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International Scientific Conference

# ECONOMIC  SCIENCES
# for AGRIBUSINESS
# and RURAL  ECONOMY

Warsaw, 5–7 June 2019

## No 3     2019

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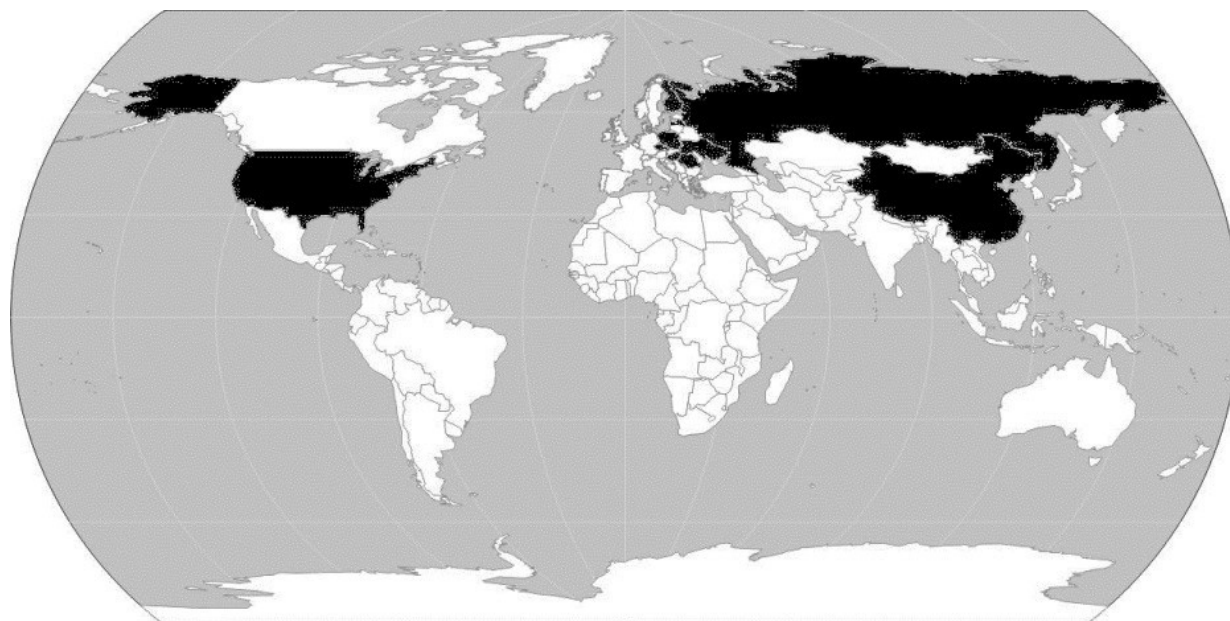


**Countries from which we hosted Conference Participants and Reviewers 2019**

## Publication of Ethics and Malpractice Statement
## for the International Scientific Conference 'Economic Sciences for Agribusiness and Rural Economy'

While upholding the highest form of ethical correctness, the Editorial Board ensured that the authors included in the publication of the papers, adhered to the ethical standards established by the Programme Committee. Each author was obliged to sign and present an editorial statement on the originality of the paper, and not publish any part or the whole paper before. The statement prepared for the authors required indicating all authors of the submitted paper and confirming their contribution to the study submitted to the editorial staff. In addition, while ensuring the correct use of sources during the preparation of the paper, the authors confirmed the demonstration of all citations used in the paper. The entire publication was planned and prepared in accordance with the highest standards of: the European Charter for Researchers, ensuring compliance with ethical standards over national standards, Polish legislation, ensuring ethical standards for publishing at the national level of the editorial office and the publisher, as well as maintaining the highest ethical standards of the institution represented by the editors of the publication – the Faculty of Economic Sciences of the Warsaw University of Life Sciences – SGGW. Under the leadership of the Editor-in-Chief, the entire editorial team, the scientific and organisational committee, as well as reviewers and authors applied the best practices in terms of their duties and ethics. All editorial staff members were introduced to the Code of Conduct and Best Practice Guidelines for Journal Editors of the Committee on Publication Ethics (COPE). In accordance with the COPE Code of Conduct and the Strategic Plan of 2016–2018 promoting integrity in research and its publication, a list of responsibilities and responsibilities were drawn up, necessary to meet the highest standards of ethical behaviour for all parties involved in the act of publication. The Scientific Council and the Editors were responsible for the high level of substantive content, a high rate of internationalisation of publications, implementation of good and better practices in the editorial process and maintaining the highest possible publishing standards.

