FACULTY OF ECONOMICS
Department of "Management and Marketing"

ATIDZE BAYRYAMOVA ALIYEVA

ROLE OF THE CAP IN PROMOTING THE INNOVATION PROCESS IN AGRICULTURE

ABSTRACT

of a dissertation for the acquisition of a doctorate in the scientific specialty "Organization and management of production (by branches and sub-branches)"

Scientific supervisor: Assoc. Dr. Teodor Radev

Plovdiv, 2023

I. GENERAL CHARACTERISTICS OF THE DISSERTATION WORK

1. Relevance and reasons for choosing the topic

In recent years, in the theory of agrarian management, the leading approach for sustainable development of agricultural holdings and the agricultural sector has become more and more important. This is determined by the fact that the world population is increasing dramatically, which leads to more and more needs for agrarian goods and services, which are produced by the increasingly limited factors of production. On the one hand, the needs of society are unlimited, and on the other, production factors are becoming increasingly scarce. This sets a difficult task for agrarian management to create goods that meet the growing needs of society.

Agriculture, as a national industry, is important for the development of the economy, because this industry forms the majority of the food supply of the population and determines the way of life of a large part of this population. The sustainable development of the sector is guaranteed both by the application of national financial support and by the application of the Common Agricultural Policy (CAP), which strive to create conditions for the sustainable development of the agricultural sector. One of the leading approaches to ensure the sustainable development of the sector is the promotion of innovations in agricultural holdings. The majority of farms in our country are small structures that are characterized by strong conservatism in terms of their management by farmers. A considerable part of these farms are run by young people, which, in our opinion, are also the main prerequisites for innovative development of the agricultural sector. Young farmers are the bearers of innovation in the sector, benefiting from the conditions of the CAP that it provides for the development of the innovation process.

The new EU rural development policy emphasizes the application of the principles of circular sharing of resources and the use of bio-based materials and technologies. These are the forms of innovation that the EU will support in the future. The support framework is known, but are Bulgarian farms ready to adapt to this framework? The present dissertation study seeks the answer to this question.

2. Conceptual thesis of the dissertation

In the present dissertation study, the thesis is defended that the Common Agricultural Policy (CAP) creates conditions for promoting the innovation process in agricultural holdings.

Leading subtheses in the study are:

- The CAP sets a framework that determines the potential for innovation in farms and the sector as a whole;
- CAP influences the innovation process of agricultural holdings and their adaptability to market conditions.

3. Object, subject and purpose of the study

Object of scientific researchare the agricultural holdings operating on the territory of Bulgaria.

The subject of the scientific research is the innovation process in agricultural holdings under the conditions of the CAP.

The goal The purpose of this dissertation is to analyze the conditions that CAP creates for the innovation process in agricultural holdings.

In order to achieve the set goal, the following scientific tasks are solved:

1. Clarification of the essence and role of innovations in the management of agricultural holdings;
2. Clarifying the nature of the CAP and its role in promoting innovation in agriculture;
3. Development of a conceptual framework for evaluating the innovation process in agricultural holdings and for evaluating the impact of the CAP on this process;
4. Analyzing and evaluating the factors of the innovation process in the agricultural sector;
5. Analyzing and evaluating the impact of the CAP on the innovation process in agricultural holdings and the sector as a whole;
6. Formulation of recommendations to improve the application of CAP in the process of promoting innovation processes in agricultural holdings.

The methods, which are used in conducting the research are:

• System analysis (object analysis presented as a system). The main objectives of its implementation in the specific case are reduced to deriving and justifying the main trends in the development of the investigated phenomena and processes.

• Situation analysis. With its application, a description of the state of the investigated enterprises at a certain moment or for a certain period will be made. Depending on the needs of management, a system of indicators will characterize the state of competitiveness and the financial state of the enterprise in the sector.

• Comparative analysis. Through it, certain conclusions are made about the place of the enterprise in the relevant sector in terms of financial status, investment activity, market presence, etc. For this purpose, comparative assessments of the main parameters of competitiveness of the enterprises in the sector are made.

• Diagnostic analysis. It is used for an in-depth study of the conditions and factors that led to the established state of the enterprise. When it is conducted, first of all, the main indicators will be determined, which give a generalized characteristic of the competitiveness of the enterprise. Next, the main factors considered to determine the level of competitiveness will be identified.

• Statistical methods. Through these methods, the properties of the studied population are investigated and the research hypotheses are tested.

Research period – 6 years. The present study analyzes the innovation process in agricultural holdings in the period 2014-2020, a period in which the current CAP (2014-2020) operates. The indicators characterizing the state of the investigated objects were calculated for the specified period. The present study is limited in time, place, methodology and scope. Specific approaches and methods are used because of the possibilities they

provide for analyzing and solving the research tasks of the dissertation work. An attempt has been made to answer the most important questions without considering that they are fully exhausted and developed.

Sources of information -data from the Ministry of Agriculture, the Directorate "Agrostatistics", the Directorate "Development of Rural Areas", the Directorate "Compensatory Measures", data contained in the Agrarian Report of the Ministry of Agriculture, data from Eurostat and the system of agricultural accounting information, as well as a number of normative documents of the European commission and the Republic of Bulgaria. The main part of the information was collected through surveys among agricultural producers managing agricultural holdings.

The dissertation is presented in an introduction, three chapters and a conclusion spread over 190 pages, references and appendices. The study is illustrated with 72 figures and 14 tables.

II. MAIN CONTENT OF THE DISSERTATION

Introduction

In this part of the dissertation, the reasons for choosing the topic are presented, as well as the arguments that defend the necessity and relevance of the dissertation research. A brief summary of the highlights regarding EU and Bulgarian policies regarding agricultural development and innovation in the sector is presented. The main thesis of the dissertation work, the object, the subject and the purpose of research are presented. The main tasks to be solved in order to achieve the goal of the dissertation research are formulated. Outlines the approaches and methods used to collect, synthesize and analyze information for the purpose of scientific research. The main sources of information as well as the methods for its objective collection and systematization are indicated.

Chapter I. Conceptual framework for evaluating the innovation process in agricultural holdings under the conditions of CAP 2014-2020

This part of the dissertation presents and validates a basic framework for the analysis and evaluation of the innovation process in agricultural holdings, which are developed under the conditions of the CAP 2014-2020.

This thesis chapter begins with a brief outline of innovation theory, smoothly transitioning to the essence of innovation and the innovation process. The main opinions of the researchers of innovation and innovation processes are reviewed. The essence of the role of CAP on the innovation process in agriculture has been clarified. The main idea behind the CAP, the policies it includes and the tools to influence the sector are presented. The First and Second pillars of OPS and their institutional influence on the development of agriculture are presented in depth. At the end of the first chapter, the methodological approach for analysis and evaluation of the CAP influence on the innovation process in agricultural holdings is presented and argued.

Methodical approach of the research

The assessment of the impact of OPS on the innovation process in the dissertation research is carried out both at the macro and micro level. A deductive approach is used to identify the regularities that occur in the researched objects regarding the innovation process. Due to the lack of sufficient data on the state of the factors determining the innovation activity of agricultural holdings, the method of expert evaluation and the survey method are used.

The analysis of the credibility of the dissertation thesis proceeds in two successive stages:

- ***Evaluation of innovation activity of agricultural holdings;***
- ***Assessment of the impact of the CAP on the environment in which the innovation process takes place in the sector both at the farm level and at the macro level.***

Evaluation of the innovation process in agricultural holdings. It has already become clear that innovation is a complex and complex economic category. This causes difficulties in determining the indicators for the evaluation of the factors determining the innovation process in the economy. In the specialized literature, there is no unified opinion on the number and composition of indicators for researching the innovation process of agricultural holdings. This stems mainly from the differences in the opinions of the authors about the essence of the economic category. On the one hand, there is an aspiration to maximally characterize the innovation process in the economy. This leads to an excessive increase in the number of proposed evaluation indicators, which in turn makes their practical use difficult. On the other hand, there is a desire to develop a separate indicator with which to easily and quickly give a generalized assessment of the innovation activity.

Based on the determined immanent characteristics of the agricultural innovation process, we define a system of indicators, through which to analyze and evaluate the input and output factors of the innovation process.

This system includes three groups of indicators - factorial, result and effect markers.

- *The factorial indicators*determine the potential of the farm to implement an innovation process. These are factors that are defined as a driver of the development of the innovation process in agricultural holdings.

- *Performance indicators*are those that determine the achieved degree of innovativeness of the agricultural holdings. They are also used as a tool for comparative analysis of the innovation process in farms of different sizes and specializations.
- *Effect Markers* –are indicators with the help of which the effects of the innovation process in agricultural holdings are measured and evaluated. Through these indicators, it is possible to summarize the effect of the innovation process in agriculture.

Statistical hypothesis testing proves or rejects the main hypothesis explaining the dependence of the factors determining the innovation process in agricultural holdings. In the present dissertation research, the hypothesis is defended that the CAP creates conditions for promoting the innovation process in agricultural holdings.

Table 1 gives the indicators for the evaluation of the innovation process in the agricultural holdings that are the subject of analysis.

Table 1. Indicators for evaluating the innovation process in agricultural holdings. Source: Own.

Indicators evaluating the input of the innovation process (factorial indicators)	**Indicators evaluating the outcome of the innovation process (outcome indicators)**	**Indicators evaluating the effectiveness of the innovation process (effect markers)**
Costs of purchasing new buildings and land	New buildings acquired	Asset turnover
Costs of purchasing new machinery and equipment	Acquired new machinery and equipment	Labor productivity
Costs of purchasing licenses and patents	Acquired licenses and new patents	Transaction costs (contract performance costs)
Implementation and/or adaptation of new production technology	Presence of a radical or advanced innovation	Contribution of the innovation to the total income of the farm
Substitution of one production resource for another	Change in production technology	Level and dynamics of production costs
		Cost effectiveness
		Cost effectiveness
Costs for increasing the qualification of the staff or for acquiring new knowledge, skills and competences	Acquired new qualifications and competencies from staff	Labor productivity
Research and development costs	Availability of product innovation	Contribution of the innovation to the total income of the farm
		Profitability of sales
	Presence of process innovation	Cost effectiveness
		Cost effectiveness
	Availability of marketing innovation	Profitability of sales
	Presence of organizational innovation	Management costs
	Presence of green innovation (environmentally friendly)	Production costs
		Amount of payments under obligations to the state budget
	Presence of social innovation	Amount of losses/gains in value
Marketing and/or market research costs	Market driven innovation/ penetration of an entirely new market or market segment	Profitability of sales
		Market growth
		Sales revenue
		Marketing cost effectiveness
Cooperation/Association	Access to new counterparties (customers, suppliers and business partners)	Profitability of sales
		Sales revenue
		Market growth
Amount of financial assistance received under individual instruments within the framework of the CAP	Structure of acquired new assets	Gross profit
		Sales revenue
		Level of investment spending
		Level of production costs
		Cost effectiveness

Change in the specialization of production	Change in business model	Amount of financial assistance received under individual instruments within the framework of the CAP
		Amount of losses/gains in value
Change in production diversification	Change in business model	Amount of financial assistance received under individual instruments within the framework of the CAP
		Amount of losses/gains in value

General framework for CAP monitoring and evaluation. The 2013 reform of the Common Agricultural Policy (CAP) created a Common Monitoring and Evaluation Framework (CMF) to measure the performance of the CAP for the period 2014-2020, show its achievements and to improve its efficiency. For the first time, this framework covers both the first pillar (direct payments and market measures) and the second pillar (rural development) as well as the horizontal measures (eg cross-compliance) of the CAP.

In the Horizontal Regulation (Regulation (EU) No. 1307/2013). it has been established that the CAP 2014-2020 monitoring and evaluation framework should assess the performance of the CAP against its three general objectives:

1) sustainable food production with emphasis on farm income, agricultural productivity and price stability;
2) sustainable management of natural resources and climate action, with emphasis on greenhouse gas emissions, biodiversity, soils and water;
3) balanced territorial development with emphasis on rural employment, growth and rural poverty.

ORMO provides key information on the implementation of the CAP (monitoring), as well as on its results and impacts (evaluation)[1]. The framework quantifies actions in Member States (outputs), describes achievements and verifies how far objectives have been achieved[2]. The Commission, together with the Member States in the framework of an expert group, designed the RMA and developed a list of indicators, which were selected on the basis of an intervention logic, proceeding from general to specific objectives and interventions, and laid down in various implementing acts.

Indicators. Five types of indicators have been identified with the help of which to evaluate the implementation of the CAP:[3]

- 45 context indicators describing the overall operational environment of the policy;
- 84 output indicators measuring activities that are directly related to policy interventions;
- 41 result indicators: 16 result indicators for the first pillar measuring the direct and immediate effects of the interventions and 25 result indicators for the second pillar (of which 19 correspond to target indicators);
- 24 target indicators (of which 19 correspond to result indicators) used to set quantitative targets at the beginning of the program period;
- 16 impact indicators measuring the impact of policy interventions in the longer term and beyond immediate effects (of which 13 are also included in the set of context indicators).

For each of the indicators, fact sheets containing the definition as well as data sources, level of geographical breakdown, frequency and time parameters of reporting were prepared.[4]In addition, sub-indicators were also included where a breakdown was deemed necessary, for example by sector or category. The framework currently includes a total of more than 900 sub-indicators.

Data Sources. The indicators are defined in such a way that, as far as possible, existing channels are used for data collection[5], to avoid creating an additional administrative burden for beneficiaries and Member States. The wide variety of data sources that

[1] Further information is provided in Technical Guidance on the CAP Monitoring and Evaluation Framework 2014-2020 (2015).
[2] Further information is provided in the CAP Monitoring and Evaluation Framework 2014-2020 (2015).
[3] Commission Implementing Regulation (EU) No. 834/2014.
[4] Fact sheets are availablehere.
[5] Most sustainable development indicators are thus also part of the general monitoring and evaluation framework.

are used for the overall ORM include notifications from Member States, European level statistics provided by Eurostat[6], data collected by the European Environment Agency.

As regards the first pillar, indicators for final products are available through the Information System for the Management and Monitoring of Agricultural Markets (ISAMM), the Clearance of Accounts Audit Trail System (CATS database) and the Reimbursement Expenditure Information System in agriculture (AGREX). Data are available for 2015, 2016 and partially for 2017.

As regards the second pillar, monitoring data is collected through the annual performance reports that Member States submit each year in June for the previous year. These reports include the values of the indicators for the final products, results and objectives. In addition, Member States had to submit extended annual performance reports in 2017 (and 2019), including additional information based on evaluation activities. Additional expenditure information is collected on a quarterly basis through the expenditure declaration for the European Agricultural Fund for Rural Development. As regards rural development, data are available on indicators for 2015 and up to the end of 2016.[7]

The use of existing data sources and the level of detail required for some indicators have an impact on the timing and frequency of data availability. For example, data based on data from the Eurostat survey on the structure of agricultural holdings are collected once every three years and are available one and a half years after the reference year. Similarly, some environmental indicators are based on periodic surveys—for example, those related to soil quality are collected at 5-year intervals, with the most recent information available being 2012.

The ORMO system makes it possible to evaluate the application of the CAP and its impact on the agricultural sector, as the indicators evaluate not only the innovativeness of the sector, but also: the effective management of natural resources, the socio-economic development of rural areas, the environmental friendliness of sector investments, the preservation of biodiversity , the adaptation of the sector to climate change, etc.

Methodology for assessing the impact of CAP on the innovation process in agricultural holdings. Within the framework of the current dissertation research, indicators are used that determine and measure the relationship between financial support (subsidization of agricultural production) and the presence of an innovation process.

The research period is 2014 - 2020, with a view to covering the application period of the CAP 2014-2020 and drawing conclusions about the effects achieved and making recommendations for improving the effectiveness of the CAP in terms of innovation process in the agriculture of the Republic of Bulgaria.

Through numerous comparisons of the indicators characterizing the sectoral development of Bulgaria and the EU, analogies or differences in the development of the innovation process in agriculture are sought.

Indicators for assessing the impact of the CAP on the innovation process in agriculture at the sectoral level. To determine the impact of the CAP on the development of the innovation process in agriculture, the following indicators are used:

- Size and dynamics of production (in value) in the "Agriculture" sector;
- Size and dynamics of imports, exports and trade balance of the Agriculture sector
- Import and export structure of the "Agriculture" sector - traditional and new markets for Bulgarian agricultural products;
- Size and dynamics of the gross added value in the "Agriculture" sector;
- Amount and dynamics of the subsidies and the absorbed financial aid in the "Agriculture" sector;
- Size of the invested credit resource in the "Agriculture" sector
- Size and dynamics of acquired assets in the "Agriculture" sector;
- Size and dynamics of acquired buildings and lands in the "Agriculture" sector;
- Size and dynamics of acquired machinery and equipment in the "Agriculture" sector;

Through the above-mentioned indicators, information will be generated and, through graphic analysis of the data, patterns will be sought between the amount of financial support for agriculture and its innovative development. The main sources of information for determining and calculating the indicated indicators are:

- Bulletins of the Agricultural Accounting Information System;
- Agrarian report of the Republic of Bulgaria;
- The information bulletins of the National Statistical Institute of the Republic of Bulgaria;

[6] Agricultural statistics, agro-ecological statistics, land cover and land use statistics (including the LUCAS survey), regional statistics, social statistics, trade statistics, etc.

[7] On 30 June 2018, Member States should submit data for 2017. These data were not yet available at the time of this report.

- Bulletins and analyzes of the "Agrostatistics" department at the Ministry of Agriculture;
- Bulletins and analyzes of EUROSTAT and FAOSTAT;
- Bulletins of the Bulgarian National Bank (BNB)

Innovations are carried out by farmers - entrepreneurs with the idea of agricultural production being competitive on the international market. Therefore, it is necessary to measure what are the competitive advantages of the native sector in terms of CAP 2014-2020. For this purpose, the following indicators are used:

- comparative export advantage index (RXA), also known as the Balassa index (Freebairn 1986);
- comparative index of import advantages (RIA);
- index of relative trade advantages (RTA) developed by (Vollrath 1991).

The indicated indicators are calculated as follows:

(1) RXA = (Xdi/Xd)/(Xwi/Xw)

- Xdi – the value of the export of agricultural products from the country;
- Xd – the value of the country's total exports;
- Xwi – the value of exports of agricultural products to the EU;
- Xw – the value of total EU exports.

(2) RIA = (Xdi/Xd)/(Xwi/Xw)

- Xdi – the value of the import of agricultural products from the country;
- Xd – the value of the country's total imports;
- Xwi – the value of imports of EU agricultural products;
- Xw – the value of total EU imports.

(3) RTA = RXA – RIA

Through the above-mentioned indicators, information will be generated and, through a graphic analysis of the data, regularities will be sought between the amount of financial support for agriculture and its competitive development. The main sources of information for determining and calculating the indicated indicators are:

- Data from FOA - Food and Agricultural Organizaiton;
- EUROSTAT data;
- Agrarian report of the Republic of Bulgaria.

Indicators for evaluating the absorption of financial assistance within the framework of the CAP with a view to achieving an effective innovation process in agriculture. The innovation process in agriculture takes place within a precisely defined financial framework. This framework determines its current and future development by setting barriers or revealing immense opportunities. The absorption of the financial assistance shows how adequate the farmers are in their business behavior in following the set objectives of the CAP at the national level. The Rural Development Program (RDP) is one of the main tools for initiating investment activity, and hence for starting an innovation process in agriculture. The rate of absorption of financial assistance within the framework of the RDP is characterized by the following indicators:

- Number of submitted applications for support under individual measures;
- Number of approved applications for support under individual measures;
- Funds disbursed under approved applications for support under individual measures.

The main sources of information for determining and calculating the indicated indicators are:

- Agrarian report of the Republic of Bulgaria;
- Data of directorates at the Ministry of Internal Affairs and Communications.

Methods and indicators for evaluating the impact of subsidies on the innovative activity of agricultural holdings.A systematic approach is used in assessing the contribution of subsidies to the innovation process in farms. The indicators used are grouped into two categories – (1) indicators assessing the input of the system, namely the level of subsidization of production in the farm and (2) indicators assessing the output of the system – that is the innovativeness of the farm. To the first group of indicators belong the following: amount of received SEPP payments, agro-ecological payments, NATURA 2000 payments, payments for disadvantaged areas and subsidies for investments. The second group of indicators includes: (1) value of new assets

(Nikolov, et al., 2012)[8]and (2) profitability of subsidies paid (ratio of subsidies received to gross output received) (Meadows, 1999).[9].

Through regression analysis, answers to the following questions are sought:

- What is the effect of subsidies on farm innovation?
- What is the relationship between the received subsidies and the achieved innovativeness of the farms?
- Does the increase in subsidies lead to an increase in the innovativeness of farms?
- What is the sensitivity of farm innovativeness to changes in subsidy levels?

