (Eurostat)

The prices of key energy-intensive raw materials such as fuels, fertilizers and pesticides as well as the disruptive consequences of the COVID-19 pandemic had an influence on both grain production and export of Ukraine in 2021. A weak harvest in South America, strong global demand and supply chain problems reduced grain and oilseed stocks and drove prices to their highest levels since 2013 (Glauber, Laborde, 2022).

Despite the country's declining grain exports in 2021, over the past two decades, three countries in the Black Sea region – Russia, Ukraine and Kazakhstan have become global leaders in grain production and trade, displacing the US and France as the previous largest wheat exporter countries (Svanidze, Duric, 2021).

3. Grain market challenges

Other regional conflicts, namely such as the "Caucasus conflict" as well as the Russian-Georgian war since 2008 contribute to the instability of relations in the Black Sea region. This finds an indirect negative impact on the relations between Russia and Ukraine and in particular strengthens the instability of the Black Sea region and raises in conflicts between the two great powers – Russia and the USA. The main reason for the growing public attention to the region are its importance for the nourishment security not only within the EU but also globally. According to Yotsov, the factors that do not allow the countries in the region to form a common policy and identity are related to:

• The border of the Black Sea between the Caucasus and the Balkans (between Europe and Asia), which does not allow for the effective implementation of the activities of various regional organizations.

• Cultural differences between countries and professed religions.

• Tensions between Ukraine and Russia (as well as between Georgia and Russia) arising from post-Soviet relations and political arrangements.

• Differences in the political and military forces of individual countries.

Russia's invasion of Ukraine in 2022 changes all grain exports in the Black Sea region, with global implications as well. The physical supply of goods is not the sole problem for Black Sea trade, as ports remain closed and logistics infrastructure in Ukraine is expected to be severely damaged. The long-term prospects for the grain market in Ukraine are also uncertain, due to the fact that a large number of grain producers have ceased operations due to their inclusion in the Ukrainian army. According to World-grain data, the country needs 9-10 million tons of wheat for domestic consumption. In the fall of 2021, the wheat crop in Ukraine was sown on a total of 6.5 million hectares. Expectations are for a harvest of 16 to 17 million tons. If initial forecasts come true, the country could be exporting 6-7 million tons of wheat in the marketing year 2022 – 2023. In reference to corn exports, expectations are for 37 million tons from a total of 5.5 million hectares, as domestic consumption of the country is amounting 7 million tons. Production problems in Ukraine may cause a food supply crisis in countries that traditionally rely on Ukrainian grain, with countries in the Middle East and North Africa already looking for alternative grain suppliers (World-grain, 2022).

Regardless of when the military tensions in the region end, its impact on global grain trade will have a lasting impact, mainly due to expected grain shortages and supply shortages. The CoBank report states that extreme price volatility is expected in the cereal market, with "high fertilizer prices, crop chemical shortages and ongoing supply chain issues" undoubtedly having influence (Zuckerberg, 2022). The conflict in Ukraine is further exacerbating existing tensions in the agricultural commodity market. Since the end of 2021, prices of commodities such as grains and vegetable oils have reached record highs, surpassing even the levels of the global food price crises of more than a decade ago. Black Sea export disruptions and high prices further destabilize food security not only in these regions but globally. However, global demand for wheat is expected to be met in the current marketing year as countries such as Australia, Brazil and the US increase exports to make up for the lack of exports from Russia and Ukraine. It is difficult to predict what will happen after this marketing year, as it will be determined by the development of the current conflict in addition to agricultural fundamentals in key cereal supply and demand regions. Currently, Ukrainian corn and wheat cannot be transported across the Black Sea. Although efforts are being made to increase exports by rail and/or trucks traveling through the country's western borders, overall cereal export volumes from the country are likely to be comparatively low, largely due to significant logistical challenges (Glauben et al, 2022).

After the annexation of Crimea in 2014, Russia gained full control of the naval base in Sevastopol, with the aim not to develop the port as a commercial enterprise. Several of the enterprises involved in transporting grain from Crimea are subsidiaries of Russian state-owned enterprises. Russia's main goal is to promote trade

through Sevastopol in order to integrate Crimea into the rest of the country and build international acceptance of its occupation of the region. As a deep-water port that can accommodate large ships, Sevastopol is the foremost port in respect of grain export. Since the beginning of the invasion of Ukraine, Sevastopol has become the closest major port to much of the newly occupied parts of Ukraine. Grain trucks are reported to be heading to Crimean depots and silos from occupied Ukrainian territory (Cook et al., 2022).