## DUTIES OF EDITORS

### Publications decisions
The editorial responsibilities under the direction of the Editor-in-Chief varied depending on the stage of publication. The editors were responsible for maintaining high standards from the point of receiving the articles all the way through to the publication of the study. In mid-2017, the Editor-in-Chief, guided by the '*summum bonum*' of the planned publication, appointed experts with vast scientific and professional experience, as well as achievements in the international field. Thus, the appointed Scientific Council of the publication, consisted of the highest ranking experts for the planned thematic sections of the conference and publication at the same time. The Editors and the Organising Committee were appointed based on the experience of their members, knowledge and acquired skills. A diversity of views was ensured by the appointment of the Editorial Board, consisting of renowned experts from abroad, representing highly-rated scientific institutions. In the decision-making field, it was crucial to appoint reviewers to direct the papers submitted by the authors to the relevant substantive and recognised reviewers. The professionalism of scientists and their unblemished reputation were used as a guideline during the selection process. After obtaining two independent reviews at the discretion of the Editor-in-Chief, the decision on accepting or rejecting the submitted paper remained, however the scale of responsibility for this decision varied depending on the opinions issued by the reviewers. In special cases, the decision of the Editor-in-Chief was addressed to a third, independent review. The editors were responsible for deciding about the need for the author to introduce corrections. The decisions made were comprehensive, considering the fact that 131 papers were sent to the Editorial Office. Since the beginning of work on the publication, editors have been guided by the principles of ethics and responsibilities resulting from current legal requirements regarding such aspects as defamation, copyright infringement and plagiarism.

## Fair play

The Editor-in-Chief asked for an assessment of papers based on their substantive content regardless of the origin of the author, the institution represented by them, race, sex, sexual orientation, religious beliefs, ethnicity, citizenship or political philosophy. Total impartiality also concerned the selection of reviewers as well as members of the Scientific Council, the Organising Committee and the Editorial Board. The development of the Fair Play principle can be found below in the Confidentiality section.

## Confidentiality

The Editor-in-Chief and every member of the editorial office could not disclose any information about the submitted report to third parties. In order to maintain the highest standard of the Editor's decision, the submitted articles were sent directly to one person from the Editorial Office, which then removed the personal data of the authors before referral for review and further proceedings. Thus, only the Editor-in-Chief and a designated representative for personal data had knowledge of the personal data of the authors. The given report, with the personal data removed, was then submitted to the reviewers appointed by the Council, who possessed no knowledge about the authors of the paper and about each other. The results of the blind, double review were directed to the authors without the disclosure of the personal data of the reviewers.

## Disclosure and conflicts of interest

The submitted papers are the intellectual property of the authors and co-authors before, during and after the publication. The members of the Editorial Staff and all persons related to publishing the publications have no right to use them under their own name. In the event of a possible conflict of interest, the Editor-in-Chief issued preventive orders to protect and place the good of the author of the paper above others.

## DUTIES OF REVIEWERS

After the deletion of personal data of authors and co-authors, each submitted report was referred for a double, blank review. In situations of contradictory reviews, by decision of the Editor-in-Chief, the paper was sent for a 'super' third review. The editors' policy was to refer the paper to the reviewer from another institution and, if possible, from another city. Referral of the submitted paper to reviewers working in the same unit as the author was forbidden. It was seen as good practice to provide one reviewer for each paper, from a country other than that of the author's. In situations of the third 'super' review, it was the decision of the Editor-in-Chief that the final choice be made by outright experts in a given field, often awarded with an honorary doctorate.

## Contribution to editorial decisions

The Editor-in-Chief made decisions about the acceptance or rejection of a paper on the basis of two professional, blind reviews. In some cases the authors also recommended that the paper should be corrected, with the aim of protecting the best interests of the authors of individual papers as well as the good of the entire publication.