In the regression model, the amount of subsidies received is defined as a factorial indicator. The following two indicators are used for performance indicators in the model - value of assets and profitability of paid subsidies (see diagram 1).

Scheme1. Regression model. Source: Own.

Type of connection investigated	**Factorial indicator**	**Performance indicator**
Effect of amount of subsidies received on assets	Subsidies received (BGN)	Assets (BGN)
Impact of the amount of subsidies received on the profitability of subsidies	Subsidies received (BGN)	Cost-effectiveness of subsidies

Data from the Agricultural Accounting Information System (AIS) are used to construct the regression model and its analysis. According to the SZSI bulletin (bulletin 382/05.2021), the published data are average results. When calculating the results, a special weighting system is used. It is based on the principle of "free expansion": a weight calculated for the holding applies to all holdings in the stratum (extrapolation factor). The individual weight is equal to the ratio between the number of farms of the same stratum (SZSI region x specialization type x economic size) in the observation field and in the sample. The representative sample of SZSI for 2021 includes 1,950 market-oriented agricultural holdings, selected on the basis of their specialization and economic size.

Methods and indicators for assessing the impact of the CAP on the innovation process of agricultural holdings. The main method used to collect information about the state of the innovation process in agricultural holdings is the personal interview accompanied by filling out a special survey. Through the survey of 180 agricultural holdings from different planning regions of the Republic of Bulgaria, the aim is to collect information needed to determine the factorial and performance indicators as well as the markers evaluating the effects (see table 5).

Organization of the survey. In order to collect the necessary information, to calculate the above-mentioned indicators, the implementation of the following research activities is undertaken (see scheme 2):

- preparation of a questionnaire for researching the state of the innovation process in agricultural holdings;
- conducting a survey and focus groups of agricultural producers

The database of the Directorate "Development of Rural Areas" and the Directorate "Compensatory Measures" of the Ministry of Internal Affairs and Communications - Sofia was used as a source for forming the sample. The resulting general population consists of 10,542 organizations that meet the criteria defining them as agricultural holdings on the territory of the country. In forming the sample, the method of simple random sampling was used, and the constituent units were selected through non-returnable selection. The sample size is 180 farms.

Scheme2. Planned number of surveyed farms by region and focus group size. Source: Own.

District (NUT2)	**Number**	**Survey period**
Plovdiv	30	10.02 - 17.02.2022
Pazardzhik	30	01.03 - 17.03.2022
Sliven	30	20.03. - 04/05/2022
Haskovo	30	04/05 – 04/18/2022

[8]Nikolov D., H. Basev, Iv. Janakieva, T. Radev (2012). Fermerski menidžmănt. Rakovodstvo za uspesen biznes v zemedelieto. Izdatelska grupa Bălgarija, Sofija. s. 248.

[9] Meadows, D, 1999. Indicators and Information for Sustainable Development. Hartland Four Corners, Vermont: Sustainability Institute.

Kurdzhali	30	01.05. – 18.05.2022
Yambol	30	19.05 – 24.05.2022
Total:	**180**	
Focus group 1	48	28.05.2022
Focus group 2	30	30.05.2022

Questionnaire. Through a specially developed questionnaire, the aim is to collect information that will characterize the innovation process at the agricultural holding level. The structure of the survey card is subordinated to the logical framework – collection of adequate and correct information necessary for the calculation of the factorial and performance indicators as well as for the calculation of the effect markers.

Organizing SWOT through focus group discussion. The "SWOT-analysis" method is among the most popular in the scientific literature, which is used in evaluating the factors determining the competitiveness of the Ministry of Foreign Affairs (Dimitrova, 2013), (Koprivlenski, 2011), (Yavuz, Baycan, 2013), (Rachid, Fadel , 2013), (Mehmood, Hassannezhad, Abbas, 2013). The SWOT-analysis technique requires the knowledge of all specific factors directly and indirectly affecting the competitiveness of the Ministry of Foreign Affairs in order to analyze them in detail so that the organization can easily adapt to their requirements. In the current dissertation research, the idea is defended that agricultural producers are the ones who most fully know the internal factors of the business environment, which determine the future development of the innovation process.

The strengths and weaknesses as well as the opportunities and threats arising from the external business environment are determined based on the results of the discussions carried out in two focus groups of farm owners in the dissertation research.

Chapter II. Analyzes of the factors of the innovation process in the agricultural sector under the conditions of CAP

Bulgaria has been a full member of the EU for 13 years. Within the union, she has the opportunity to receive financial assistance for the development of her agriculture. Despite the years that have passed, Bulgarian agriculture still lags behind in terms of productivity, innovation and competitiveness. In this part of the dissertation, the impact of the CAP on the innovation process in agriculture is analyzed. The effects of investments in innovation on productivity, competitiveness and the environment are evaluated, emphasizing those factors that largely determine the dynamics and effectiveness of the innovation process in agriculture.

Impact of the CAP on the development of agriculture. Before the accession of our country to the EU, Bulgarian agriculture suffered from a number of problems, which turned out to be a major obstacle for the rapid implementation of innovations with the goal of achieving competitive agriculture that meets the requirements of the common agricultural market of the EU. Main problems at the moment are:

- The high degree of fragmentation of agricultural land, which hinders the mechanization of agriculture based on new highly productive machines and equipment;
- The existence of a significant dal of an informal sector in agriculture, which prevents the development of the market as well as the establishment of competition in this type of market. Competition is one of the critical factors determining productivity and innovation as factors determining the adaptability of agricultural holdings to changes in the business environment;
- Depreciated and in many places completely destroyed infrastructure, built over the years to serve the agricultural sector. Irrigation systems are broken in some regions of the country and inefficient in terms of the use of water resources. Most of the equipment that is used for irrigation is outdated and depreciated, which leads to low efficiency of irrigation activities in agriculture. Agriculture is one of the main consumers of water resources. In the conditions of increasingly noticeable scarcity of this natural resource, the use of inefficient irrigation systems leads to wastage, as well as the emergence and rapid spread of new diseases and enemies of agricultural crops and animals in the country. The road infrastructure serving the sector is also neglected and in many places lacking,
- The unattractive working conditions in agriculture in those years were the main reason for the outflow of labor from this branch. The low degree of mechanization of production determines the strong dependence of agriculture on experienced and motivated labor. Migration processes strongly affect agriculture at this point in its development, leading to large amounts of fallow land in rural areas and capital outflows;
- Capital is scarce because of high levels of risk and most lenders as well as entrepreneurs channel capital into sectors where returns are greater and more certain. Agriculture is defined as a "workshop under the open sky", which motivates entrepreneurs to look for other, more attractive alternatives for investing their accumulated capital. Undoubtedly, at this moment, agriculture cannot provide such conditions. Due to the high levels of risk, it is difficult for banks to grant loans for the development of agriculture, and the main users of these services are those agricultural enterprises that can pledge valuable assets securing the received loans. In a large part of the small farm community, there is a lack of access to a credit resource, which limits the process of innovation and increasing the competitiveness of agriculture;

- The outflow of labor, limited access to credit resources, as well as strong fragmented agricultural land, determine great difficulties for the development of a comprehensive and responsible entrepreneurial process in agriculture. These factors exert enormous pressure on the entrepreneurial resource and at this moment in Bulgarian agriculture there is a significant outflow of entrepreneurs.
- Underdeveloped and well-organized market system in the sector. There are few regulated agricultural markets and marketplaces where farmers can sell their produce. Very often access to these markets is limited for small farmers who are forced to sell their agricultural produce in unregulated places. The market system is the "trigger" of the innovation process in any economic sector, and if this system is vegetative and underdeveloped it leads to a lack of innovation and productivity in agriculture.

After the accession of Bulgaria to the EU in 2008, the state has the opportunity to use the experience, assistance and market of the EU to deal with the mentioned problems and to transform the Bulgarian agriculture into an innovative and competitive sector, contributing significantly to the economic development of the country.

1.1. Influenceof the CAP on agricultural productivity

Using macro-indicators determined in the meteorological part, we will analyze and evaluate whether the CAP positively affects the development of agriculture in our country and whether this policy has helped to solve the mentioned problems.

Figure 1 shows the dynamics of the gross output generated in the agricultural sector of the Republic of Bulgaria. For the purposes of the comparative analysis, the dynamics of the gross output and of the EU are also shown.

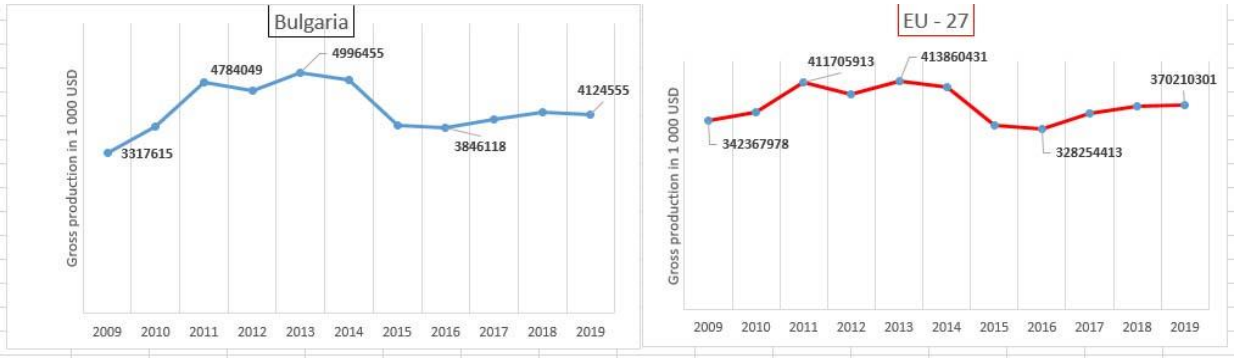


Figure1. Gross output of the Agriculture sector in USD 1,000. Comparison between Bulgaria and the EU. Source: own calculations on FAOSTAT database - www.fao.org

The graphical analysis clearly shows that the dynamics of the gross output from Bulgarian agriculture is almost identical to the dynamics of this indicator at the EU level. Two peaks in the productivity of native agriculture are seen, which coincide with those determined for the EU, namely in 2011 gross output reached $4.78 billion and in 2013, respectively, $4.99 billion. We can tentatively divide the restructuring process of Bulgarian agriculture into two phases:

(1) First phase covering the period 2009-2014. During this phase of development, we can see a clear turbulence in the productivity of agriculture in our country. It is determined by the launched restructuring processes of the industry under the CAP conditions. After 2009, the gross output generated by the sector increased sharply, and in just 5 years it increased nearly 1.5 times.

(2) Second phase, which covers the period 2015-2019. During this period, Bulgarian agriculture in terms of productivity harmonized with that of the EU. Gross production began to decline after the realized peak in 2014 and reached levels of 3.8 billion dollars in 2016. Gross output is shrinking and this process is determined by the slowdown in the investment process in the agricultural sector. Investment interest is starting to cool, which is normal considering the previous period of intensive investment, caused by the financial aid with which the state "pumped" agriculture. The investments have been made and the entrepreneurs take the next step, which is to implement strategies to consolidate their market positions. Another important factor limiting the growth of gross production is the action of the "Natura 2000" instrument. Through this financial instrument, the preservation of biodiversity is aimed at limiting the aggressive growth of the share of agricultural land, a factor that significantly affects the gross output generated in the sector. However, at the end of 2019, gross output is seen to remain high compared to the beginning of this phase, reaching $4.12 billion.

Figure 2 shows the dynamics of agricultural land use in the sector over the last 10 years. And with this indicator, a clear separation of two phases in the development of agriculture can be seen in terms of the land resource involved.

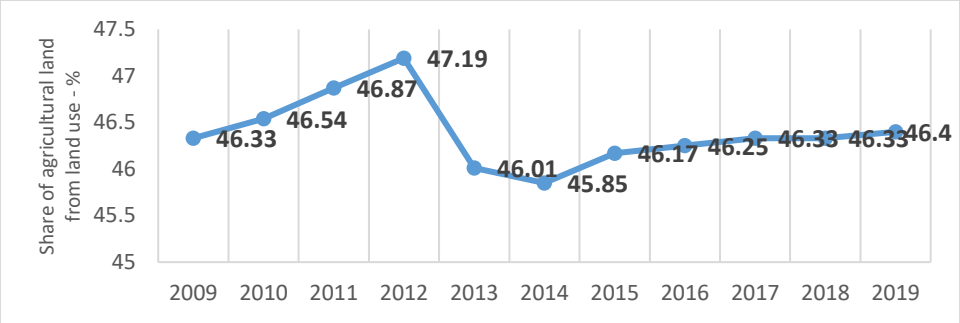


Figure2. Dynamics of agricultural land use (% of the agricultural side of the total land used). Source: own calculations on FAOSTAT database - www.fao.org

The first phase covers the period 2009 - 2012, during which a sharp increase in the use of agricultural land was observed, with peak values being realized in 2012. In that year, the agricultural land included in the agricultural turnover reached 47.19% of the total available land. After 2012, there was a sharp decrease in the use of agricultural land in agriculture, and the "bottom" was reached in 2014, when 46.01% of the used land was intended for the purposes of the agricultural sector.

The second phase covers the period 2014 – 2019. During this phase, the use of agricultural land began to increase smoothly and reached a level of 46.4%.

A major role in changing the trend of the studied indicator in the program "Natura 2000" as I already mentioned. They limit the rapid growth of agricultural land use in the industry. It can be summarized that the CAP does not have a significant impact on the amount of agricultural land involved in production. As a relative share of total land use, agricultural land remained unchanged over 10 years.

Figure 3 provides information on the dynamics of added value generated in agriculture over the last 10 years.

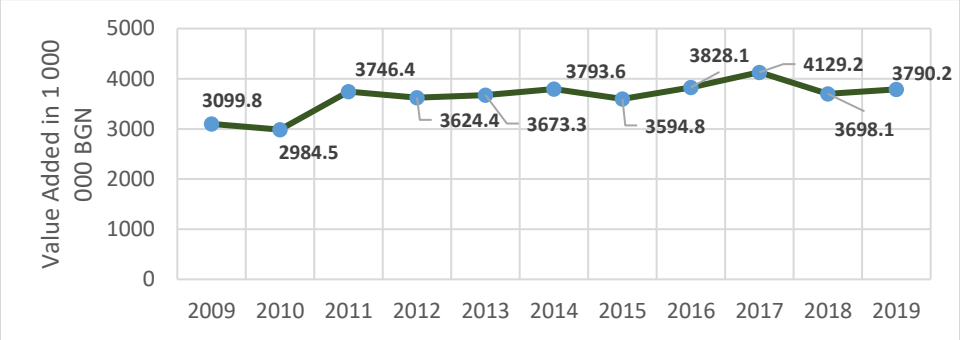


Figure3. Added value in the agricultural sector (in BGN 1,000,000). Source: own calculations on FAOSTAT database - www.fao.org

The data show that the added value in the sector is positively affected by the application of the CAP. And with the trend of this indicator, they are visiblefluctuations, which proves that the sector is undergoing structural changes caused by the impact of the CAP. The added value for the last 10 years has increased nearly 1.2 times. Added value is one of the reliable indicators characterizing the efficiency and productivity process of the sector. Judging by its size, it can be concluded that the CAP had a favorable impact on agricultural productivity during the period under study. Another aspect in which added value can be considered is as a measure of the degree of innovation implemented in agriculture. In this regard, the data shown in Figure 3 show that under the influence of the CAP, Bulgarian agriculture is becoming more and more innovative, i.e. uses technologies and techniques that enable higher labor productivity and the generation of greater added value along the chain.

Impact of the CAP on trade in agricultural products and the competitiveness of agriculture.Innovations need to lead to the competitiveness of the agricultural sector both on the domestic and foreign markets. Within these factors, the impact of the CAP has been examined. Figure 4 shows a comparison of the import of agricultural products in our country and in the EU.

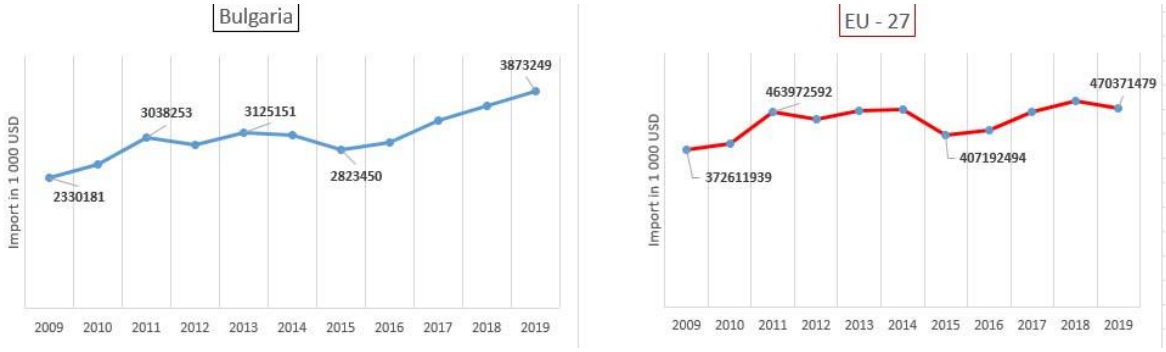


Figure4. Import of agricultural goods in Bulgaria and the EU (expressed in 1,000 USD). Source: own calculations on FAOSTAT database - www.fao.org

The data show that over the last 10 years, the import of agricultural goods in our country has been growing in line with the EU import. The CAP had a favorable impact on imports, which increased 1.7 times during the period under study. The main importers of agricultural goods in our country are EU member states. Traditional exporters of agricultural goods for Bulgaria are Greece, Romania, Poland, Germany and the Czech Republic. Undoubtedly, our neighbors are the biggest importers because of the proximity to our borders and because of their specialization. These countries produce and trade in agricultural products that are sought after by Bulgarians and are traditional for his table.

Figure 5 contains information on the dynamics of the export of agricultural goods from Bulgaria and the EU over the last 10 years.

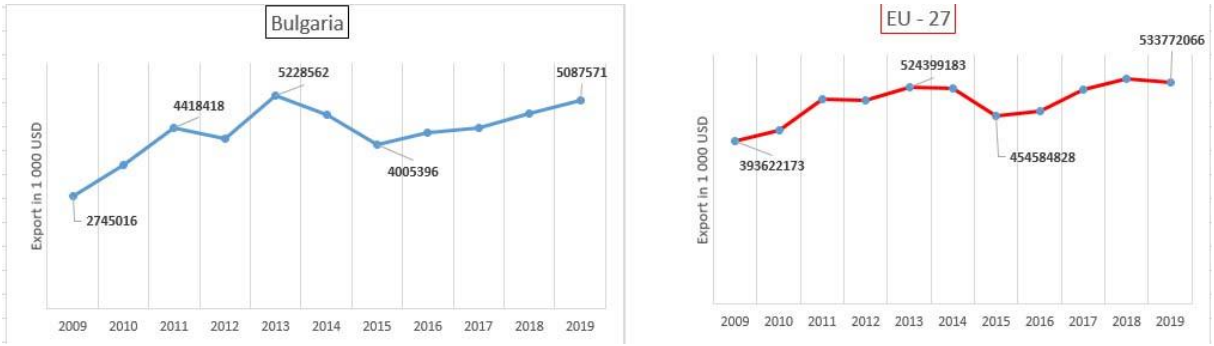


Figure5. Export of agricultural goods from Bulgaria and the EU (expressed in 1,000 USD). Source: own calculations on FAOSTAT database - www.fao.org

According to this indicator, Bulgaria realized an expansion in the export of agrarian goods during the studied period. In the conditions of the CAP, exports increased nearly 1.8 times. Thus, for the last 10 years, Bulgaria has emerged as an exporter of agrarian goods for the European market. Main countries to which agricultural goods are exported are Greece, Germany, Poland and Portugal. The export dynamics once again mark two phases in the development of the export of agricultural goods:

(1) First phase - the period from 2009 to 2013, when the CAP 2009-2013 is in effect. During this phase, a sharp increase in exports is observed, with peak values being realized in 2011 (value of exports is 4.4 billion dollars at this moment) and in 2013 (exports worth - 5.2 billion dollars).;

(2) Second phase - the period 2014 - 2019. During this phase, a reduction in exports can be seen, and in 2015 it reached its lowest value - 4 billion dollars. After 2015, a gradual increase in exports was observed.

The sharp changes in the value of exports prove that in the period 2009 - 2015, the native agriculture underwent structural changes in terms of its market orientation. Traditionally, before our country's accession to the EU, markets for Bulgarian agricultural products were non-EU countries such as Russia (the main importer of Bulgarian grain and wine); and Turkey (major importer of cotton and rice and flour). After the accession of Bulgaria to the EU, the export of agricultural goods was redirected to Greece, Romania, Poland and Great Britain.