The Russian-Ukrainian crisis poses serious global and regional challenges for food security. Russia's invasion of Ukraine has displaced millions and disrupted agricultural production and trade from one of the world's major export regions. The overall impact of the Russian-Ukrainian military invasion of global food markets, both directly and indirectly through fertilizers and energy, is unparalleled in at least the last half century. Global food markets registered a significant price spike immediately following Russia's invasion of Ukraine on February 24, 2022. The FFPI food price index reached its highest recorded level since its inception in 1990 in March 2022, averaging 159.3 points, and 12.6 percent higher than February 2022. The Russian-Ukrainian crisis and related sanctions against Russia are cutting off fertilizer supplies, accelerating the rise in fertilizer prices. In addition to the direct impacts, the Russian-Ukrainian crisis has significantly increased global uncertainty for all market participants. This uncertainty, which is both reflected and caused by increasing price volatility in internationally traded commodities, affects production and marketing decisions and stimulates speculative market behavior of other participants. With these price fluctuations, it is difficult for farmers to make decisions about what to produce and how much to trade; firms are more cautious to invest in agriculture (Abay et al., 2022).

Russia ships grain from Black Sea ports, which is also a major channel for international grain shipments from Ukraine. Major grain export ports include Chernomorsk, Kherson, Mykolaiv, Odessa and Yuzhny. Disruption of logistics activities and normal functioning of Black Sea ports affects exports from Russia, Ukraine and neighboring countries, in this number Bulgaria, Kazakhstan and Romania. After the invasion it is common practice export shipments to be canceled or significantly delayed. Disruptions in the normal functioning of Black Sea ports and grain exports from the Black Sea region have a notable impact on global food supplies, and limited global supplies further strengthen the price of global food. Ukrainian cities, particularly port cities, are key to the country's agricultural exports. The conflict has limited exports from one of the world's largest grain suppliers by damaging its ports (Nhemachena et al., 2022).

Despite the tension in the export market, no deficits in wheat supply are currently expected on a global scale. Russia has largely resumed its Black Sea exports. However, as a result of sanctions, the US Department of Agriculture predicts that Russian wheat exports will decrease by 8.6% (three million tons). However, agricultural

products are exempt from the latest sanctions announced by the European Commission, related to the ban on transport through the EU territory and access to EU ports. Accordingly, Russian wheat supplies are expected to be around 32 million tonnes, which is slightly lower than export volumes in 2018/2019 and 2019/2020, but still higher than the highest export volumes in the last 15 years. Ukrainian corn and wheat are currently prevented from being transported across the Black Sea (Thomas et al., 2022).

Russia is the world's largest exporter of wheat, ahead of the US and Canada. Ukraine is fourth in the global ranking and while India is relatively small in comparison, the shipment ban reduces alternative sources for importers in terms of both food and livestock, which favors India.

Ukraine can produce up to 26.7 million tons of wheat per year in the short term; although there is great potential for higher production values. Access to international grain markets is one of the main motivations for increasing productivity (Ryabchenko, Nonhebel, 2016). There fore the lack of such access could be negatively influencing the productivity of the country in the following years.

In summary of the data presented in the publication, the challenges facing the grain market in the Black Sea region are the following:

First: The military invasion in the region puts the world trade in cereals at risk and leads to endangering the food security of the population, since the Black Sea region is a major producer and exporter of grains, as well as an important strategic center for the world trade with agricultural goods.

Second: The Russian-Ukrainian crisis poses serious global and regional food crisis challenges.

Third: Disrupted logistics for exports from the Black Sea region leads to instability and increases in cereal prices, further destabilizing global food security.

4. Conclusion

The Black Sea region is an important center for global food production and trade. Russia and Ukraine are major global producers and exporters of major grain crops such as wheat, barley, corn, and vegetable oils. Volatility in food production and trade (especially exports) has far-reaching implications for food supplies, prices and food security in import-dependent countries. Given that Russia and Ukraine are the dominant exporters, finding replacement suppliers is extremely difficult in the short term. Shortages in global food supply production due to drought conditions, mainly affecting regions in South America such as Argentina, Brazil and Paraguay, make it difficult to increase imports from alternative sources. In addition, increased demand from countries seeking alternative suppliers and any restrictive export measures by major exporting countries will significantly affect global food supplies and maintain pressure on food prices. The disruptions in food production caused by the military conflict will further affect future food supplies from conflict-affected

areas such as the eastern parts of Ukraine, which is the breadbasket of the country. Most of Ukraine's wheat is grown in the east, where fighting has taken place since the war broke out.

The unfolding crisis in Ukraine comes at a time when global food markets are already reeling from rising prices, supply chain disruptions and the ongoing effects of the COVID-19 pandemic. As the world's largest and fourth largest exporters of wheat, Russia and Ukraine are essential to ensuring global food security. Any major disruption to production and exports further contributes to price escalation and undermines food security for millions of people already subject to high levels of global food inflation. Beyond these immediate effects, the crisis risks having negative consequences for next season's harvest as it affects the supply and prices of natural gas and fertilizers, of which Russia is a key exporter. As farmers prepare for the new planting season, a sharp rise in commodity prices could lead to lower yields, lower quality produce, and less planted area.

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Contact details: Desislava Stefanova Ivanova, PhD candidate University of Economics – Varna, e-mail: desis89@gmail.com

INNOVATIVE DEVELOPMENT OF AGRICULTURAL BUSINESS AND RURAL AREAS

Reviewers: Prof. Dr. Diana Kopeva
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