## Promptness

A professional computer system, the 'Online Journal System' was set up by the Editor-in-Chief prior to the planned work on the publication. This enabled each reviewer selected by the Editor to be granted a request for a review and receive information about the date of acceptance or rejection of the review, as well as a date for its completion. If it was impossible to complete the review within the time frame of the deadline set by the Editorial Board, the request was rejected and the decision required justification. The designated reviewer had 5 days to agree to the review and then 14 days for its implementation. In the case of a reviewer's request for an extension to the deadline, the Editor-in-Chief, taking into consideration the good of the author, decided to extend the deadline for the review to up to 21 days.

## Confidentiality

The reviewers were informed of the necessity to maintain confidentiality in the reviewing process and all dissemination of information about the report was forbidden. The reviewer could not show or consult the paper with anyone other than the Editor-in-Chief or the person indicated by him.

## Standards of objectivity

Each paper was subject to an unbiased and objective review. No personal criticism of the reviewer was allowed. Every opinion, either positive or negative, had to be supported by arguments concerning the content of the paper. In the case of an unsatisfactory justification, the reviewer was requested to elaborate upon his comments so as to prevent any reservations of the Editor with regard the content and opinion of the review.

## Acknowledgement of sources

In the interests of the highest good of science and its creators, reviewers were required to identify situations in which parts of the paper were taken from other sources without this being mentioned by the authors. Any use of the work of other authors should be accompanied by appropriate quotations, which the authors were informed about when completing the statement prepared by the Editorial Board. The reviewer was obliged to draw the Editor's attention to significant similarity between the discussed paper and any other document or publication. It was seen as good practice to use the 'random' function in the database to draw a paper in a unbiased way, that would then be checked by the anti-plagiarism system.

## Disclosure and conflict of interest

Each reviewer was obliged to immediately report any cases where the review could be related to the work of the reviewer, or give competitive advantage in any way associated with the reviewer or their work.

## DUTIES OF AUTHORS

## Reporting standards

All authors and co-authors were required to present original contents, not previously published in fragments or in their entirety. In the case of work based on own research, they were required to present in their research in detail, its time and place, justification for its implementation, and any successes and failures. In the case of a paper based on secondary research, all authors and co-authors were required to provide as detailed information as possible about the origin of the data, their availability and use. All work was required to be presented in detail, in a way that would allow other scientists to use it for the purposes of their future research. All dishonest practices were forbidden and it was part of the editors' and reviewers' responsibility to identify and remove them with the consequences. In projects whose author was a participant and the paper was completed due to the researcher's participation in it, they were obliged to present information about the project in the section of the paper dedicated for such a purpose.

## Data access and retention

All authors who based their papers on their own research are required to store a database of such data for a period of at least 5 years from the date of publication of the paper. It is a good practice for the authors to make the database available for research and educational purposes at the request of governmental and non-governmental institutions.

## Originality and plagiarism

The authors and co-authors attested the originality of their works in consideration of the protection of intellectual property, good name of science and editorial policy. The statement of originality of the paper, the quotation and presentation of any sources used in the creation of the work were provided in the bibliography together with the content of the paper and sent to

the Editor. In addition, papers were selected in a random manner using the 'random' function and checked by a special anti-plagiarism program. Every effort was made to verify the presence of sources for citations and their correctness.

## Multiple, redundant or concurrent publication

By submitting a paper to the Editorial Board of the conference 'Economic Sciences for Agribusiness and Rural Economy', the author and co-authors have stated that they have not published, and are not in the process of intending to send the same paper or any part of it to any other editorial office. Publication of a paper based on the same data is considered unethical by the editorial office and is unacceptable.

## Acknowledgement of sources

The authors, by drawing on other publications and sources in their papers, were obliged to display their utmost diligence in ensuring the correct quotation of the works that they used to create their own papers. The use of various sources to create own work is the basis for the development of the world of science, which is why the entire editorial team has made every effort to prevent unethical behaviour. A specially prepared review sheet was used containing detailed questions about the correctness of citations and bibliography. Thus, all reviewers were obliged to do their utmost to verify all sources on this basis.

## Authorship of the paper

The author who sent the paper was obliged to present all the people who contributed to the creation of the work and list them as co-authors. All co-authors had to sign a statement attached to the paper. The statement contained information about the requirement to list all those who significantly contributed to the creation of the paper and agreed to send it to our editorial staff. It was perceived as good editorial practice to send the collected reviews to both the authors and co-authors.

## Hazards and human or animal subjects

In cases when research involved the use of chemical compounds, behaviours or equipment associated with a possible threat to the health or life of animals or people, the author was obliged to clearly identify this threat in the paper.