Figure 6 shows the dynamics of Bulgaria's comparative advantages in trade in agricultural products over the last 10 years.

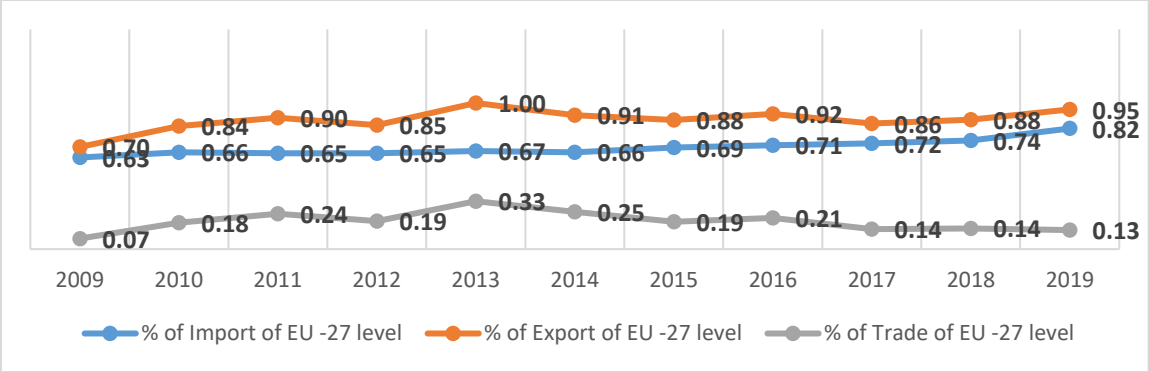


Figure6. Dynamics of comparative advantages in trade in agricultural goods of Bulgaria. Source: FAOSTAT own database calculations – www.fao.org

The data show that Bulgaria, under the terms of the CAP, has become an export-oriented country. In 2009, the export of agricultural goods from Bulgaria, represented as a percentage of the total EU export, was 0.7%. In 2013, a peak in exports was achieved according to the analytical tool used - Bulgarian exports from the agricultural sector equaled 1% of the total agricultural exports of the EU. After that, a decline is visible, and by 2019, the value of the indicator is 0.95%. Within the last 10 years, exports as a relative value have increased 1.4 times.

Imports of agricultural goods have also increased in recent years, expressed as a percentage of the EU's total agricultural imports. In 2009, the value of the indicator was 0.63%, and in 2019 it reached 0.82%, which is an increase of nearly 1.3 times. The comparative advantages in trade with agricultural products of Bulgaria under the conditions of the CAP are also growing. In 2009, the value of the indicator was 0.07%, and in 2019 it was 0.13%. This defines our country as an export-oriented country, whose competitiveness on the foreign market has slightly increased over the last 10 years.

1.2. State aid, credit resources and investments for the development of agriculture under the terms of the CAP

The agricultural sector within the EU is defined as strategically important, which dictates the amount of its financial support. Bulgaria, as a full member of the EU, also highlights the importance of agriculture as an important priority for its economic development.

Over the past 10 years, billions of BGN financial aid has been absorbed by the agricultural sector. A significant part - about 88% (According to the data of the Agrarian Report for 2013, 2014, 2015, 2016, 2017, 2018 and 2019) comes from European funds and programs. The complete dominance of European support is determined by the European approach to equalize the regional development of the member states proportionally based on their contributions to the European agricultural fund. Despite the huge financial resource that comes from the EU, Bulgaria allocates a significant part of its budget for national financing of the development of the agricultural sector.

Figure 7 shows the dynamics of state aid for the development of the agricultural sector in comparison with the overall budget for supporting the national economy.

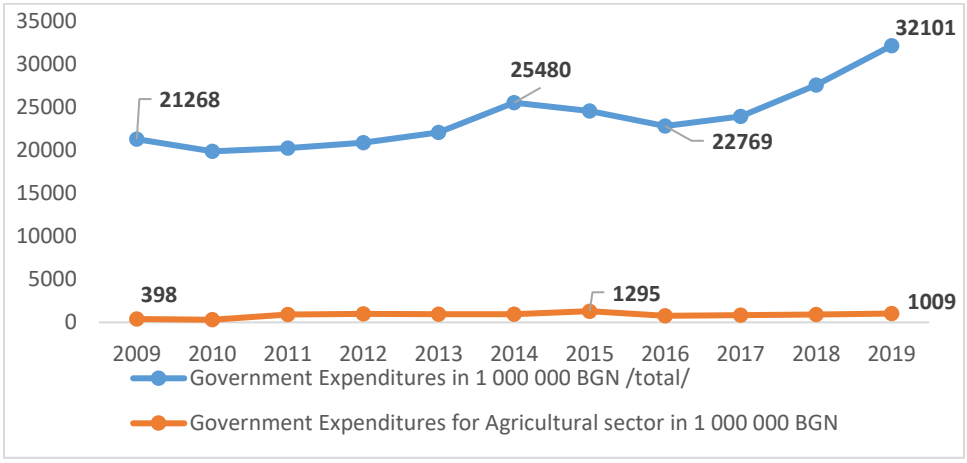


Figure7. State support for the development of the economy and agriculture in the Republic of Bulgaria (expressed in BGN 1,000,000). Source: FAOSTAT own database calculations –www.fao.org

In 2009, the Bulgarian government supported the development of agriculture with BGN 398 million, and this aid reached a peak in 1025 - BGN 1.2 billion. Within the framework of the CAP, state spending on agricultural development increased 3.3 times. It is clearly seen that the financial aid from the EU "pulls up" the state's expenses for the development of the sector.

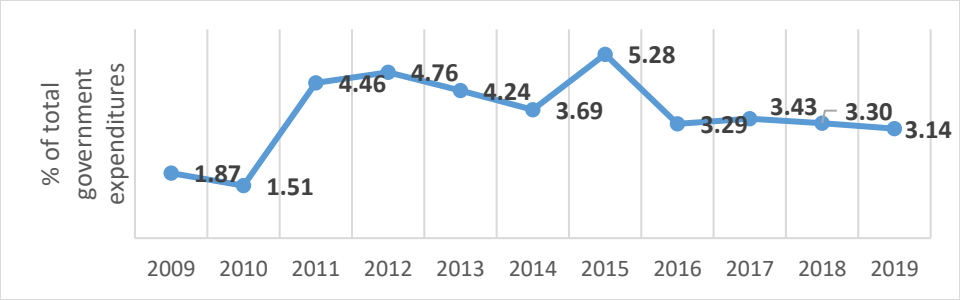


Figure8. State support for the development of agriculture in the Republic of Bulgaria (expressed as a % of the total state expenditure.). Source: FAOSTAT own database calculations –www.fao.org

If we look at state support as a relative share of the total amount of state expenditure, a different picture will be obtained. According to the data shown in figure 8, in 2009 the indicator had a value of 1.87%. In the period 2010 - 2012, the percentage of expenditure on agricultural development reached 4.76%. After that, a drop to a level of 3.69% was observed, followed by an upswing and realization of a peak value of 5.28% and a drop again. This alternating increase and decrease of state support for the development of the sector is determined by the initial low level of absorbed non-financial aid from the EU, which also leads to low levels of national co-financing of projects and current costs in agriculture. A part of the funds that Bulgaria could not spend under the terms of the CAP 2008-2013 have been transferred to the next CAP 2014-2020. This leads to a boom in approved applications for financial assistance in 2015, which determines a significant attraction of public funds within the required national top-up payment that my country makes under the CAP. After 2015, state spending on supporting the sector began to decrease and reached 3.14% in 2019.

The application of the CAP also affects the attracted foreign direct investments in the native agriculture. Figure 9 provides information on the dynamics of foreign direct investment over the past 10 years. At the end of the CAP application period 2007-20134, it can be seen that the direct investments were 9.83 million dollars. These investments continued to grow in 2014, reaching 16.07 million dollars. In the following year, a sharp reduction in the amount of direct investments was noticed and they became a negative value, respectively -25.63 million dollars. This is a clear sign that foreign investors are beginning to avoid investing in Bulgarian agriculture. The reason for this can be found in the unstable political situation in the country during this period of time.

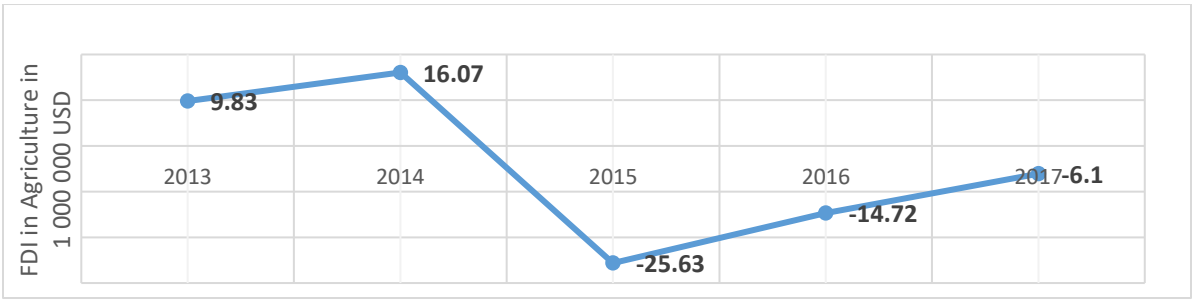


Figure9. Attracted foreign direct investment in the agriculture of the Republic of Bulgaria (1,000,000 USD). Source: FAOSTAT own database calculations –www.fao.org

In the subsequent years 2016 and 2017, the confidence of foreign investments in Bulgarian agriculture returned, but despite this, foreign direct investments remained a negative value - 6.1 million dollars (in 2017).

In addition to the state and foreign investors, the main role in the formation and development of the innovation process in agriculture is played by banking institutions, which are also the main supplier of credit resources for the sustainable development of the industry over the years.

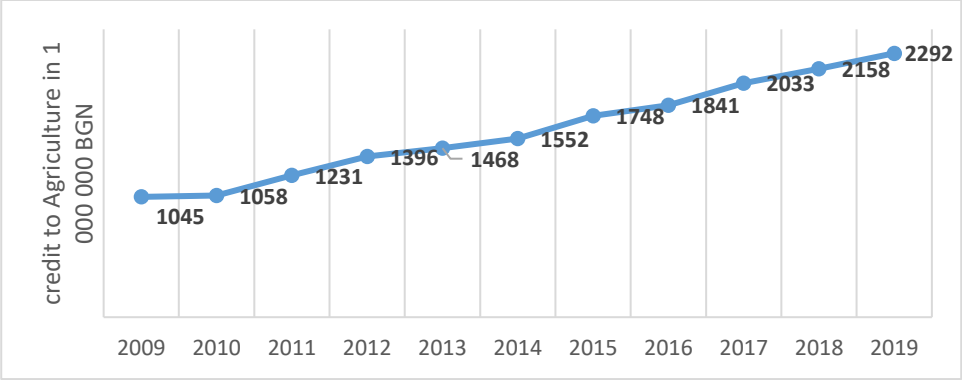


Figure10. Lending to the agricultural sector in the period 2009 - 2019 (in BGN 1,000,000). Source: FAOSTAT own database calculations – www.fao.org

The implementation of innovations in agriculture requires significant financial capital, which the majority of farmers cannot afford to invest. On the other hand, effective management of entrepreneurial risk requires sharing the risk with other business partners. By building a guarantee fund for the purposes of agricultural lending, the state has been boosting lending over the years. This can also be seen from the positive dynamics of loans granted for the development of agriculture over the last 10 years, shown in figure 10. In 2009, agriculture absorbed a little over BGN 1 billion in credit resources. After the launch of the CAP application, the loans distributed in the agricultural sector started to realize a progressive positive growth. In 2019, loans granted to the agricultural sector amounted to BGN 2.29 billion,

Impact of CAP on innovation factors in agriculture. Agriculture is one of the industries that directly and intensively affects the environment. This industry is one of the few that consume large amounts of natural resources that are non-renewable and increasingly scarce. This requires the CAP to pursue objectives such as environmental friendliness, sustainable development, social responsibility and economic efficiency.

One of the main tools for achieving these goals is the promotion of innovation in the sector, through the application of various financial schemes, measures and programs within the framework of the CAP. Innovations to enable farmers to be competitive and environmentally friendly in their activity. These financial instruments should promote the use of production resources and technologies in agricultural holdings that exert organic pressure on the environment.

Impact of the CAP on the renewal of agricultural chemicals. One of the roles of the innovation process is to transform the activities of agricultural holdings to exert less pressure on the environment. Of course, farmers are ready to implement innovations in agricultural production more quickly if in return they receive financial support, which forms a significant part of their income.

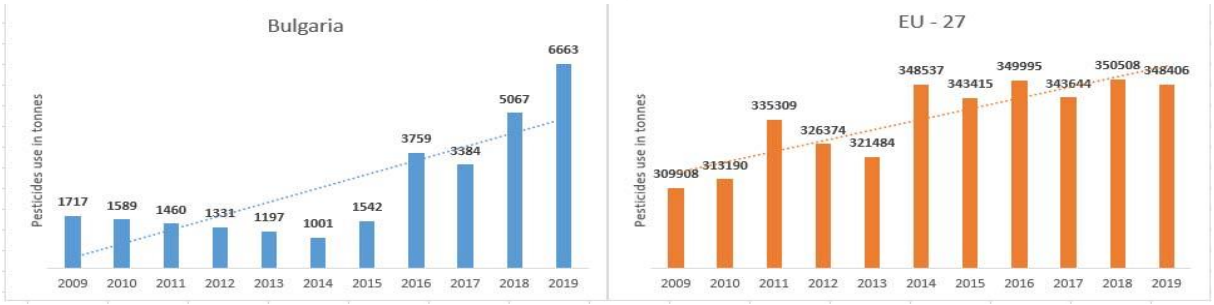


Figure11. Use of pesticides in agriculture. Comparison between Bulgaria and the EU. (measurement unit – the ton). Source: FAOSTAT own database calculations –www.fao.org

That is why the CAP is "tailored" to motivate farmers to use "green" production practices. The CAP offers a huge arsenal of financial mechanisms for "greening" the activities of farms, conventionally called "green architecture", aiming on the one hand to protect the environment, and on the other hand to increase profitability in the sector. Of course, environmental friendliness and economic efficiency as goals can hardly be combined, which also leads to complex planning and implementation of the CAP. Another important aspect of the application of green architecture is to analyze whether it leads to the desired effect, namely lowering the pressure on the environment and protecting natural resources on the EU territory. In this context, the types of innovation in the use of chemicals in the agricultural sector are investigated.

The data show that in the period 2009 - 2014, the amounts of pesticides used in agriculture decreased and reached 1,001 tons in 2014. It should be noted that this trend of reduction is in the conditions of the CAP in force at the time - 2008-2013. The data prove that the CAP has a positive impact on the environment by forcing farmers to use fewer and fewer pesticides when growing agricultural crops in our country. Immediately after 2014, there was an accelerated increase in the amount of pesticides used in native agriculture. In the period 2015-2019, the quantities of pesticides used increased nearly 4.3 times and reached a value of 6,663 tons. It should be noted that in this period of time the CAP 2014-2020 begins to be implemented. In this program period, based on the analysis of the previous CAP, the subsequent CAP is designed to be "greener" and to motivate farmers to use environmentally friendly technologies. The data in figure 11 clearly prove that the CAP 2014-2020, despite its "green" schemes and support measures, fails to achieve the goal, and on the contrary - the amounts of pesticides that farmers use in

their activities are rapidly increasing. What can "reassure" the general public is that the same processes of intensive use of pesticides are also observed in the EU (see figure 11). The data shown in Figure 11 show a steady upward trend in the amounts of pesticides used in European agriculture. that the CAP 2014-2020, despite its "green" schemes and support measures, fails to achieve the goal, and on the contrary - the amounts of pesticides that farmers use in their activities are rapidly increasing. What can "reassure" the general public is that the same processes of intensive use of pesticides are also observed in the EU (see figure 11). The data shown in Figure 11 show a steady upward trend in the amounts of pesticides used in European agriculture. that the CAP 2014-2020, despite its "green" schemes and support measures, fails to achieve the goal, and on the contrary - the amounts of pesticides that farmers use in their activities are rapidly increasing. What can "reassure" the general public is that the same processes of intensive use of pesticides are also observed in the EU (see figure 11). The data shown in Figure 11 show a steady upward trend in the amounts of pesticides used in European agriculture.

With a view to reducing the use of pesticides in the agricultural production process, the idea of "organic production" has been promoted in the EU for the last 10 years. Bulgaria, as a full member of the EU, is also actively promoting the approach of converting conventional production into organic production.

By promoting the application of innovations in the agricultural sector, a process of step-by-step transition to organic production begins. The innovations that have been approved by the EU and are beginning to be implemented are (REGULATION (EC) No. 834/2007 OF THE COUNCIL of 28 June 2007 on organic production and labeling of organic products and repealing Regulation (EEC) No. 2092/ 91):

- crop rotation;
- growing plants that enrich the soil with nitrogen and other green crops to restore soil fertility;
- ban on the use of mineral nitrogen fertilizers;
- to reduce the impact of weeds and pests, organic farmers choose resistant varieties and breeds and techniques that promote natural pest control;
- promoting the natural immunological defense of animals;
- to protect animal health, organic farmers need to prevent overstocking.

In exchange for the implementation of these innovations, farmers in Bulgaria have access to a number of measures to compensate them for the losses that arise from the specifics of the organization of organic production on farms.

Figure 12 contains information on the use of bio-pesticides in agriculture in Bulgaria over the last 10 years. Data indicate that in 2009, bio-pesticides accounted for 1% of the total amount of pesticides used in agriculture.

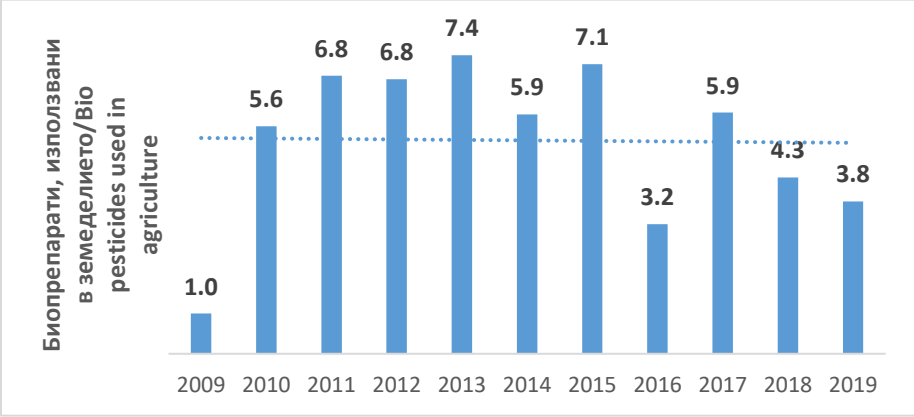
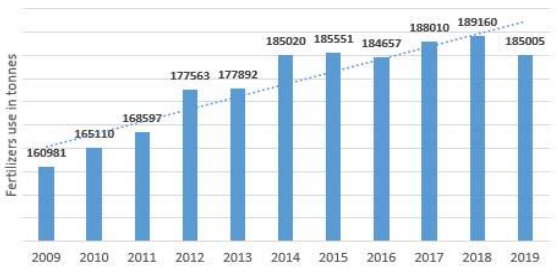


Figure12. Use of bio-pesticides in agriculture in Bulgaria (% of bio-pesticides from the total amount of pesticides). Source: FAOSTAT own database calculations –www.fao.org

Over the years, the share of bio-pesticides has increased, with the largest share of the total applied amounts of pesticides being achieved in 2013 – respectively, bio-pesticides occupy 7.4%. The CAP affects not only the attraction of the amounts of pesticides used, but also their "greening". The application of bio-products for plant protection within 10 years have increased nearly 4 times. This increase is due to an increase in the area occupied by organic production in our country.

Another component that is important as an environmentally friendly innovation is the fertilizers that are used in agriculture. Figure 12 contains information on the dynamics of fertilizer use in native agricultureand the EU.



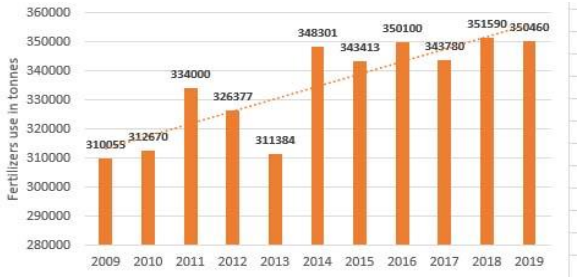


Figure13. Use of fertilizers in agriculture in Bulgaria and the EU (tons). Source: FAOSTAT own database calculations –www.fao.org

From the information provided, it is clear that the amounts of fertilizers that are applied in the industry are steadily increasing over time. In 2009, imported fertilizers amounted to 160,981 tons, and in 2019 they reached 185,005 tons, which is an increase of nearly 1.1 times. It is noticed that the same trend of increase in the quantities of imported fertilizers is present at the EU-27 level as well. In the last 10 years, the use of fertilizers at the EU level has increased nearly 1.1 times. The data show that the process at the national level and at the EU level is developing in an identical aspect.