## Disclosure and conflicts of interest

Financial support for creating a paper resulting from cooperation with or membership of a project group should be demonstrated in a specially prepared section of the paper. Regardless of any conflict of interest, the authors preparing the papers were obliged to present the full truth to prevent the spread of unethical behaviour in the world of science.

## Fundamental errors in published works

In the case of finding any error, every author and co-author of the submitted and published paper is obliged to immediately contact the Editor-in-Chief in order to withdraw the publication and correct it. Editors also give third parties the right to report errors or any ambiguities in the published publication. Any information about a possible error has always been, is and will be considered with respect to the good of science.

Editor-in-Chief *Jarosław Gołębiewski*

# Foreword

On 5–7 June 2019, at the Faculty of Economic Sciences of Warsaw University of Life Sciences – SGGW, an International Scientific Conference titled 'Economic Sciences for Agribusiness and Rural Economy' took place for the second time. This year we have provided a day for young scientists – workshops at our faculty and fieldwork at research station. We plan to keep the workshops day continuation so that the conference is always preceded by a workshop day for young scientists. In addition to gaining new knowledge, it is an amazing opportunity to make new relations and start cooperation. Back to the right conference, this year we had 110 participants from European and Asian countries. 8 speeches were given in plenary sessions and 54 in thematic sessions. Also like last year there was special panel titled 'Challenges of Contemporary Economy in the Perspective of Research of Young Scientists' for young scientists organised. Our conference was held under the patronage of His Magnificence Rector of the Warsaw University of Life Sciences – SGGW, the Ministry of Agriculture and Rural Development as well as the Polish Economic Society, the Marshal of the Masovian Voivodship and the Association of Agricultural and Agribusiness Economists.

In total, 20 scientific articles were published in conference proceedings, which positively went through a double, blind review made by 57 reviewers from around the world. 23.1% of scientific articles sent to the conferences failed to be reviewed successfully. In 15% of cases the Editor-in-Chief asked for a third, conclusive review. The Editorial Board gathered 9 top experts in the field of economics from 6 countries: Latvia, the United States, Finland, Ukraine, Italy and Poland. What is more, 3 sponsors agreed to financially support this exceptional event for science development. The conference proceedings contained scientific articles of highest quality, which gave an accurate description of economic reality. The proof of the relevance and high quality of the conference is just granted for No 1 and No 2 Conference Proceedings Citation Index – Social Science and Humanities from Web of Science Core Collection!

On behalf of the conference organisers I would like to thank all participants of the conference 'Economic Sciences for Agribusiness and Rural Economy' for given speeches and submitted articles. I convey special thanks to the entire Scientific and Organising Committee and especially the Chairwoman. Finally, I would like to invite you to our conference in June 2020.

On behalf of the Editorial Board
*Jarosław Gołębiewski*
Associate Professor of Warsaw University of Life Sciences – SGGW

# CONTENTS

# MEASURING THE AGRIBUSINESS GDP IN EUROPEAN UNION COUNTRIES

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## ABSTRACT

The purpose of this paper was to measure the Gross Domestic Product of the agribusiness in European Union countries and to determine its contribution to national economies. The agribusiness GDP was measured using a proprietary method based on input–output tables. The study covered all 28 European Union countries and relied on 2014 data, the most recent available information in the World Input–Output Database (used as data source). The study found the prevalence of two relationships; (i): the higher the development level of a country, the lower the share of agribusiness GDP in the national economy; (ii): as the country develops, the share of the 2nd agribusiness aggregate in the GDP becomes relatively smaller compared to that of other agribusiness aggregates. A known problem faced in these analyses is that the I/O tables are published with a huge delay and are only available for some countries. Therefore, the studies on agribusiness measurement for all European Union countries in one period are relatively scarce in the relevant literature. Also, a proprietary method of agribusiness GDP measurement was used which takes account of the particular role of the food industry.