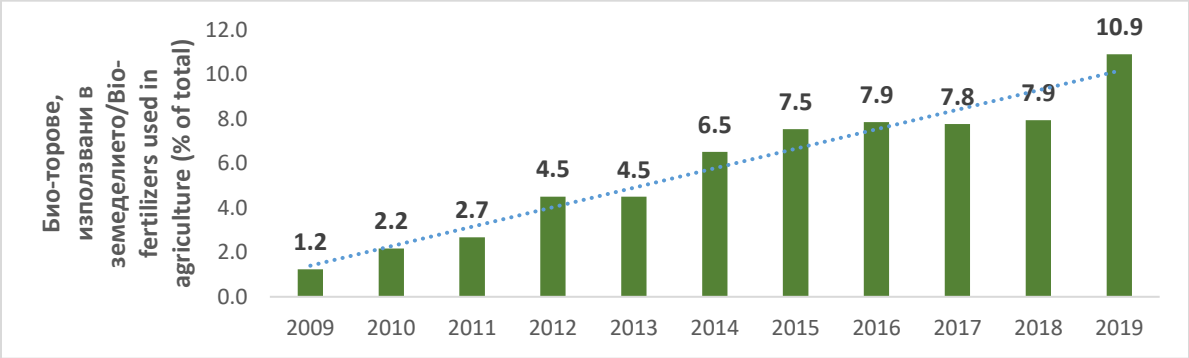


Figure14. Use of bio-fertilizers in Bulgarian agriculture. (% of total imported fertilizers). Source: FAOSTAT own database calculations – www.fao.org

Figure 14 presents information about the trend in the application of bio-fertilizers in Bulgarian agriculture over the last 10 years. The graph shows that OPS has positively influenced the share of these bio-preparations to increase over the years. Innovations in fertilization are gradually entering native agriculture and by 2019, bio-fertilizers accounted for 10.9% of the total imported fertilizers in agricultural holdings. A major factor for the increase in the use of bio-fertilizers in agriculture is the gradual expansion of the areas occupied by agricultural crops that are grown in biological production conditions.

Impact of the CAP on the technical renewal of agricultural holdings. Another important factor at the input of the innovation process is the renewal of machinery and equipment in agricultural holdings. The fact that CAP makes a significant contribution to the technical renewal of the agricultural sector in our country is indisputable. The data shown in figure 15 clearly show an upward trend in the value of newly purchased machinery and equipment in agricultural holdings. In 2012, the average value of newly purchased equipment in one farm amounted to BGN 41,986, in just 6 years this value reached BGN 62,255, which is an increase of nearly 1.5 times. It is clearly seen that the CAP has a positive impact on innovation in terms of the machinery and equipment used in agriculture.

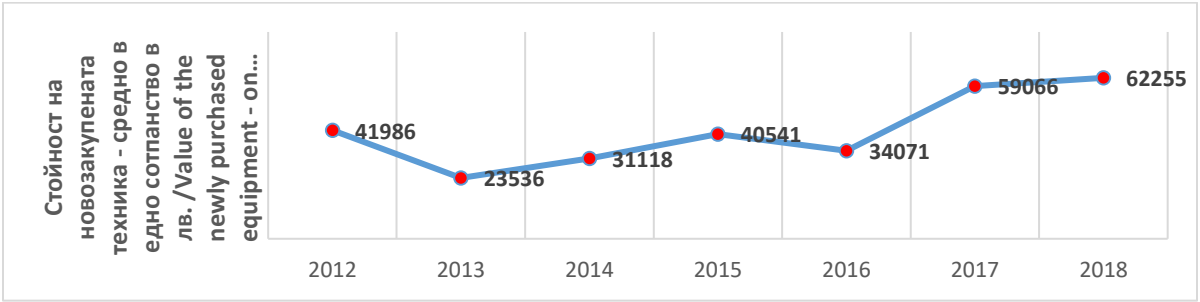


Figure15. Value of newly purchased machinery in agricultural holdings in BGN, on average per farm. Source: own calculations of the Agricultural Accounting Information System database - newsletter for 2012, 2013, 2014, 2015, 2016, 2017 and 2018.

Figure 16 contains information on the renewal of agricultural machinery in agricultural holdings in the period 2008 - 2015. The data show that before the accession of the Republic of Bulgaria to the EU, the number of agricultural machinery was greater than after the accession to the Union. It should be noted that there are more agricultural machines, but their condition is amortized both technically and morally. Mainly used equipment during this period from Russia, which is defined as low-productive and often in need of repairs, which burdens mechanization in agricultural holdings. After the accession of our country, one of the most popular measures for financing the purchase of new agricultural machinery is "Modernization of agricultural holdings", included in the portfolio of the Rural Development Program for the period 2008-2013.

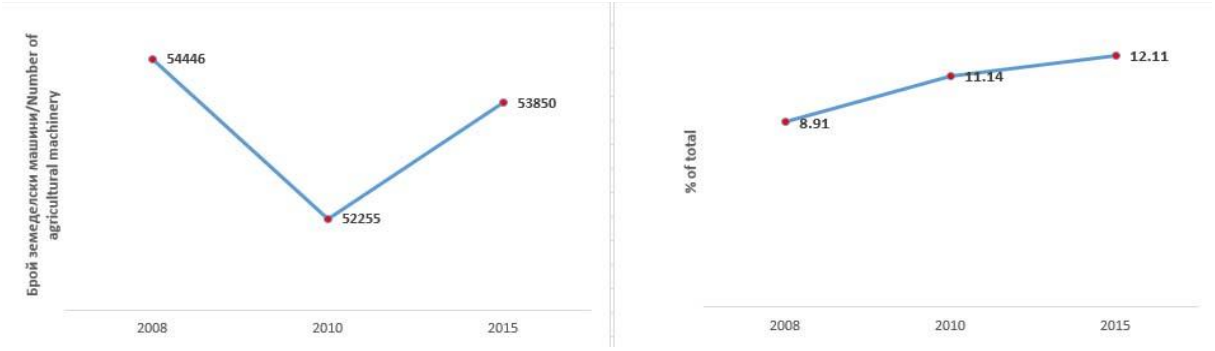


Figure16. Dynamics of the number of new agricultural machines on farms (expressed as a % of the total number of machines on the farm). Republic of Bulgaria. Source: own calculations of the database from the "Results of the census of agricultural holdings - 2010 and 2015" and the NSI database - Statistical Yearbook for 2008, 2010 and 2015.

The data on the graph (see on the right) show that the machine-tractor fleet in agricultural holdings is gradually being renewed. In 2008, only 8.9% of purchased machines were new in agricultural holdings, in 2010 this percentage reached 11.1% and 5 years later in 2015, the share of newly purchased machines was 12.1%. Mainly, tractors and combine harvesters with the equipment attached to them are renewed. In this way, the CAP successfully supports the implementation of innovations in terms of renewal of machinery and equipment used in agricultural holdings.

Impact of the CAP on the technological renewal of agricultural holdings. Besides technical renewal as an expression of the innovation process at the "entry" of the agricultural production system, another important factor is the development and implementation of new technologies in production. At the beginning of the researched 10-year period, conventional production technologies prevailed in agricultural holdings. These technologies are standard and familiar to farmers and they use them with confidence that they will achieve good production and economic results in the management of agricultural holdings. Through the application of the CAP in both phases - 2008-2013 and 2014-2020 - the policy architects aim to make farmers adopt biological technologies as the main means of organizing a profitable business model in agriculture.

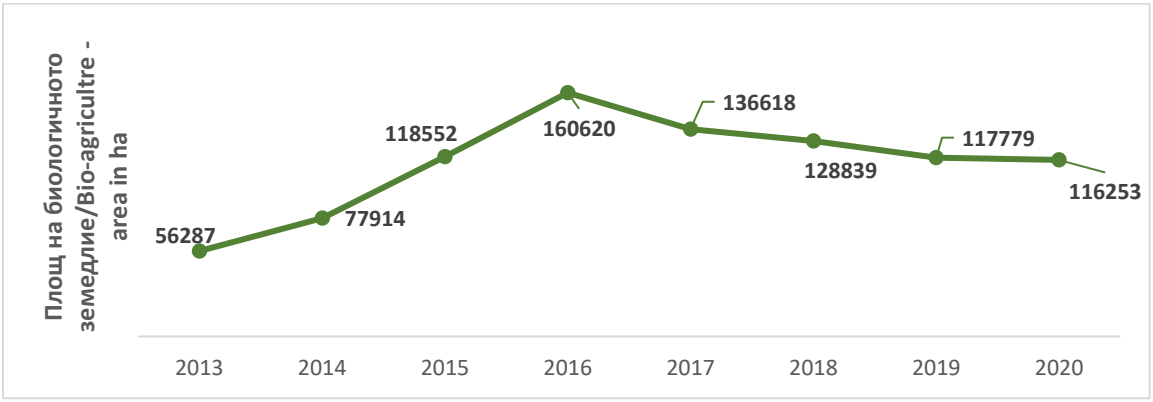


Figure17. Area of agricultural crops that are grown according to the method of "biological" production in Bulgaria (in hectares). Source: own calculations based on EUROSTAT data for the period 2013-2020.

Figure 17 contains information on the dynamics of the areas of agricultural crops that are grown under the conditions of organic production. At the end of the 2008-2013 CAP application period, the area of organic farming was 56,287 hectares. Within the framework of 2014-2016, a "boom" was realized in the expansion of organic agriculture in our country. As the largest size of the areas with organic crops was realized in 2016 - correspondingly, the total area reached 160,620 hectares. A period of "cooling" of interest in organic production followed, and within 2017-2020, the areas occupied by organic crops began to decrease and reached 116,253 hectares (in 2020).

Figure 18 provides information on the share of agricultural holdings applying bio-technologies in production for the period 2013 - 2020. The data show that CAP positively affects the growth of farms switching from conventional to organic production in the sector. The largest share of these farms was achieved in 2016 – 5.9% of the total registered agricultural farms. The same picture is observed in the previous graph, which reflected the size of the area of bio-cultures.

It can be summarized that within the framework of the two phases of the CAP, a wide promotion of bio-technologies as a successful technological innovation in the agricultural sector is achieved. In the period 2013-2020, the share of organic farms increased 1.2 times. However, the data indicate that the mass implementation of bio-technologies in agricultural holdings is not happening and the percentage of organic holdings remains below 5% of the total number of registered holdings.

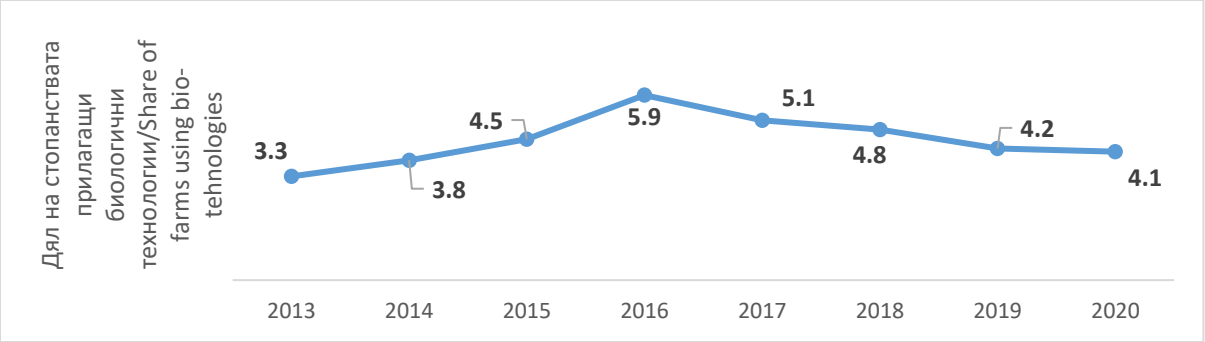


Figure18. Share of agricultural holdings applying biological production technologies (% of total agricultural holdings). Source: EUROSTAT database.

Impact of the CAP on the acquisition of new knowledge, skills and increasing the qualification of personnel in agricultural holdings. One of the important elements of the innovation process in the agricultural sector is the retention and development of personnel in agricultural holdings. The creation of innovation requires the transfer of knowledge and the valorization of this knowledge into new goods, services or business models in the sector. Agriculture is characterized as a sector in which working conditions are not one of the most attractive. This is also the main reason that limits the flow of young people to be the bearer of the change in the traditional models imposed in native agriculture. Undoubtedly, the attraction of young people in the industry, as well as the creation of new skills, are principles embedded in the CAP. Mainly, through the Rural Development Program Phase I and Phase II, the CAP seeks to upskill farmers and encourage young entrepreneurs to actively engage in the sector.

According to EUROSTAT data, persons employed in the agricultural sector are 439,740 on average for the period 2018-2020. According to EUROFOUND data, the share of persons employed in the sector who have participated in training or training allowing them to acquire new knowledge and skills, directly related to work at the workplace has been increasing over the years (see figure 19).

In 2005, the share of those who completed training in the sector was 7.7%, and immediately after the accession of our country to the EU, this share increased sharply and in 2020 amounted to 21.1%.

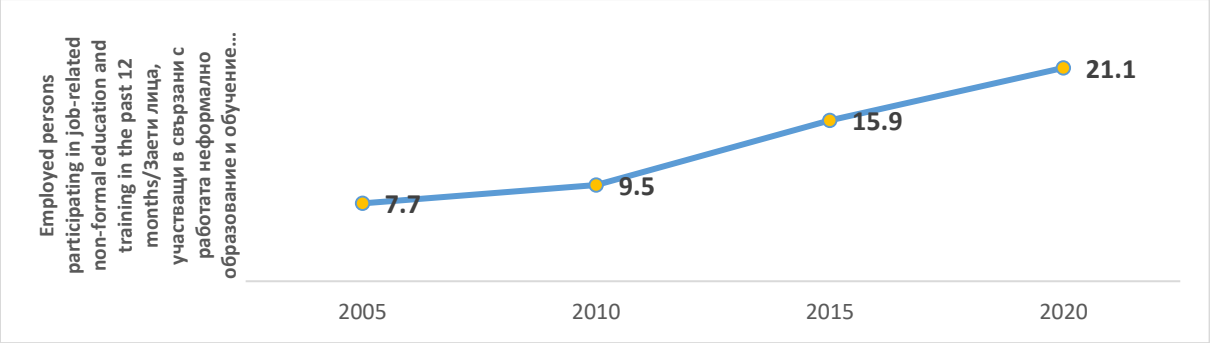


Figure19. Proportion of those employed in agriculture who received training related to the work they perform at their workplace in the last 12 months. Source: Eurofound data, 2020.

Another indicator of the transfer of knowledge in agriculture is the share of employed people who have acquired secondary and higher education. According to the data shown in figure 20, the share of the employed with secondary education gradually decreased. In 2013, 15.1% of the employed had secondary education and by the end of 2019, their share reached 12.4%. Contrary to this trend, is the trend of employed people who have acquired higher education. With this group of employed, the share is gradually increasing and from 1.9% in 2013, it reached 3.2% in 2019.

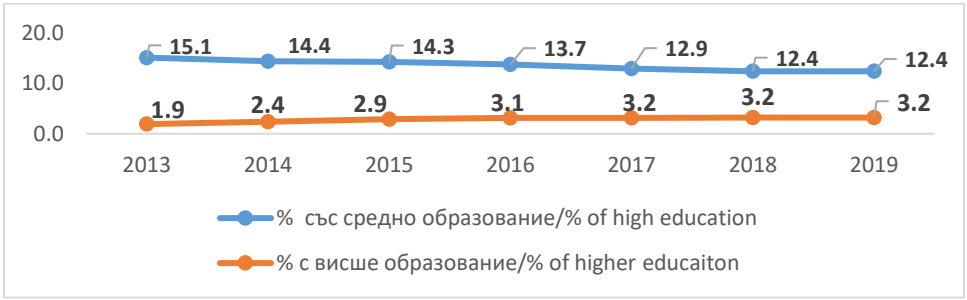


Figure20. Share of those employed in agriculture with secondary and higher education. Source: own calculations based on EUROSTAT data for the period 2013-2029.

However, the share of employed people with higher education remains low compared to that at the EU-27 level - according to EUROSTAT data, the share of employed people in agriculture with higher education is close to 6.5%.

In addition to increasing qualifications, the process of acquiring new skills is an important factor in the innovation process in agriculture. According to data from a field survey conducted in 2018 among 120 farmers, it was established that the formation of skills for managing financial flows and investments is one of the main priorities among the farming community - 35% have undergone training related to the formation of such skills. The share of farmers who have undergone training for the formation of skills for the overall management of the agricultural holding is significant - 30% of the total respondents.

Figure21. Acquired skills from farmers. Survey among 120 farmers from the South Central region of the Republic of Bulgaria for the period 2016-2018. Source: Field survey within the AgriEco project funded under the ERASMUS 2016-2018 program.

Digital skills, as well as human resource management skills, were also a priority among the farming community, with around 20% of respondents indicating that one of the two skills was important to them and had undergone training to acquire it.

Impact of the CAP on the innovative products that the agricultural holding offers on the market. In addition to the analysis of the "input" of the innovation process, it is necessary to analyze how much CAP affects the "output", namely how much the farms have diversified their activities and offered new products to their customers. CAP supports the investments of farms in the diversification of the product range, mainly through the measures laid down in the Program for the Development of Rural Areas, such as measure 311 "Diversification to non-agricultural activity" (PRDP 2007-2013) and measure 11 "Organic agriculture" (PRDP 2014-2020).

As innovative products in agriculture, we perceive those that provide new value for the customer. In the last few years, such products have been defined as organic products and products that are defined as new for the Bulgarian market.

Within the framework of the AgriSpin project funded under the Horizon 2020 Program, the main innovations that the agricultural sector offers to end customers have been identified.

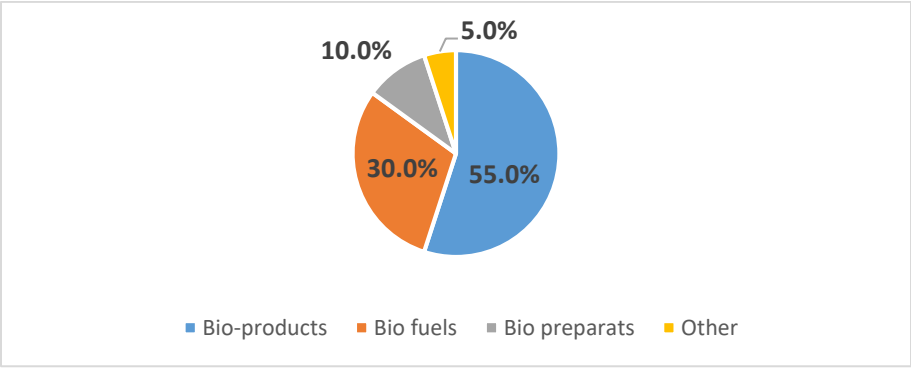


Figure22. The most significant innovations offered by agriculture in Bulgaria. Source: AgriSPin Project, 2018.

Effects of the innovation process within the CAP application. Effects of CAP application are measured both at the input of the system "innovation process" and at its output. The input of the system is the resources that are included in the innovation process in agriculture. In order to achieve efficiency from the innovation process, it is necessary that the use of these resources leads to positive effects. Basically, the evaluation of these effects is carried out by stepping on the standard indicators that are used in the evaluation of economic efficiency.

Effects on labor productivity. One of the roles of innovations is to be a driver of higher productivity in the conditions of limiting production factors. Agriculture is one of the industries that functions in conditions of limitation both in terms of typical production resources and in terms of specific natural resources. Natural resources are non-renewable and their sparing use requires looking for alternatives in their substitution or looking for higher productivity in the use of resources in agriculture.

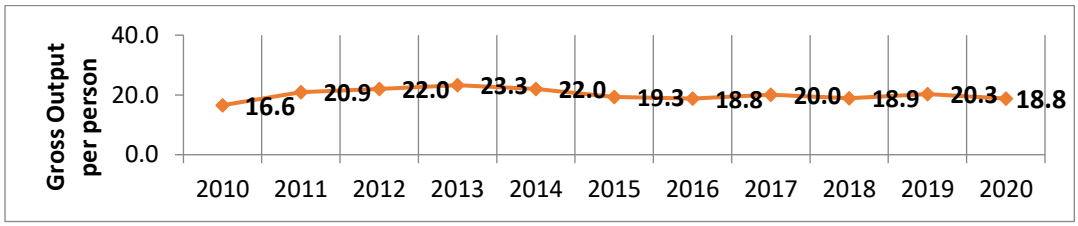


Figure23. Dynamics of labor productivity in agriculture in Bulgaria, measured by the indicator of gross output per employee. Source: Own calculations of FAOSTAT and EUROSTAT database for the period 2010-2020.

Figure 23 shows the dynamics of the indicator of gross output per person employed in agriculture over a 10-year period. The dynamics of the studied indicator conditionally passes through 2 periods. During the first year - 2010 - 2014, a sharp rise in labor productivity was noticed, with the value of the indicator measuring it reaching a peak value in 2013 - 23.3 units. The graph proves that the "first" phase of the CAP positively affects labor productivity in agriculture. Encouraging the use of innovation in the industry through the CAP mechanisms leads to an increase in labor productivity both in terms of the use of the human factor and in terms of renewing its technical armament. These two factors have a positive impact on labor productivity. After 2013

In view of which factors have had an impact on labor productivity in agriculture, the indicators of gross added value generated by one employee and by one invested annual unit in agriculture are analyzed.

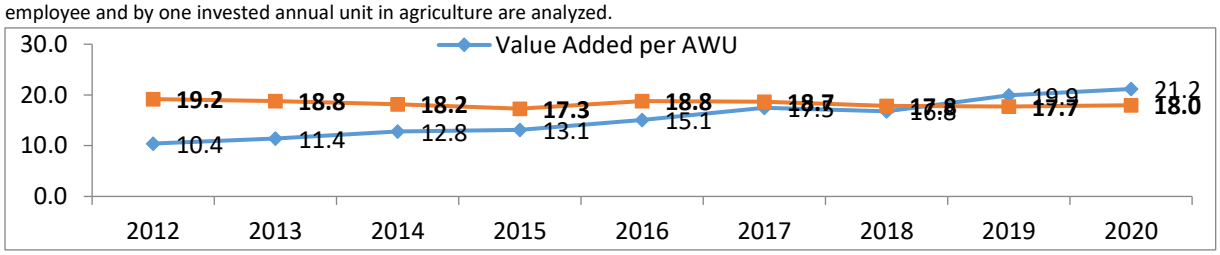


Figure24. Dynamics of labor productivity in agriculture in Bulgaria, measured by the indicators of gross added value per employee and per annual work unit (GRE). Source: Own calculations of FAOSTAT and EUROSTAT database for the period 2010-2020.

Figure 24 contains information on the dynamics of the mentioned indicators. It can be seen that the graphs of the studied indicators have an opposite development trend. While the gross added value of one employee decreases smoothly over time, the dynamics of the gross added value of one invested GRE shows a positive trend. This proves that, in general, the number of people employed in agriculture is decreasing (by almost 8% in the last 10 years, according to EUROSTAT data), but despite this, labor productivity is increasing. This proves that the CAP affects the productivity of labor in agriculture by promoting the use of innovations allowing the intensification of the sector and its development is determined to the fullest extent by this factor.

Effects on emissions to air, soil and water. Another important aspect on which innovations need to have an impact is the reduction of harmful emissions in the air. According to FAO data, agriculture is one of the main causes of greenhouse gases in the earth's atmosphere. The implementation of innovations encouraged by the CAP instruments should lead to lower harmful emissions. Agriculture generates significant amounts of methane, carbon dioxide and nitrous oxide emissions into the atmosphere. One of the main focuses of the CAP is reducing the carbon footprint of the agricultural sector.

Figure 25 shows the graph of carbon dioxide emissions that agriculture has generated in the atmosphere for the last 10 years. In general, there is a tendency to reduce the carbon dioxide emitted by agriculture. Within the studied period, carbon dioxide emissions decreased by nearly 5.5%.

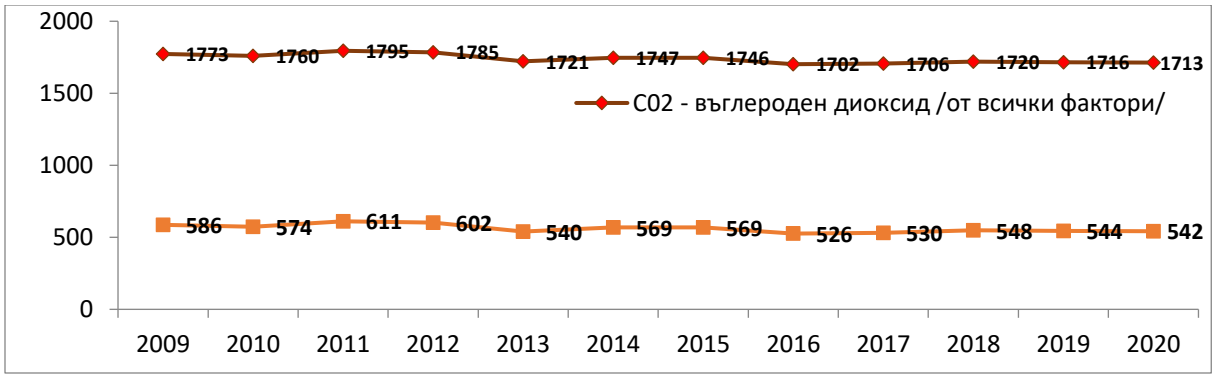


Figure25. Emissions of carbon dioxide with a source from the agricultural sector of Bulgaria. Source: FAOSTAT data for the period 2009-2020 /kiloton/

The decrease may be seen as symbolic, but it should be noted that the production of agricultural produce doubled during this period. The production expansion in the sector involves a huge amount of production resources, which are the main source of carbon dioxide (CO2) emissions. Through the CAP's 'green mechanisms', the sector is encouraged to use innovations to reduce CO2 emissions, and data shows that this is actually happening. In 2009, agriculture generated 1,773kilotons of C02 in the atmosphere, and in 2020 this amount drops to the level of 1,713 kilotons of C02.

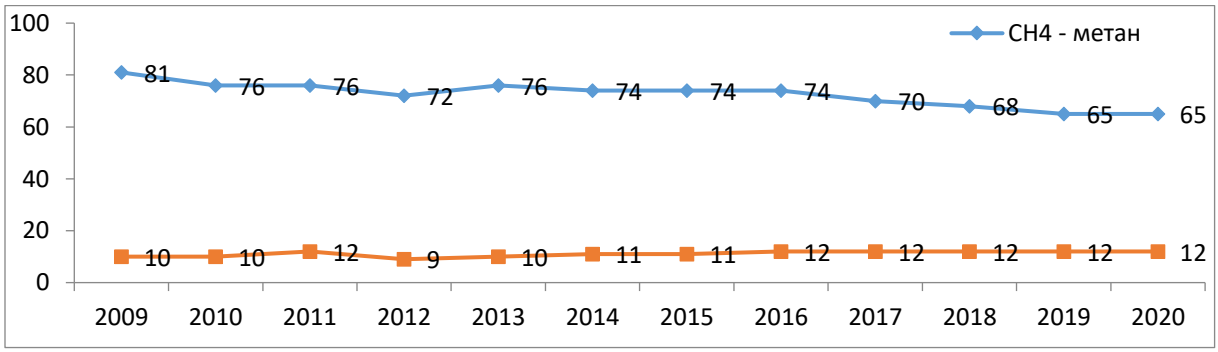


Figure26. Emissions of CH4 and N20 with a source from the agricultural sector of Bulgaria. Source: FAOSTAT data for the period 2009-2020 /kiloton/

The main reason for the reduction of carbon emissions is the use ofresource-saving technologies of production and improvement of the energy efficiency of agricultural holdings. This is evidenced by the data shown in Figure 25. According to this data, emissions from the use of energy resources in agriculture fell from 586 kilotons in 2009 to 542 kilotons in 2020, a decrease of 8%. These data prove that the CAP has a beneficial impact on innovations reducing CO2 emissions in the air both during the first stage of its application and during the current stage.

Another harmful atmospheric gases that agriculture generates are methane andnitrous oxide, which are defined as having a negative impact on the Earth's atmosphere.

Figure 26 shows the dynamics of the amounts of CH4 and N20 gases emitted by agricultural holdings in the period of the last 10 years. The data show that despite the intensification of agricultural production, harmful emissions are gradually decreasing. Although the reduction is not significant, it is a fact and the levels of CH4 released into the air are reduced by 20%. At N20, a slight increase is seen, which is contained at a level of 12 kilotons per year. It can be concluded that the application of the CAP in managing the emissions of CH4 and N20 that farms generate leads to positive effects. Encouraging the use of innovations in the fight against harmful gas emissions is imminent, but it is necessary to rethink the role of the CAP in this process.

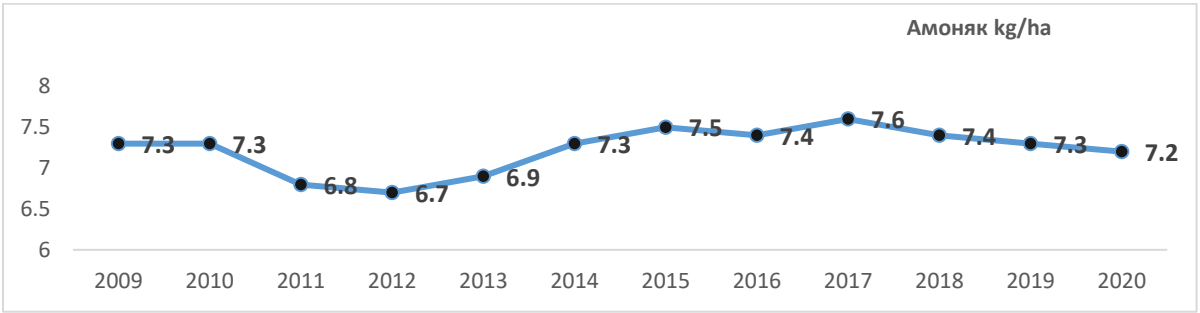


Figure27. Ammonia emissions in the soil (kg/ha). Source: EUROSTAT data for the period 2009-2020.

One of the main sources of harmful emissions in the soil, and hence in the water resources of the country, are the fertilizers and plant protection preparations that are used in agriculture. The main polluting component is ammonia. During the last 10 years, the accumulation of ammonia in the soil varied between 6.7 kg/ha and 7.3 kg/ha (see figure 27). Despite the implemented compensatory measures against this unwanted effect, it remains perceptible for the time being. It can be seen that in the period 2011 - 2013, the accumulation of ammonia in the soil is minimized, after which its accumulation begins to increase and reaches initial levels. Innovations in fertilizers and plant protection preparations cannot significantly reduce ammonia emissions in the soil, and hence in the groundwater.

Another important non-renewable resource that agriculture uses is water. Although cereal crops predominate in Bulgarian agriculture, water consumption in the sector remains significant. In order to protect this natural resource, it is necessary for the innovation process in agriculture to achieve less pressure on the country's water resources. From the data shown in figure 28, it can be seen that agriculture is increasing its pressure on water resources, and in recent years, polluted water as a result of the industry's activity has reached 5.6% of the total water used. Despite the available support measures and schemes in the previous and current CAP, the negative effect of agricultural activity is increasing. In this context, we can conclude that innovation does not lead to addressing the problem of water pollution. It is necessary to think in the direction of purifying the polluted water and reusing it for irrigation of agricultural crops. In this way, the waste of this strategically important resource for the state will be limited.

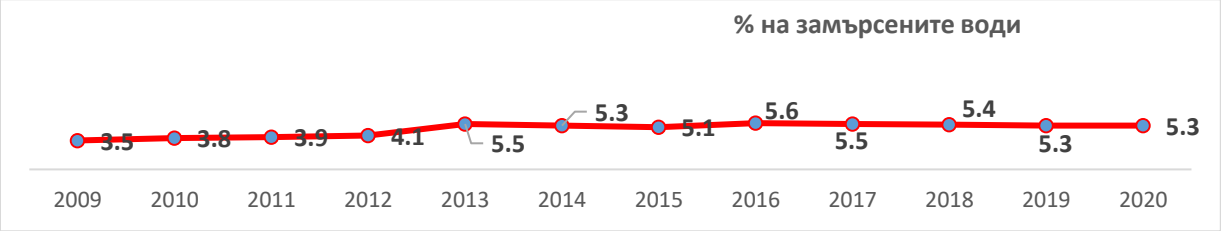


Figure28. Share of polluted water as a result of its use in agriculture. Source: own calculations of EUROSTAT database.

The significant successes of the CAP in recent years regarding the reduction of harmful emissions from agriculture are the following:

- Limiting the burned areas in agriculture as well as gradually eliminating the practice of burning stubble after growing cereals;
- The use of energy-efficient resources in production as well as encouraging farmers to build their own renewable energy sources;
- Inclusion of a large part of land resources in the "NATURE-2000" network. In this way, the expansion of agriculture is reduced and farmers are encouraged to use innovations that increase their productivity without including additional land in the economic turnover;
- Encourage the use of optimal crop rotations and through this practice reduce the use of chemicals in agriculture.

Effects on the social factor. Another important aspect when evaluating the effectiveness of the innovation process and innovations in agriculture is whether they lead to positive effects on the development of the social factor in rural areas. Innovations need to create jobs, keep young people in the industry, attract new players in the industry, and increase the income of the population in rural areas.

Figure 29 contains information on the dynamics of agricultural employment over the last 10 years. The data show that the number of people employed in agriculture is decreasing, as before 2009 they were 230 thousand people, and in 2020 they reached 205 thousand people. The trend shows a smooth decrease, which proves that the outflow of workers from the agricultural sector to other economic sectors is small, but it is there. The main reasons for this trend are the following:

- Innovations lead to higher productivity of agricultural holdings by using technologies that require less manual labor, which is reflected in a lower need for labor;
- Agricultural holdings are consolidated, which leads to the standardization of production, and hence to the stabilization of the number of people employed in agriculture. In most cases with small farms (which prevail in the structure of farms - data from the last census in the sector).

Along with the decrease in the number of employed people, the share of the self-employed in Bulgaria's agriculture is also decreasing. The data in figure 29 show a sharp trend of reduction of the self-employed, as the reduction for the last 10 years is by nearly 40%. Main reasons for this trend are:

- In the conditions of economic upswing and efficiency in the absorption of financial assistance under the CAP, a large part of agricultural holdings have become market-oriented structures, in which part of the farmer's family (who were self-employed) has been replaced by specialists from separate functional areas of businesses attracted to the operation of the farm through a contract;
- A part of the farmers leave the industry and seek realization in other economic sectors.

It can be summarized that the innovation process fails to hold the migration processes in the rural areas, and there is still an outflow of human capital in other economic sectors of the country.

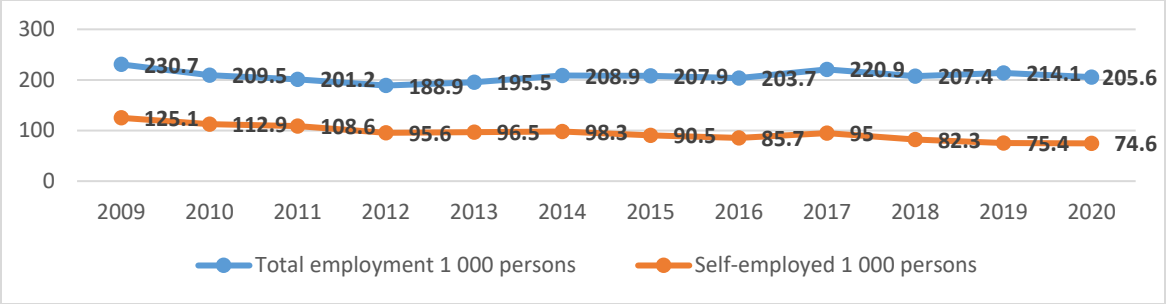


Figure29. Dynamics of employment in the agricultural sector (thousands of people). Source: Own calculations of FAOSTAT database for the period 2009-2020.

Another important measure of the effects of the innovation process in agriculture is the level of profitability of those employed in the sector. Income is one of the main economic drivers for the development of the social factor in rural areas of the country. According to the data in figure 30, the disposable income of one employed in agriculture is growing significantly. The dynamics of this indicator conditionally passes through two stages - (1) stage covering the period 2009 - 201 and (2) stage covering the period 2015 - 2020. The first stage shows a smooth increase in disposable income as in 2009. on average, one employee generates BGN 277.7 monthly income. By the end of 2014, the monthly income as a value doubled and reached a level of BGN 440.1. During the second stage, the monthly income began to increase rapidly and in 2020 it reached BGN 987.7.

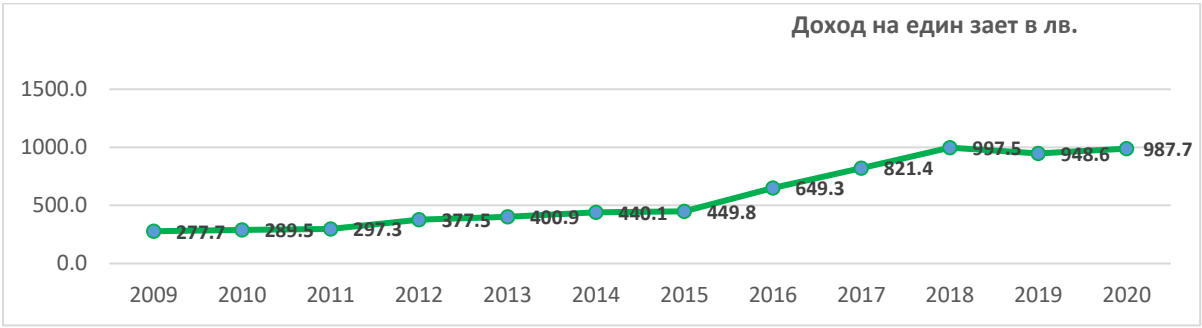


Figure30. Income of one person employed in agriculture (monthly income in BGN) for the period 2009 – 20202. Source: Own calculations based on the EUROSTAT database.

This proves that with the application of the CAP in the 2014-2020 phase, the incomes of those employed in the industry are growing significantly faster. According to data from the department "Agrostatistics" at the Ministry of Agriculture, 83% of the income is formed by the financial support received from the state, which implements CAP in the sector. Despite the sharp increase in income, agriculture lags behind other industries in terms of the value of this indicator. Which also explains the outflow of human capital to other economic sectors of the country, where profitability is higher with relatively lower risk. It should be noted that despite the lower levels of profitability, farmers have full freedom to diversify their activity and thus, through market innovations, increase their profit and hence income.

The growth of income in agriculture in the last 10 years is almost 5 times. However, the share of low-income workers in the industry still remains significant. According to the data in figure 31, the share of the employed with low incomes was 18.9% in 2009. In the following year, this share reached the highest value – 22.1%. In subsequent years, the share of employed people with low incomes varied between 20.5% - 14.9%. A permanent trend of shrinking the share of this group of farmers is noticed, as in 2020, their share amounted to 16.1%. In terms of the CAP, the share of the poorest farmers remains significantly higher compared to the EU-27 level – 8.5%.

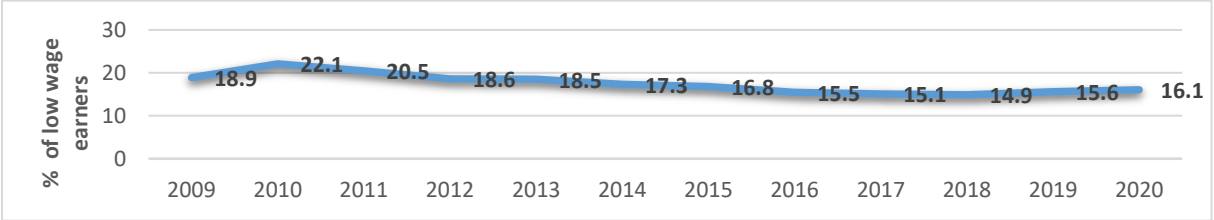


Figure31. Share of the employed with low incomes formed by their activity in agriculture. Source: own calculations of EUROSTAT database.

Despite generous financial assistance, the innovation process in agriculture cannot create conditions for higher profitability among the poorest farmers. This is due to the "spiral of sluggish investment" effect, where farms cannot allocate substantial investment to innovations that have a higher market value and the ability to generate higher operating returns.