**Key words:** agribusiness, GDP, European Union
**JEL codes:** Q11, Q13, Q47

## INTRODUCTION

As indicated by many researchers, including Leones, Schluter and Goldman (1994), the importance of agriculture in the national economy should be determined based not only on the agricultural production sector alone but also on its relationships with other industries which grow stronger as the country develops. This is explained in the findings by Cook and Chaddad (2000) who indicate that as the countries develop, there is increasing importance of activities which add value at the pre- and post-farmgate levels while decreasing value at the farm production level. These relationships can be best traced with the input––output model conceived and developed by Leontief. Davis and Goldberg (1957) were the first ones to use it in studying the connections between the agricultural sector and other industries. They referred to the entire system of connections as "agribusiness". Since then, research efforts have addressed many aspects of

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this issue (King et al., 2010), including the measurement of the actual contribution of agribusiness to the national economy.

The purpose of this paper is to measure the Gross Domestic Product of the agribusiness in European Union countries and to determine its contribution to national economies. The studies on this matter are relatively scarce in the relevant literature. Moreover, they are impeded by the relatively poor availability of comparable up-to-date data for all Community countries. The World Input–Output Database, used as data source in this paper, is among the solutions which provide an opportunity to change that state of affairs.

## THEORETICAL BACKGROUND

The term "agribusiness" was first used by Davis in 1955 at a conference held in Boston. In January 1956, he published a paper titled "From Agriculture to Agribusiness" (Davis, 1956). Ultimately, the concept of agribusiness was characterized and explained in detail one year later, in "A Concept of Agribusiness" (Davis and Goldberg, 1957). As noted by the authors, the relationships between agriculture and other industries are more complex than anywhere else in the economy. Therefore, it was necessary to analyse the relationships with input–output tables which continue to be the main method for measuring the importance of agribusiness in the national economy as they allow to trace the most complicated flows between the sectors (Miller and Blair, 2009).

According to the classical concept by Davis and Goldberg, agribusiness is "the total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing, and distribution of farm commodities and items made from them" (Davis and Goldberg, 1957). The authors also defined certain aggregates to help analysing the interdependencies. In the initial concept, agribusiness was divided into three aggregates: farm supplies; agriculture; and processing and distribution of agricultural produce. Later in their book, Davis and Goldberg carried out an in-depth analysis of interdependencies and redefined the three aggregates to use them as a

reference for research findings, namely: agriculture, food processing, and fibre plants processing (at that time, these were believed to be the most important elements of agribusiness). Hence, interdependencies in the agribusiness may be examined from different standpoints. Therefore, the appropriate selection of aggregates plays an important role in analyses based on the I/O model. What also matters is whether or not certain flows between production sectors are classed as components of agribusiness. This gives rise to doubts because no official statistics exist for that subsystem of the economy. As a consequence, particular areas of agribusiness are interpreted in different ways by authors dealing with this topic.

The relevant literature provides two main methods for estimating the size of agribusiness. The first one, proposed by Davis and Goldberg (1957) and described by Schluter, Lee and Edmondson (1986), estimates the Gross National Product of agribusiness by computing the influence coefficient for food and fibre sectors also for the period not covered by the input–output tables published. However, that method assumes that the structures of intersectoral connections remain unchanged even if the structure of agribusiness evolves, which is not a realistic prospect (Yan, Fan and Zhou, 2011). The second method, proposed by Furtuoso, Barros and Guilhoto (1998), allows to estimate the Gross Domestic Product of agribusiness directly based on I/O tables and relaxes the assumption of the first method. Furtuoso, Barros and Guilhoto (1998) proposed a division of the agribusiness into four aggregates: (a) inputs to agriculture; (b) agriculture; (c) agriculture-based industries which include industries the most related to agriculture in terms of demand for its products; and (d) final distribution. That classification is also applicable to the structure of the food supply chain, and was used to measure the size of agribusiness by other authors, too (Guilhoto, 2004; Xianhui and Yingheng, 2010; Yan, Fan and Zhou, 2011; Moreira, Kureski and Veiga, 2016).

However, certain difficulties in using this classification emerge in the context of international benchmarking. This is especially true for the extraction of sectors comprising the third aggregate (agriculture-based industries). In each country, the sectors differ

in their demand for agricultural produce. In turn, the agribusiness measurement method takes account of total value added in sectors classed as agriculture-based industries. Therefore, identifying the same sectors in each country may result in revaluations. Conversely, if different sectors are considered in each country, this could result in understatements in relation to countries with a larger number of sectors (if a sector is not classed as an agriculture-based industry, it does not necessarily mean it does not require any agricultural produce at all; instead, it only means it requires agricultural produce in small quantities compared to its demand for products of other sectors).