Conclusions

Conclusions regarding the impact of the CAP on the "entry" of the innovation process in Bulgarian agriculture in the last 10 years:

- Under the terms of the CAP, Bulgaria has become an export-oriented country. In 2009, the export of agricultural goods from Bulgaria, represented as a percentage of the total EU export, was 0.7%. Within the last 10 years, exports as a relative value have increased 1.4 times;
- Within the framework of the CAP, state spending on agricultural development has increased 3.3 times. It is clearly seen that financial aid from the EU "pulls up" the state's expenses for the development of the sector;
- In addition to the state and foreign investors, the main role in the formation and development of the innovation process in agriculture is played by banking institutions, which are also the main supplier of credit resources for the sustainable development of the industry over the years.
- CAP 2014-2020, despite its "green" schemes and support measures, fails to achieve a reduction in the use of pesticides, on the contrary - the amounts of pesticides that farmers use in their activities are rapidly increasing. The CAP affects not only the attraction of the amounts of pesticides used, but also their "greening". The application of bio-products for plant protection within 10 years have increased nearly 4 times. This increase is due to an increase in the area occupied by organic production in our country.
- The CAP also affects the level of fertilizers used in agriculture. From the analysis, it is clear that the amounts of fertilizers that are applied in the industry are steadily increasing over time. In 2009, imported fertilizers amounted to 160,981 tons, reaching 185,005 tons in 2019, which is an increase of nearly 1.1 times;
- Innovations in the application of fertilizers in agriculture are intensively entering the sector, encouraged by support under the CAP. The policy has positively influenced the share of bio-preparations to increase over the years. Innovations in fertilization are gradually entering native agriculture and by 2019, bio-fertilizers accounted for 10.9% of the total imported fertilizers in agricultural holdings. A main factor for the increase in the use of bio-fertilizers in agriculture is the gradual expansion of the areas occupied by agricultural crops that are grown in biological production conditions;
- The CAP has a positive impact on innovation in terms of the machinery and equipment used in agriculture. Over the past 10 years, the average value of newly purchased equipment on a farm has increased nearly 1.5 times. Mainly, tractors and combine harvesters with the equipment attached to them are renewed;
- Within the framework of the two phases of the CAP, a wide promotion of bio-technologies is achieved as a successful technological innovation in the agricultural sector. In the period 2013-2020, the share of organic farms increased 1.2 times. However, the data indicate that the mass implementation of bio-technologies in agricultural holdings is not happening and the percentage of organic holdings remains below 5% of the total number of registered holdings.
- One of the important elements of the innovation process in the agricultural sector is the retention and development of personnel in agricultural holdings. Under the conditions of the CAP, the turnover of permanently employed personnel in the farm decreases significantly. Over the past 10 years, farmers have developed digital skills as well as human resource management skills, with around 20% of respondents indicating that one of the two skills was important to them and they had received training to acquire it.

Conclusions regarding the impact of CAP on the "outcome" of the innovation process in Bulgarian agriculture in the last 10 years:

- Innovative products for the end user are defined as bio-products and bio-preparations needed for the purposes of farmers developing organic production on their farms

Conclusions regarding realized effects of the application of the CAP:

- Within the framework of the implemented CAP, there is an outflow of employees in the sector. In general, the number of people employed in agriculture is decreasing (by almost 8% in the last 10 years according to EUROSTAT data), but labor productivity is still increasing. This proves that the CAP affects the productivity of labor in agriculture by promoting the use of innovations allowing the intensification of the sector and its development is determined to the fullest extent by this factor;
- Through the CAP's 'green mechanisms', the sector is encouraged to use innovations to reduce CO2 emissions, and data shows that this is actually happening. The main reason for the reduction of carbon emissions is the use of resource-saving production technologies and the improvement of the energy efficiency of agricultural holdings;

- It can be concluded that the application of the CAP in managing the emissions of CH4 and N20 that farms generate leads to positive effects. Encouraging the use of innovations in the fight against harmful gas emissions is imminent, but it is necessary to rethink the role of the CAP in this process;
- One of the main sources of harmful emissions in the soil, and hence in the water resources of the country, are the fertilizers and plant protection preparations that are used in agriculture. The main polluting component is ammonia. During the last 10 years, the accumulation of ammonia in the soil varies from 6.7 kg/ha to 7.3 kg/ha. Despite the implemented compensatory measures against this unwanted effect, it remains perceptible for the time being. Innovations in fertilizers and plant protection preparations cannot significantly reduce ammonia emissions in the soil, and hence in the groundwater;
- Despite the available support measures and schemes in the previous and current CAP, the negative effect of agricultural activity is increasing. In this context, we can conclude that innovation does not lead to addressing the problem of water pollution. It is necessary to think in the direction of purifying the polluted water and reusing it for irrigation of agricultural crops. In this way, the waste of this strategically important resource for the state will be limited. The significant successes of the CAP in recent years regarding the reduction of harmful emissions from agriculture are the following: (1) Limitation of burned areas in agriculture as well as gradual elimination of the practice of burning stubble after growing cereals; (2) The use of energy efficient resources in production as well as encouraging farmers to build their own renewable energy sources; (3) Inclusion of a large part of land resources in the NATURA-2000 network. In this way, the expansion of agriculture is reduced and farmers are encouraged to use innovations that increase their productivity without including additional land in the economic turnover; (4) Encourage the use of optimal crop rotations and through this practice reduce the use of chemicals in agriculture; which increase their productivity without including additional land in the economic turnover; (4) Encourage the use of optimal crop rotations and through this practice reduce the use of chemicals in agriculture; which increase their productivity without including additional land in the economic turnover; (4) Encourage the use of optimal crop rotations and through this practice reduce the use of chemicals in agriculture;
- It can be summarized that the innovation process fails to hold the migration processes in the rural areas, as there is still an outflow of human capital in other economic sectors of the country;
- With the application of the CAP in the 2014-2020 phase, the incomes of those employed in the industry are growing significantly faster. According to data from the "Agrostatistics" department at the Ministry of Agriculture, 83% of the income is formed by the financial support received from the state, which implements CAP in the sector. Despite the sharp increase in income, agriculture lags behind other industries in terms of the value of this indicator. The growth of income in agriculture in the last 10 years is almost 5 times. However, the share of low-income workers in the industry still remains significant. Despite generous financial assistance, the innovation process in agriculture cannot create conditions for higher profitability among the poorest farmers. This is due to the "spiral of sluggish investment" effect, where farms cannot allocate substantial investment to innovation,

Chapter III. Identification of the needs of agricultural holdings and strategic orientation of the innovation process

The CAP has an impact on the innovation process in agriculture, both in terms of the renewal of the production resources that are used, and in terms of the manufactured products intended for the final consumer. In this part of the dissertation, the state of the innovation process is analyzedmicro-level and determine the needs of agricultural holdings for higher efficiency from the used innovations in production.

Typology of the investigated holdings. In order to collect reliable information, a survey was conducted, which covers 180 farms in the territory of the city of Plovdiv, the city of Pazardzhik, the city of Sliven, the city of Haskovo, the city of Kardjali and the city of Yambol. The survey period is from 10.02 to 30.05. 2022. The purpose of the survey is to collect information about the state of the innovation process in agricultural holdings.

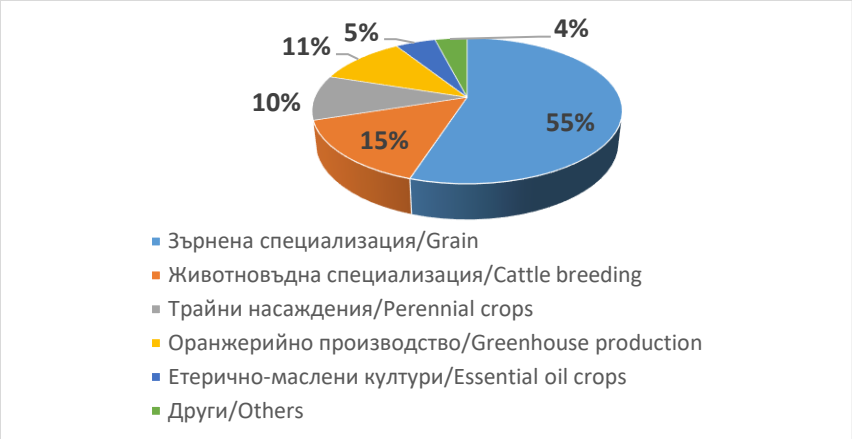


Figure32. Specialization of the studied holdings. Source: own survey among 180 farms, 2022.

The structure of the studied farms according to their specialization is given in figure 47. From the data presented, it can be seen that 55% of the studied farms specialize in the cultivation of cereals, followed by farms specializing in animal breeding - 15%, farms specializing in greenhouse production - 11% and farms with perennial crops – 10%.

Figure 48 shows the structure of agricultural holdings according to when they have existed as a business model on the market. According to the data, farms that are over 10 years old predominate (they occupy 35% of the total surveyed farms), followed by the group of farms with an age of up to 5 years - 35% and finally those with an age of 5 to 10 years, respectively - 30%

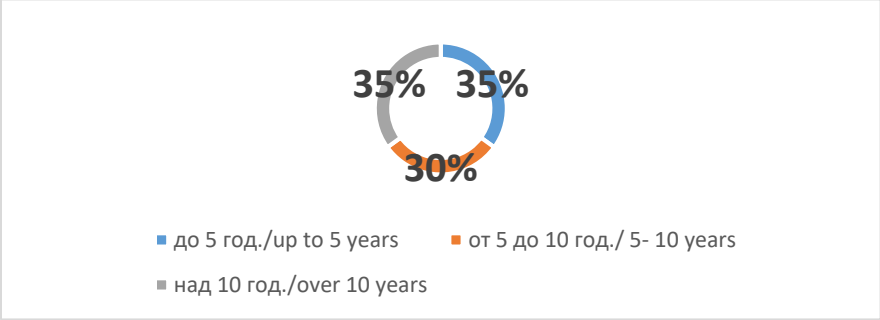


Figure33. Maturity of agricultural holdings. Source: own survey among 180 farms, 2022.

In 2/3 of the surveyed farms, the farmers who manage the farm for men. In half of the farms, the number of permanent employees is less than 10 people.

Figure34. Sources of financial assistance that farms have used. Source: own survey among 180 farms, 2022.

85% of the surveyed farms used financial assistance within the framework of one of the schemes or measures laid down in the CAP 2014-2020 (see figure 49). Farmers on 10% of surveyed farms state that they did not use financial assistance during the current CAP. Did the remaining 5% of farms use financial support other than that provided by the CAP 2014-2020. All farms surveyed stated that financial support is vital for their future development and they rely on it to renew their assets.

Costs of implementing innovations in agricultural holdings. One of the reliable indicators of the state of the innovation process in agricultural holdings is the cost of acquiring new assets. Figure 50 provides information on the dynamics of costs for the acquisition of new buildings and land in agricultural holdings over the last 5 years. The data show that the costs of acquiring such assets are increasing - 38% of the surveyed farms declare this as a fact. This means that investments have been made in these farms for innovations, securing the building and land fund. In 31% of the farms, the costs of acquiring new buildings and land did not change, and in 24% of the farms, no such costs were incurred in the last 5 years. Only in 8% of the agricultural holdings these costs decrease. In general, it can be concluded that

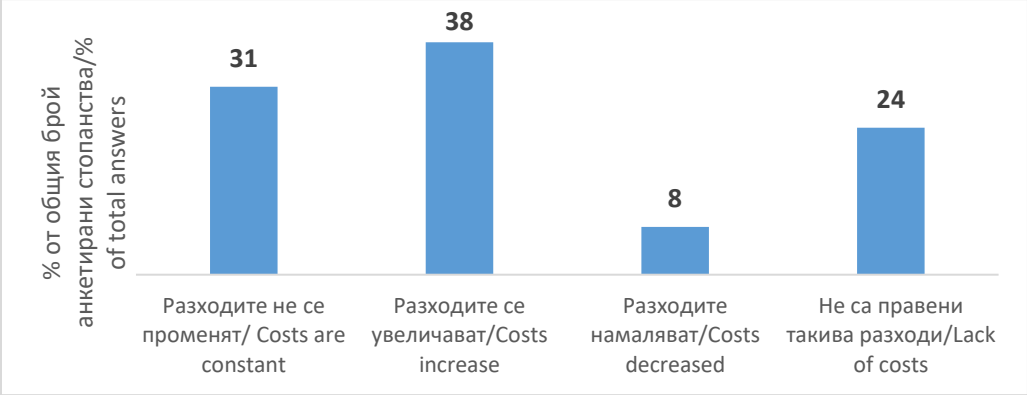


Figure35. Changing the cost of acquiring new buildings and land. Source: own survey among 180 farms, 2022.

Figure 51 contains information on the dynamics of costs for the acquisition of new machinery and equipment in agricultural holdings. Of all 180 farms, 51% declared that the costs of renewing these assets did not change in the last 5 years. At 42% of farms, the costs of acquiring new machinery and equipment are increasing, and at 6% no such costs were incurred. In general, the renewal of machinery and equipment in agricultural holdings occurs in 93% of the surveyed expenses, and in half of them they remain a constant value.

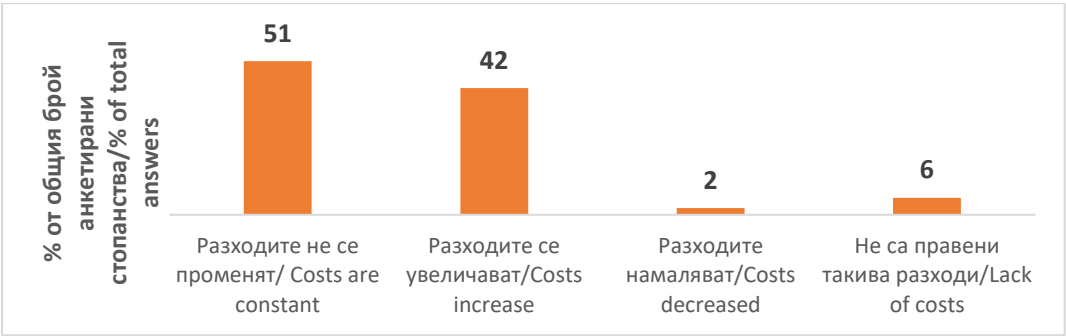


Figure36. Change in the cost of acquiring new machinery and equipment. Source: own survey among 180 farms, 2022.

From the data in the last two figures, it can be seen that innovations in new physical assets exist, and the tendency is that the costs of their acquisition in the holdings do not change over time.

Figure37. Changing the costs of acquiring new licenses and patents. Source: own survey among 180 farms, 2022.

Through patents and licenses is one of the ways of technological renewal of agricultural holdings. Figure 6 provides information on the costs of acquiring these non-physical assets in farms. The presented data show that agricultural holdings are not inclined to spend on this type of innovation - 94% of the studied holdings did not make such spending in the last 5 years. Clearly, technological innovation occurs in other ways that cannot be captured by the acquisition cost metric. This is also proven by the data shown in the following figure 52. According to these data, agricultural holdings renew their technological level - 53% of the surveyed holdings declare that this is a fact. A major supplier of a new technology is one who supplies the planting and/or seed material, or the supplier of preparations and fertilizers necessary for organizing agricultural production. The supplier does not require payment when transferring the technology to the farm, and the costs are most likely factored into the other resources and activities that he supplies to the farmer. Another part of the new technologies is supplied by specialized providers – digital services are defined as such services, which a part of agricultural holdings (only 33%) use in organizing and managing agricultural production. Such specialist suppliers are those - who deliver Another part of the new technologies is supplied by specialized providers – digital services are defined as such services, which a part of agricultural holdings (only 33%) use in organizing and managing agricultural production. Such specialist suppliers are those - who deliver Another part of the new technologies is supplied by specialized providers – digital services are defined as such services, which a part of agricultural holdings (only 33%) use in organizing and managing agricultural production. Such specialist suppliers are those - who deliversmart - equipment (hardware and software) or typical mobile services (A1, Vivacom, Telenor).

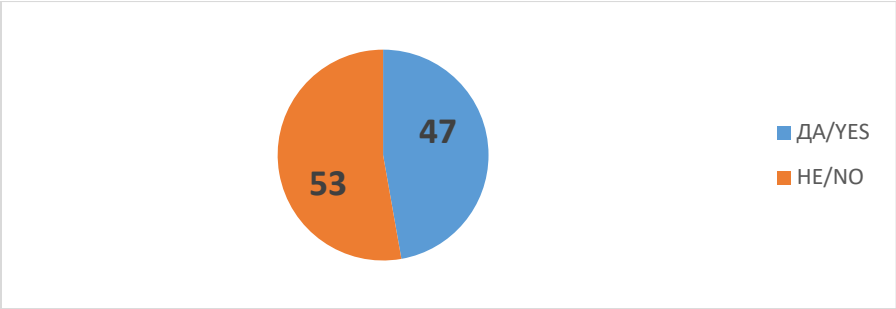


Figure38. Acquired new technology agricultural holdings. Source: own survey among 180 farms, 2022.

Types of technological innovations that farms implement. Technological innovations used by agricultural holdings aim to solve specific problems of farmers in organizing the production and trade of agricultural products. The following figure shows the directions of use of new technologies in the studied farms. From the data in figure 54, it can be seen that in 31% of the farms, the new technology that was implemented is one that allows the achievement of a higher quality of the produced products. In 25% of the farms, the new technology they have implemented in the last 5 years is one that allows the penetration of new markets. At 25% of farms, investments are in the direction of implementing resource-saving technology. At 21% of the farms, new technology is available, which allows the diversification of the manufactured products.

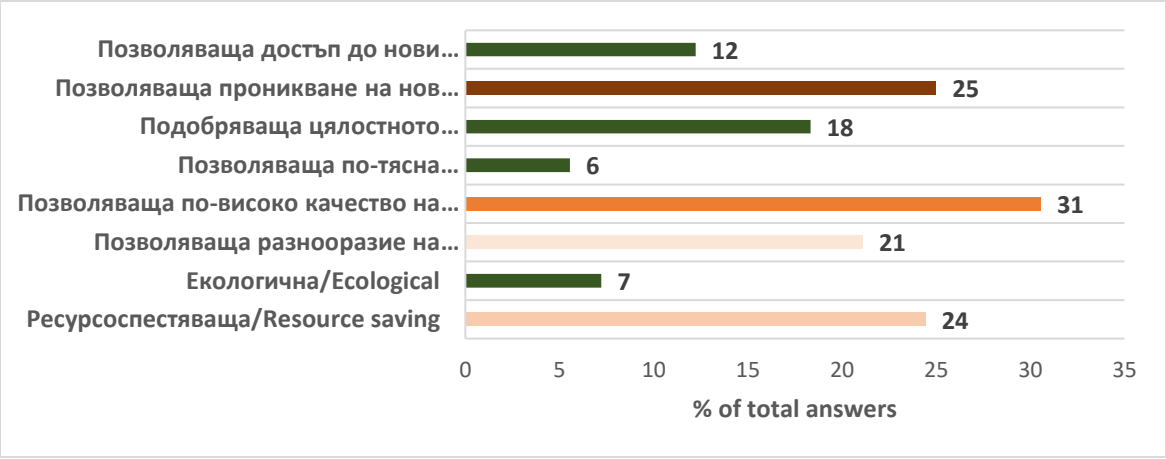


Figure39. Types of new technologies being implemented in agricultural holdings. Source: own survey among 180 farms, 2022.

Change in the qualifications of those employed in agricultural holdings. Technological renewal in agricultural holdings requires a change in the qualifications of those employed in production. In case of a radical change in the technological level in

the farm, the staff needs to undergo education and training to acquire new knowledge and new skills, which will allow them to adapt to the new technological requirements. One of the questions in the survey is "How have the costs of personnel qualification changed in the last 5 years?", the purpose of which is to establish the presence of such practices in farms. According to the data shown in figure 55, 44% of the surveyed farms do not spend on improving the qualifications of the staff. In general, 50% of the farms have made such expenses, and in 36% of the surveyed farms, the expenses for this activity are increasing, and in 14% they have not changed in the last 5 years. These data indirectly indicate that the qualification of those employed in production occurs as farmers set aside funds for this activity.