As found in research by Wilkinson and Rocha (2009), food industry is the sector most strictly related to agriculture, and its role becomes increasingly important as the population's incomes grow. Agriculture can be observed to be more closely related to the food industry than to other sectors in all countries around the world. Together, agriculture and food industry are responsible for the entire production and processing of food. This is reflected in the concept of food economy which has been developed since late 1960s in socialist European countries (Kapusta, 2012). That concept places focus on the particular responsibility of (broadly defined) agriculture as a sector which is supposed to ensure sufficient supply of food for the society. Hence, the most important sector – in addition to agriculture itself – is the food industry whose role is strictly related to food. Woś (1979) proposed that the inflows of materials and services to the food sector also be considered a component of agribusiness to emphasize that the food sector and agriculture are inseparable. In his concept, agribusiness was divided into three aggregates: (a) supply of goods and services to the agriculture and the food industry; (b) agriculture; and (c) food industry.

For a detailed theoretical description of the agribusiness concept (underpinned by the classification proposed by Woś), see Poczta and Mrówczyńska-Kamińska (2004). This became the basis for many other papers (e.g. Czyżewski and Mrówczyńska-Kamińska, 2011; Mrówczyńska-Kamińska and Poczta, 2013). Also, the relevant literature presents some

other, less frequent methods for the identification and division of the agribusiness (e.g. van Leeuwen, 2000; Trejos, Segura and Arias, 2004).

## MATERIALS AND METHODS

The calculations were based on I/O tables retrieved from the World Input–Output Database (WIOD), Release 2016. The advantage of WIOD is that it publishes methodologically unified tables for all countries. Moreover, particular focus is placed on data quality, so that the figures provide the best possible reflection of official national statistics. The calculations were based on 2014 data, the most recent information available in the database. In WIOD Release 2016, data for 56 sectors was classified as per the International Standard Industrial Classification revision 4 (ISIC Rev. 4). The tables adhere to the 2008 version of the System of National Accounts (SNA). Detailed information on the structure of tables can be found in publications by Dietzenbacher et al. (2013), Timmer et al. (2015) and Timmer et al. (2016).

In accordance with what was proposed by Woś (1979), three aggregates of agribusiness were identified: (1) supply; (2) agriculture; (3) food industry. As provided for in ISIC Rev. 4, agriculture is defined as sector A01: Crop and animal production, hunting and related service activities. In turn, the food industry are sectors C10–C12: Manufacture of food products, beverages and tobacco products.

The GDP of agribusiness was calculated using a proprietary method, by modifying the one described by Furtuoso, Barros and Guilhoto (1998). The first step consists in determining the value added at producer prices in the I/O table. In accordance with SNA 2008, that amount is calculated as total value added at basic prices plus taxes on products less subsidies on products.

The coefficients of value-added flows from different sectors ($CVA_i$) need to be calculated in order to determine the part of GDP of particular sectors which contributes to agribusiness GDP. This was done by dividing value added at producer prices in the sector concerned by the corresponding output. The coefficients calculated this way were first used to calculate the GDP of the 1st aggregate.

To calculate the GDP for the 1st aggregate, the coefficients ($CVA_i$) must be multiplied by the value of products and services (inputs) from the corresponding sectors delivered to the agriculture ($z_{ia}$) and to the food industry ($z_{if}$). These values were retrieved from the I/O tables. Then, the flow of value added (which results from self-supply in the agriculture and food industry) must be deducted from the amount calculated above in order to avoid double counting. In accordance with what was described above, the GDP for the 1st aggregate was calculated as follows:

$$GDP_1 = \sum_{i=1}^{n}\left(z_{ia} \cdot CVA_i\right) + \sum_{i=1}^{n}\left(z_{if} \cdot CVA_i\right) - $$
$$-\left(z_{aa} \cdot CVA_a\right) - \left(z_{ff} \cdot CVA_f\right)$$

$i$ = 1, 2, ..., $n$ – economic sectors

where:

$GDP_I$ – Gross Domestic Product of the 1st aggregate;

$z_{ia}$ – total inputs delivered from sector $i$ to the agriculture (sector $a$);

$z_{if}$ – total inputs delivered from sector $i$ to the food industry (sector $f$);

$z_{aa}$ – total inputs delivered by the agriculture (sector $a$) to itself;

$CVA_a$ – value added coefficient for the agriculture (sector $a$);

$z_{ff}$ – total inputs delivered by the food industry (sector $f$) to itself,

$CVA_f$ – value added coefficient for the food industry (sector $f$).