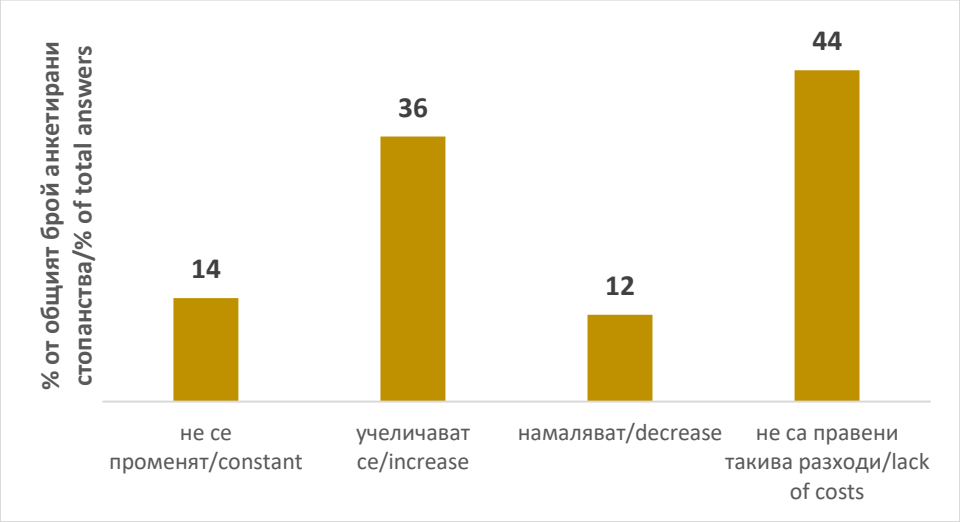


Figure40. Costs of agricultural holdings to increase the qualification of the staff. Source: own survey among 180 farms, 2022.

From a survey conducted, it is clear that the qualification of the staff is aimed at the formation of the following more important skills:

- Skills related to working with new machines and equipment (50% of surveyed farms claim this);
- Skills related to overall production management - 35% of respondents gave this answer;
- Skills related to working with specific software - 10% of surveyed farms;
- Other skills (teamwork, financial management, human resources management, marketing management and others) – 5% of surveyed farms.

The data from the presented field research prove that farmers and other persons employed in the farm increase their qualifications in the direction of using new machines and equipment, conditioned by the application of a new technological level in production.

Expenditures for research and development activities in agricultural holdings. In the existing theoretical models for managing the innovation process in the economic sectors of countries around the world, the level of R&D expenditure is a key factor in creating an innovation environment. In Bulgaria, according to NSI data, R&D expenditures over the past 10 years have traditionally been made by the state - 95% of these expenditures are made by the state (see fig. 56). The remaining 5% is made by the private sector, which defines it as a symbolic player in the formation of an innovation environment. The main representatives from the private sector who spend on R&D are business angels and companies whose main activity is the supply of products with a specific purpose, which are mainly consumed by the state.

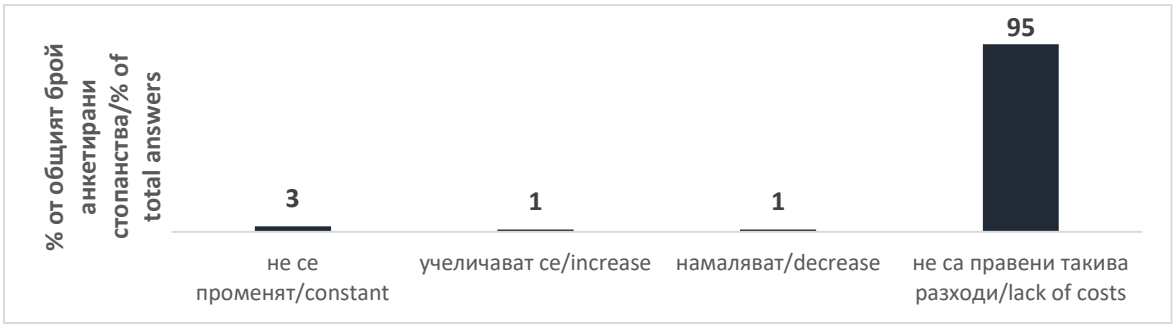


Figure41. Expenditures for research and development activities in agricultural holdings. Source: own survey among 180 farms, 2022.

The state, as the main generator of R&D costs, supports, through subsidized support, the network of scientific institutes and universities that must offer innovations for business needs. The next question in the survey aims to gather information about the state of R&D expenditures in Bulgarian agriculture. Figure 56 shows information reflecting the responses received from 180 farms. According to 95% of surveyed farms, no R&D expenses are incurred. The main reasons for the absence of such costs are:

- Misunderstanding the nature of R&D costs;
- Insufficient funds to allocate for research and development;
- Lack of trust in R&D activities as a source of innovation.

It can be summarized that R&D expenses are mainly concentrated in scientific organizations - institutes and universities, and farms should only be users of R&D results in these structures.

Change in the specialization of agricultural holdings. One of the effects observed in the assessment of the impact of the CAP on the innovation process in agriculture. In this part of the dissertation, the impact of the CAP on the specialization of the individual agricultural holding is analyzed.

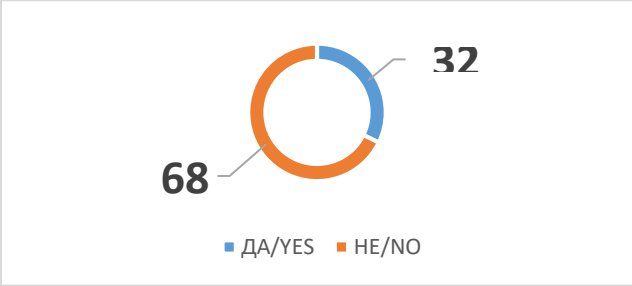


Figure42. Change in the specialization of agricultural holdings. Source: own survey among 180 farms, 2022.

The results of the conducted survey among 58 farms[10]show that the majority of agricultural holdings (23% of a total of 58 surveyed holdings) have changed their specialization as a result of the application of the CAP (see Fig. 57). The main motive that they point out for the conversion of production to another type is the financial assistance that is provided for the organization of the new type of production. Almost 65% of surveyed farms state that the choice for a new type of production is determined by a previously performed analysis regarding the crops and animal breeds that are subsidized at the highest levels by the state.

Another important factor that is taken into account in the change in the specialization of farms is the market demand - 8% of the surveyed farms declare that this factor was the main factor in their transition to another type of production in the last 5 years (see fig. 58). Finally, farmers indicate (15% of all surveyed farms) that personal motives are the main factor for a change in specialization in the last 5 years.

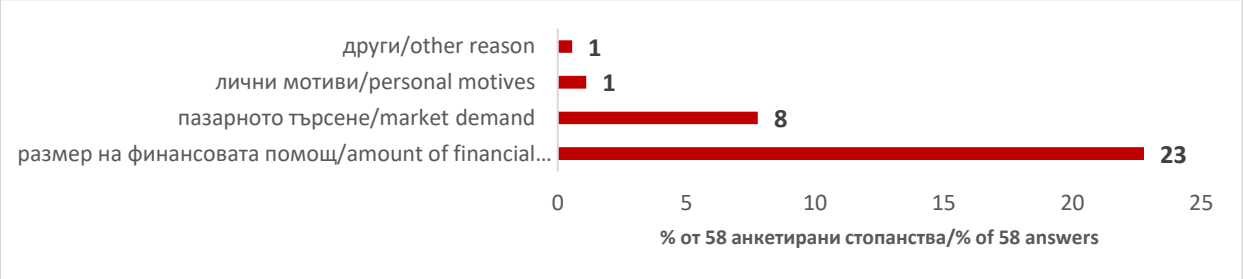


Figure43. Factors determining the change of specialization of agricultural holdings. Source: own survey among 58 farms, 2022.

Another important factor for the change in agricultural specialization is the effective organization and management of the resource security of production. When the price of a basic production resource increases, the farmer seeks to replace it with another cheaper one and thus maintain his market competitiveness. Another reason for not replacing one resource with another can be the state, which seeks to regulate a relatively smaller impact of the industry on the environment. Most often, the state

[10]The total number of farms covered in the survey is 180, but only 58 farms answered the question in the survey, the purpose of which is to collect information about the factors determining a change in their specialization in the last 5 years.

resorts to the use of financial incentives to motivate farmers to switch to another production specialization thatexerts less pressure on the environment and at the same time provides higher income from the activity. It is clear from the conducted survey (31% of surveyed farms indicated the CAP 2020-2014 as a financial incentive for the conversion of their production) that agricultural farms changed their specialization mainly by being motivated by the financial assistance within the CAP 2014-2020 .

Change in the product range and business model of agricultural holdings. Bringing innovation to the market is a high-risk activity, and few are willing to take the risk of offering an entirely new product that does not currently have a close substitute. Agriculture has its own specificity, which generally determines the lower degree of innovativeness of the branch compared to other economic branches in the country. In agriculture, the turnover of capital is lower, investments are returned more slowly, force majeure circumstances are more often manifested in the organization of this type of production activity than in other types. All this determines the rarer occurrence of real innovations on the part of farms.

Figure44. Types of innovations that farms offer to the end user. Source: own survey among 180 farms, 2022.

Figure 59 provides information on the types of innovations that farms offer to their customers. The data shows that only 6% of the farms surveyed have launched a real innovation (a product that has no analogue on the market at the moment). Of all surveyed farms - 31% have declared that in the last 5 years they have tried to impose on the market a new product that is an imitation of a product already established on the market.

Farmers mainly rely on innovations that are environmentally friendly products - 46% of surveyed farms indicate that their innovations are of this type (environmentally friendly) and those that are defined as a healthy product - 18% of the total surveyed farms. From the obtained data it can be concluded that farmers recognizethe environmental friendliness and health aspect of products as a source of innovation that has value in the market. The demand for environmental friendliness is motivated by the farmer's desire to receive additional income in the form of a subsidy paid by the government in exchange for the farmer's following a "green" practice. The healthy nature of the product produced is a goal of the farmer, determined by his desire to provide a marketable product with higher added value and thereby increase sales revenue.

In addition to a change in specialization as a result of the application of the CAP and as an important sign of the presence of an innovation process in agriculture, it is sought whether the CAP exerts pressure on the type and structure of the farm's business model. With the next question, the survey aims to collect precisely such information. Figure 60 shows the responses of farmers regarding business model change over the past 5 years. The data show that farmers have been affected by the application of the CAP and have changed their business model - 121 farms state this as a fact.

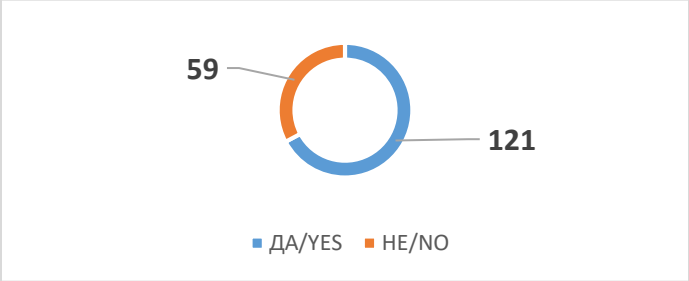


Figure45. Change in the farm's business model affected by the application of the CAP. Source: own survey among 180 farms, 2022.

Apart from the fact that the business model may change under the impact of the CAP, its structure, which determines its competitive advantage, may also change. Figure 61 provides information on the factors of the business model that farmers identify as critical in its restructuring. The data show that the received financial assistance is the most important factor that determines the form and type of the business model - 49% of the surveyed farms indicate this factor. Another important factor determining the change in the business model is the access to the new customers - 21% of the surveyed farms indicate this factor.

In addition to clients, farms are restructuring their business model in order to be able to reach new suppliers – 17% of farms indicate this factor.

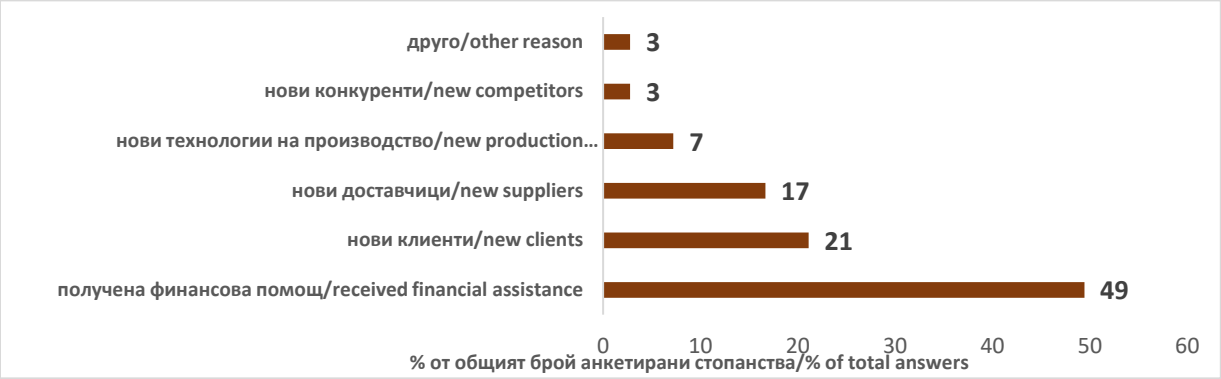


Figure46. Important elements of the agricultural business model that form a competitive advantage. Source: own survey among 180 farms, 2022.

Taking into account the data from figure 60 and 61, it can be concluded that the financial assistance within the framework of the CAP is the most important factor that changes the business model in agriculture. Farmers are willing to change their business model in whole or in part in order to obtain even greater levels of subsidy and thereby ensure their viability over time. This is also proven by the data generated by the Agricultural Accounting Information System, according to which more than 2/3 of the income of farms is formed by the received financial assistance within the framework of the CAP.

Change in productivity and profitability of agricultural holdings. Labor productivity is used as the main measure of the efficiency of the output of the innovation process in agricultural holdings. Figure 62 provides information on the change in labor productivity in the surveyed farms. The data show that labor productivity has increased in 59% of farms as a result of implementing innovations in production. At 18%, labor productivity remains unchanged as a result of the implemented innovations, and at 23% of farms, labor productivity decreases as a result of rationalization through innovations in production.

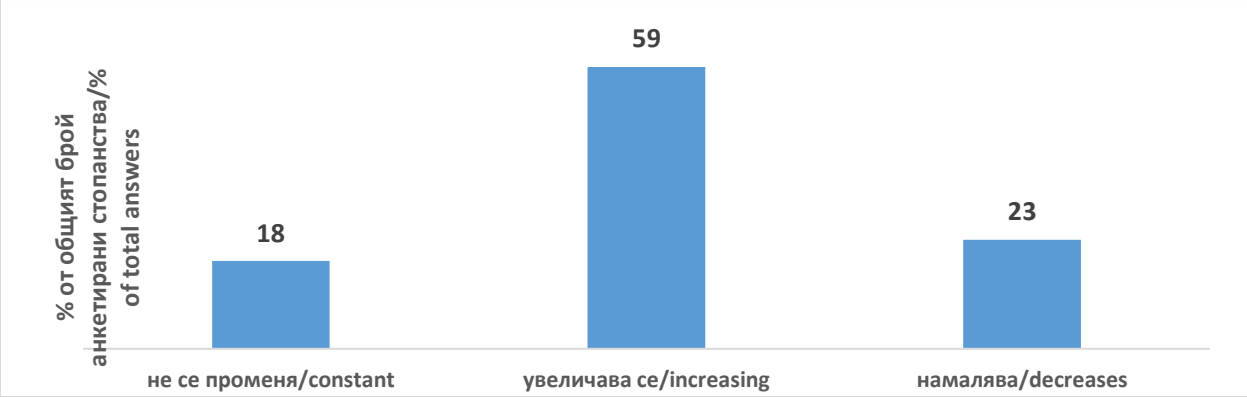


Figure47. Change in the labor productivity of agricultural holdings. Source: own survey among 180 farms, 2022.

As a result of the higher productivity from the implemented innovation, the revenue is expected to increase and hence the farm's operating income.

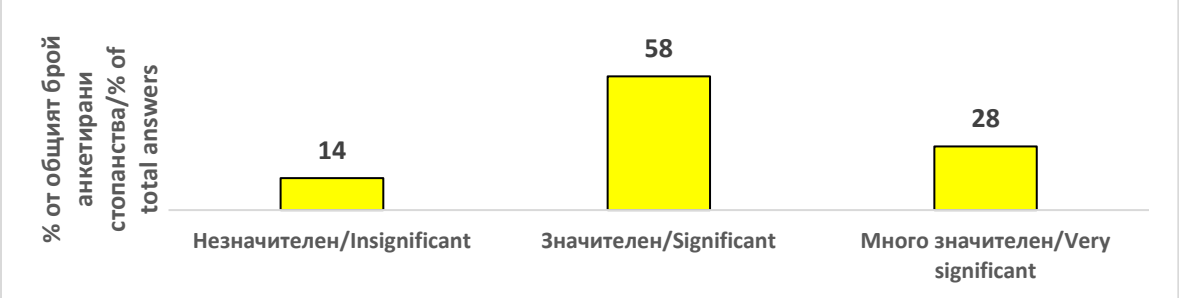


Figure48. Contribution of the new products to the total income from the farm's activity. Source: own survey among 180 farms, 2022.

Figure 63 shows the contribution of new products to the total income from agricultural holdings. According to 58% of surveyed farms, the contribution of new products to the generated total revenue is substantial (that is, they generate more than 30% of sales revenue). In 28% of the farms, the contribution is exceptional, that is, the new products generate more than 50% of the sales revenue on the farm. The obtained data prove that innovations significantly affect the income of agricultural holdings. This defines the innovation process as having a positive impact on the farm's ability to generate income during the year. Farm profitability is also affected by the level of production costs.

According to the survey data, production costs increase when innovations are implemented on the farm - 92% of farms say that their costs have increased.

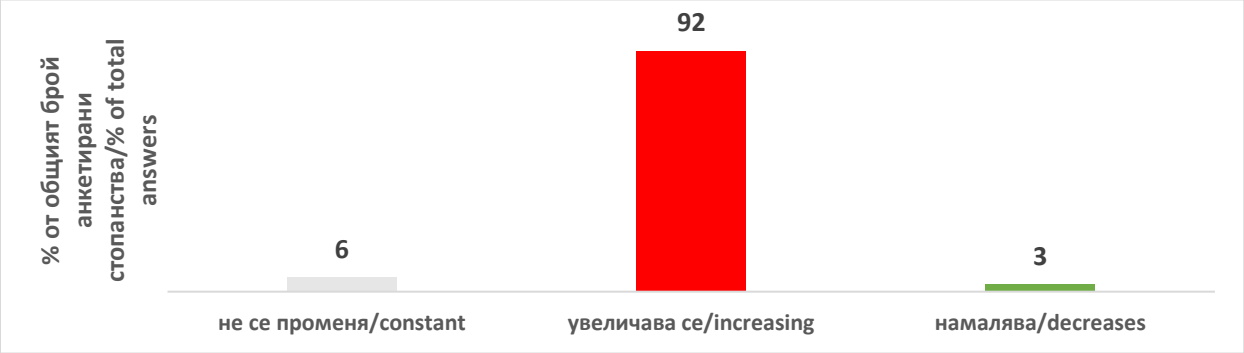


Figure49. Change in the level of production costs in agricultural holdings. Source: own survey among 180 farms, 2022.

Only 3% of agricultural holdings saw a reduction in production costs as a result of the implementation of innovations in production.

There are a number of factors that have an impact on the level of production costs in agricultural holdings during the year. According to the data from the conducted survey, the most critical factor affecting the amount of production costs in the farm is inflation - 56% of farmers indicate this factor. The inflationary processes that are observed in the current moment in the Bulgarian economy are also present in agriculture, which is due to higher prices of production resources - electricity, fertilizers, preparation and agronomic services. All this "swells" the farmer's account and he transfers the inflationary pressure to the final consumer. Another factor that exerts significant pressure on the level of production costs is the amount of financial assistance received within the framework of the CAP - 34% of the farms surveyed. the farmers, tend to incur more production costs at higher levels of subsidies received. Motivated by revenue growth, they strive to follow good manufacturing practices and incur higher costs by performing quality activities during the business year.

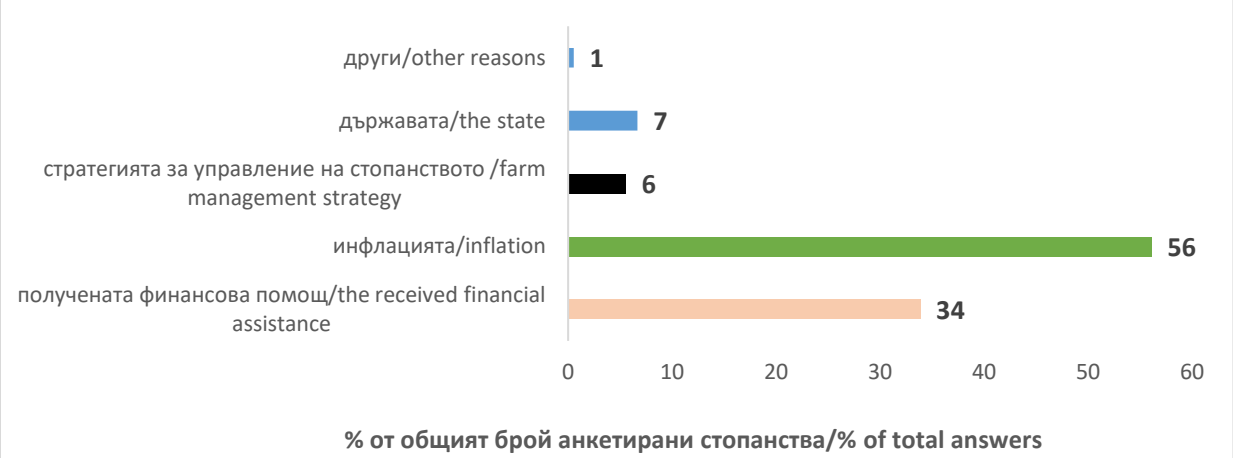


Figure50. Factors having a significant impact on the level of production costs in farms. Source: own survey among 180 farms, 2022.

As a result of the increase in production costs over the past year, more than half of the surveyed farms report that their profits have decreased, with 54% of farms indicating that their income has decreased significantly.

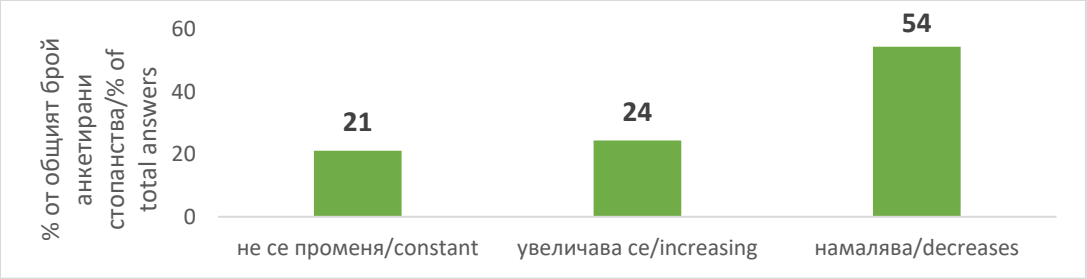


Figure51. Changes in farm profits. . Source: own survey among 180 farms, 2022.

Change in farm investments. One of the markers for the presence of an innovation process in agricultural holdings is the size and dynamics of their investments. From the conducted survey among 180 agricultural holdings, it can be seen that in 56% of the agricultural holdings, investments have increased in recent years (see figure 21). In 28% of farms, the costs of investment in innovation remain unchanged. The data prove that the investment activity within the CAP 2024-2020 is increasing. Only 13% of surveyed farms report a decrease in the amount of investments made, and 3% lack any investments at all in the last 5 years (see fig. 67).

Figure52. Dynamics of investments in agricultural holdings. Source: own survey among 180 farms, 2022.

Despite the reported increase in investment activity among more than half of the agricultural holdings, it is necessary to analyze the factors that prevent the holdings from expanding their investments in the future. The figure below shows the main reasons that farmers point out as limiting their investment activity. According to the data, 31% of farmers state that the main obstacle to the investment processis the lack of new markets. Another important limiting factor is the lack of investment management skills – 25% of surveyed farmers cited this as the main reason. Of all respondents, 18% stated that they do not make investments due to the lack of sufficient financial means. Apparently, the lack of a market and formed skills are the main, dominant factors limiting investments in agricultural holdings in the current CAP 2014-2020.

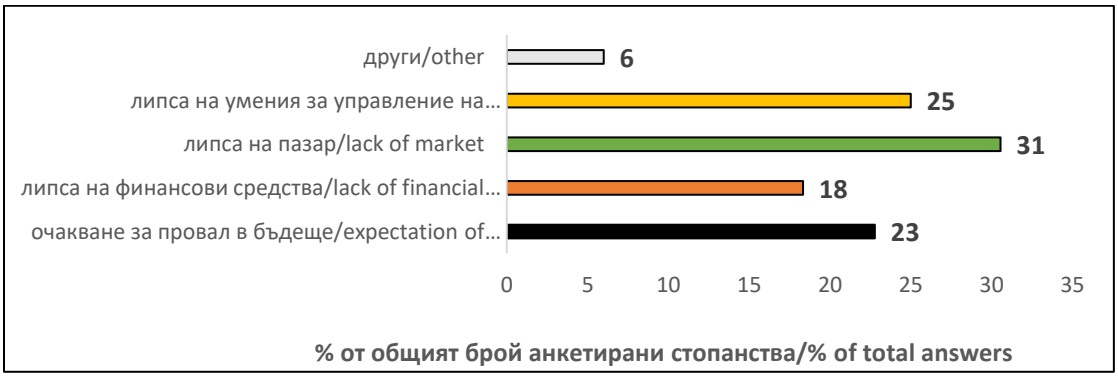


Figure53. Factors limiting investments in agricultural holdings. Source: own survey among 180 farms, 2022.

The lack of skills to manage the investment process can be overcome by training farmers and spreading good practices in this area among the farming community. Regarding the lack of sufficient finances, it can be considered to motivate a stronger intervention in the sector by banking institutions, which will play a major role in providing a credit resource for the development of the investment process in the future.

Marketing approach in managing the competitiveness of agricultural holdings. Innovations and marketing activities for the strategically important business processes that take place in the economy, guaranteeing the achievement of market competitiveness. Innovations need to lead to better market positions, be welcomed by customers and create new value that has no analogue in the market at the current moment. The main tool for valorizing innovations in the economy is adequate marketing, which must present the innovation as a vital value for the customer. Therefore, marketing costs and the formation of a marketing unit and the implementation of marketing activities in agricultural holdings are elements for successful innovation. From the survey carried out among 180 agricultural holdings in our country, it was found that that only 15% of farms make marketing expenses and think of them as an important element in the overall budget of the farm (see fig. 69). The remaining 85% do not make and do not plan to make marketing expenses in the future. Main reasons for this are that farmers do not consider marketing activities as an important factor in innovation management. Out of all 180 surveyed farms, 27 – spend on marketing and seek to implement marketing approaches in managing sales revenue. These farms, which represent 25% of the total surveyed farms, declare that marketing expenses have a positive impact on the amount of sales, and 8% are of the opposite opinion, 6% - state that marketing expenses maintain the sales levels of the previous year/s. The survey results clearly show

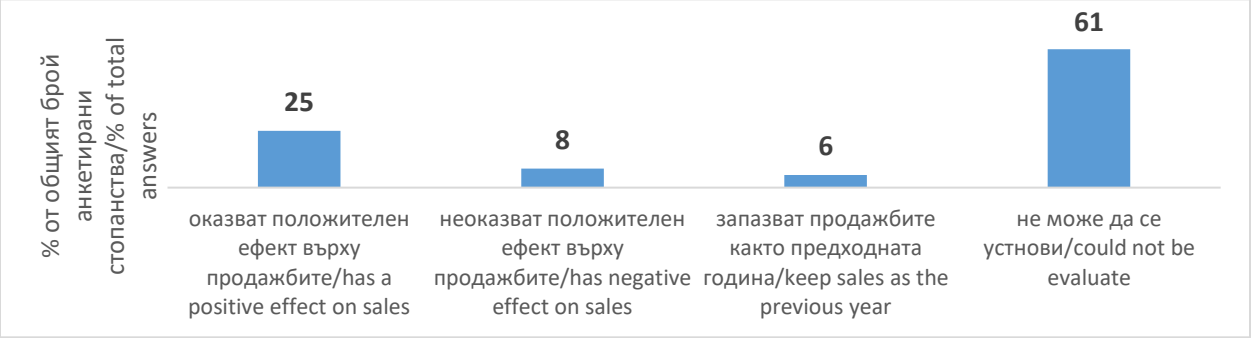


Figure54. Impact of Marketing Costs on Farm Sales. Source: own survey among 180 farms, 2022.

One of the important roles of innovations in agricultural holdings is that when they are implemented in production, they must lead to higher competitiveness in the market. The main measure of the level of competitiveness of the agricultural holding is the market share - as a size and dynamics over time. According to the data of the conducted survey, 54% of farms state that their market share has shrunk in the last 5 years (see fig. 70). Of all respondents, 24% stated that their market share has increased over the past 5 years, and 21% stated that their market share has not changed over time. The majority of farmers have no idea how to organize a system to collect information that allows them to determine their market share relative to that of their main competitors.

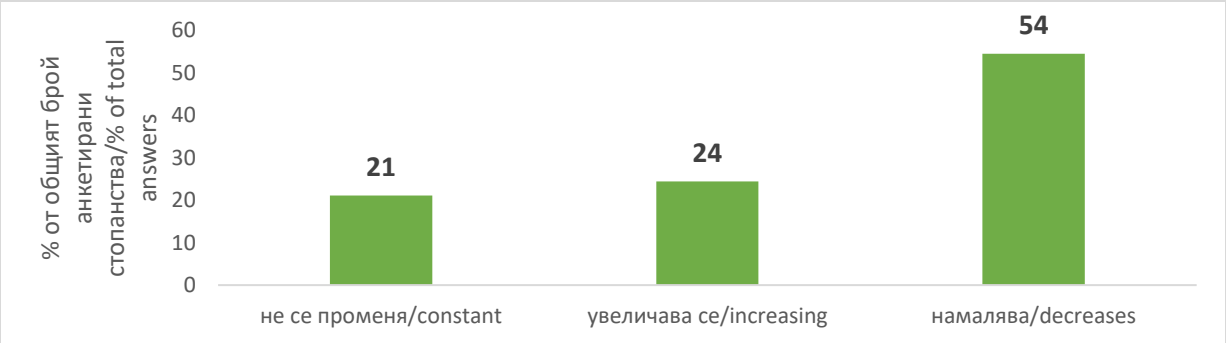


Figure55. Change in the market share of agricultural holdings. Source: own survey among 180 farms, 2022.

Statistical evaluation of the impact of subsidies on the innovation process in agricultural holdings. Through the application of regression analysis, it is sought what is the influence of subsidies on the innovation process in agricultural holdings. In the regression model, the amount of subsidies received is defined as a factorial indicator. The following two indicators are used for performance indicators in the model - value of assets and profitability of paid subsidies.

Table 14 shows the results of the performed regression analysis of the data. The model shows that subsidies have a significant impact on the formation of assets in agricultural holdings. This is proven by the correlation coefficient, which in the connection between paid subsidies and acquired assets in an average farm is 0.9703 (see table 1). In the connection of subsidies

with the achieved profitability in the farm from their use, the correlation coefficient is low, namely 0.167. The regression analysis does not prove the expected dependence, that with an increase in subsidies in a farm, its profitability increases in direct proportion.

Table1. Statistical evaluation of the impact of subsidies on gross margin, net income and profitability of subsidies in farms. Source: Proprietary database of SZSI.

Statistical indicators	**Assets BGN**	**Cost-effectiveness of subsidies**
Correlation coefficient Multiple R	0.9703	0.1670
Coefficient of definition R square	0.9415	0.0279
Corrected coefficient of determination AdjustedR Square	0.9399	-0.0045
Degree of dependence Degree of dependence	Big	Very weak
Type of addiction Type of dependence	Rights	Rights
Regression coefficient b0 Regression coefficient b0	-1753.48	3.23
Regression coefficient b1 Regression coefficient b1	1.2596	1.9550
Statistical significance Statistical significance	There is	There is no

According to the data from the SZSI, the share of financial assistance in the value of newly acquired assets in agricultural holdings remains a relatively high value. The data show that in 2013, during the first CAP, 38.5% of the value of the acquired new assets was covered by the subsidies received. 2018 saw a peak in the value of subsidies, defined as a relative share of the value of new farm assets. In 2020, the value of the studied indicator reaches - 44.3% (see fig. 71). Over the past 7 years, the share of subsidies in the value of newly acquired farm assets has increased by nearly 5.8%. The data from the performed regression analysis as well as from the graphic analysis of data from the National Institute of Statistics prove that the CAP has a decisive role in the acquisition of new assets in agricultural holdings in our country.

Figure56. Share of the received financial assistance in the value of acquired new assets in farms. Source: Proprietary database of SZSI.

Conclusions on innovations at the input and output of the agricultural system

- Leading technological innovations in agricultural holdings that enable the achievement of higher quality of manufactured products, penetration of new markets, saving of resources, as well as enabling the achievement of diversification of manufactured products.
- The results of the presented field research prove that farmers and other persons employed in the farm increase their qualifications in the direction of using new machines and equipment, conditioned by the application of a new technological level in production;
- In the majority of farms, no R&D expenditure is observed. According to 95% of surveyed farms, no R&D expenses are incurred. The main reasons for the lack of such expenses are: (1) Misunderstanding of the nature of R&D expenses; (2) Insufficient funds to be set aside for research and development; (3) Lack of confidence in R&D

activities as a source of innovation. It can be summarized that R&D expenses are mainly concentrated in scientific organizations - institutes and universities, and farms should only be users of R&D results in these structures;

- Financial assistance under the CAP 2020-2014 is the main reason for the conversion of farm production;
- Farmers mainly rely on innovations that are environmentally friendly products - 46% of surveyed farms indicate that their innovations are of this type (environmentally friendly) and those that are defined as a healthy product - 18% of the total surveyed farms. From the data obtained, it can be concluded that farmers recognize the ecological and healthy aspect of products as a source of innovation that has value in the market;
- In addition to a change in specialization as a result of the application of the CAP and as an important sign of the presence of an innovation process in agriculture, it is sought whether the CAP exerts pressure on the type and structure of the farm's business model. The data show that farmers have been affected by the application of the CAP and have changed their business model;
- One of the markers for the presence of an innovation process in agricultural holdings is the size and dynamics of their investments. From the conducted survey among 180 agricultural holdings, it can be seen that in 56% of the agricultural holdings, investments have increased in recent years. The data prove that the investment activity within the CAP 2024-2020 is increasing;
- In the formation of assets in agricultural holdings, subsidies have a significant impact. This is proven by the correlation coefficient, which in the connection between paid subsidies and acquired assets in an average farm is 0.9703. When analyzing the relationship between subsidies and the profitability achieved in the farm from their use, the correlation coefficient is low, namely 0.167. The regression analysis does not prove the expected dependence that with an increase in subsidies in a farm, its profitability increases in direct proportion;
- CAP has a decisive role in the acquisition of new assets in agricultural holdings in our country. With an increase in aid in this direction, it is expected that the value of acquired new assets in farms will also increase.

Strategic orientation of the innovation process. The results of the focus groups of farmers on the territory of the city of Plovdiv and the city of Kardjali show that the most significant opportunities for the development of the innovation process in agricultural holdings are:

- The trend of increasing demand for organic products and regional products in the market;
- Validation of local food brands;
- The financial support of the state for the development of the sector;

The most significant threats that limit the innovation process in agricultural holdings are:

- Unstable market prices;
- The strong market power of agricultural product distributors;
- The trend of increasing prices of production resources.

The development of the innovation process in holdings and validation is determined by the following strengths:

- The farmer's high motivation for agricultural development;
- The ability to easily adapt to market requirements, due to the small volume of production;
- The variety of manufactured products;
- The production of quality products.

The most significant weaknesses of agricultural holdings that limit the management of the innovation process are:

- Poor awareness of market trends;
- The lack of desire to cooperate;
- Weak influence on the purchase price;
- High production costs;
- Insufficient working capital.

Conclusion

During the program period 2007-2013. as well as in the second program period 2014-2020, there is a constantly growing interest on the part of agricultural holdings in the measures in the PRDP (Pillar II) and the schemes included in Pillar I of the CAP. The majority of the surveyed farms (nearly 75%) made their investments in innovation with the help of some of the measures included in the RDP. Almost all (95%) farms received financial support from the schemes under Pillar I of the CAP for the development of their innovation activity. This determines the leading role of the CAP in shaping the innovation process in

Bulgarian agriculture both now and in the future, as farms are already used to and rely on financial assistance from the state and the EU. The National Agricultural Advisory Service (NAA) has made a significant contribution to the absorption of financial assistance for the purposes of managing the innovation process in the industry. The large-scale information and consulting activity carried out by this service contributes to the gradual renewal of both the resource endowment of farms and the products they produce. Particularly useful is the free help received from the NSSZ in the preparation of business plans in connection with the application for individual measures from the RDP, from which a significant number of farmers benefit. In practice, almost all (almost 99%) of the total number of submitted applications for individual measures for the entire study period (from 2007-2019) were prepared by the NSSZ. This unconditionally places the NSSZ as a structure having a decisive role in the absorption of financial resources, necessary for the effective management of the innovation process in agriculture in our country. NSSZ has a positive impact on the innovation activity of agricultural holdings in the application of the CAP in the sector, which should be taken into account in the future application of sectoral policies in agriculture. In order to cover the identified needs of agricultural holdings, it is necessary to strengthen the NSSZ both organizationally and to increase the quality of the human resources employed in this structure. which should be taken into account in the future application of sectoral policies in agriculture. In order to cover the identified needs of agricultural holdings, it is necessary to strengthen the NSSZ both organizationally and to increase the quality of the human resources employed in this structure. which should be taken into account in the future application of sectoral policies in agriculture. In order to cover the identified needs of agricultural holdings, it is necessary to strengthen the NSSZ both organizationally and to increase the quality of the human resources employed in this structure.

It is necessary to increase the intensity of trainings for the acquisition of skills by farmers in risk management and marketing of agricultural holdings. One of the priorities of the CAP is the intensive digitization of agriculture as a leading sector innovation. This also determines the need to set aside money in separate financial instruments for training the farming community to acquire digital skills. In this way, the implementation of innovations both at the farm level and at the industry level will be accelerated. A special emphasis is needed in the proposed financial aid in the next CAP to support agricultural holdings in mountainous regions with a view to increasing their innovation and improving the demographic situation in these regions. It is expedient to allocate special aid to this group of farms to promote the conversion of production in the direction of diversification and production of products with higher added value. In the next CAP, it is necessary to provide for a continuation of the Thematic sub-programme for the development of the innovative activity of small farms within the framework of the RDP for the program period after 2020 or another intervention tool supporting these farms. In this direction, the levels of support for the transformation of part of the small farms into market-oriented and innovative farms should be increased, as well as the diversification of their economic activity. In the next program period, it is necessary to promote the possibilities of the NSSZ to provide advisory and consulting services, incl. development of business plans for agricultural holdings. Next, the scope of access to information, advisory and consulting services in hard-to-reach rural areas should be improved by strengthening the capacity of the NSSZ and its connection with the institutes of the Agricultural Academy and universities. Another element of support can be aimed at promoting investments to organize and develop short chains for access to new markets. In connection with improving access to markets, support is also needed for the adaptation of agricultural holdings to changes in the food system related to advisory and consulting services in hard-to-reach rural areas by strengthening the capacity of the NSSZ and its relationship with the institutes of the Agricultural Academy and universities. Another element of support can be aimed at promoting investments to organize and develop short chains for access to new markets. In connection with improving access to markets, support is also needed for the adaptation of agricultural holdings to changes in the food system related to advisory and consulting services in hard-to-reach rural areas by strengthening the capacity of the NSSZ and its relationship with the institutes of the Agricultural Academy and universities. Another element of support can be aimed at promoting investments to organize and develop short chains for access to new markets. In connection with improving access to markets, support is also needed for the adaptation of agricultural holdings to changes in the food system related tothe dominance of large retail chains and the need to develop local markets. Last but not least, it should be noted the improvement of agricultural holdings' access to financing, by supporting the functioning of the following rural financial institutions: agricultural credit cooperatives, mutual guarantee and insurance funds, rural funds for risk financing related to innovations in agriculture.

III. PUBLICATIONS ON THE TOPIC OF THE DISSERTATION

1. Alieva, A. (2022). Influence of the CAP on innovation factors in agriculture. Journal of Bio-based Marketing, vol.1, 2022, 23 – 41
2. Alieva, A. (2022). Diagnosis of the innovation process in agricultural holdings in the Republic of Bulgaria. Journal of Bio-based Marketing, vol.2, 2022, 28 – 45

3. Aliyeva, A. (2022). Influence of the Common Agricultural Policy (CAP) on the development of agriculture in the Republic of Bulgaria. Trends in the development of the professional field "Administration and management" - a collection of round table reports. Publishing complex - UNSS, ISBN 978-619-232-600-5, str. 61 – 77.

IV. CONTRIBUTIONS OF DISSERTATION

In the dissertation work, the following contributions can be highlighted:

- The essence and role of innovations in the management of agricultural holdings are clarified;
- The essence of the CAP and its role in promoting innovation in agricultural holdings are clarified;
- A conceptual framework has been developed for evaluating the innovation process in agricultural holdings and for evaluating the impact of CAP on this process;
- The factors of the innovation process in the agricultural sector have been analyzed and evaluated;
- The impact of CAP on the innovation process in agricultural holdings and the sector as a whole has been analyzed and evaluated;
- Specific recommendations have been formulated to improve the application of CAP in the process of promoting innovation processes in agricultural holdings.