The GDP for the 2nd aggregate was calculated as agriculture value added at producer prices less value added delivered from the agriculture to the food industry (classed under the GDP of the 1st aggregate). This allowed to avoid double counting.

$$GDP_{II} = VA_{PPa} - z_{af} \cdot CVA_a$$

where:

$GDP_{II}$ – Gross Domestic Product of the 2nd aggregate;

$VA_{PPa}$ – agriculture value added (sector $a$) at producer prices;

$z_{af}$ – total inputs delivered from the agriculture (sector $a$) to the food industry (sector $f$);

$CVA_a$ – value added coefficient for the agriculture (sector $a$).

The GDP for the 3rd aggregate was calculated in a similar manner, as value added of the food industry at producer prices less value added delivered from the food industry to the agriculture (classed under the GDP of the 1st aggregate):

$$GDP_{III} = VA_{PPf} - z_{fa} \cdot CVA_f$$

where:

$GDP_{III}$ – Gross Domestic Product of the 3rd aggregate;

$VA_{PPf}$ – value added of the food industry (sector $f$) at producer prices;

$z_{fa}$ – total inputs delivered from the food industry (sector $f$) to the agriculture (sector $a$);

$CVA_f$ – value added coefficient for the food industry (sector $f$).

The GDP of the entire agribusiness is the total GDP of its aggregates.

## RESULTS AND DISCUSSION

The calculation results for the GDP of the agribusiness and its different aggregates, for all 28 European Union countries, are presented in Table 1. In the interest of clarity, the countries are sorted in descending order by the share of agribusiness GDP in total GDP. The following general pattern could be observed: the higher the development level[3] of a country, the lower the share of agribusiness GDP in the national economy. This is primarily because of a low share

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[3] The country's development level was determined based on the World Bank's 2014 data on GDP per capita in purchasing power.

**Table 1.** Amount and share of GDP of the agribusiness and its aggregates in the GDP of European Union countries in 2014 (million USD)

| Code | 1st aggregate | | 2nd aggregate | | 3rd aggregate | | Agribusiness | | Total GDP |
|---|---|---|---|---|---|---|---|---|---|
| | value | % | value | % | value | % | value | % | |
| ROU | 7 845 | 4.2 | 5 977 | 3.2 | 9 724 | 5.2 | 23 545 | 12.6 | 187 508 |
| IRL | 15 187 | 6.5 | 2 557 | 1.1 | 11 572 | 4.9 | 29 316 | 12.5 | 234 028 |
| BGR | 2 315 | 4.5 | 1 999 | 3.9 | 2 005 | 3.9 | 6 319 | 12.3 | 51 450 |
| HRV | 2 887 | 5.7 | 1 037 | 2.1 | 1 983 | 3.9 | 5 907 | 11.7 | 50 278 |
| LTU | 2 429 | 5.4 | 849 | 1.9 | 1 940 | 4.3 | 5 218 | 11.7 | 44 676 |
| GRC | 8 875 | 4.2 | 5 406 | 2.5 | 6 417 | 3.0 | 20 698 | 9.7 | 213 691 |
| POL | 23 442 | 4.7 | 7 596 | 1.5 | 15 499 | 3.1 | 46 536 | 9.3 | 502 326 |
| HUN | 4 942 | 4.0 | 3 345 | 2.7 | 2 598 | 2.1 | 10 885 | 8.9 | 122 155 |
| ESP | 49 219 | 3.8 | 11 679 | 0.9 | 33 826 | 2.6 | 94 725 | 7.4 | 1 286 714 |
| LVA | 785 | 2.8 | 405 | 1.4 | 817 | 2.9 | 2 007 | 7.0 | 28 508 |
| EST | 756 | 3.1 | 310 | 1.3 | 534 | 2.2 | 1 601 | 6.6 | 24 185 |
| PRT | 6 930 | 3.3 | 1 419 | 0.7 | 5 286 | 2.5 | 13 635 | 6.4 | 212 105 |
| CYP | 721 | 3.3 | 262 | 1.2 | 382 | 1.8 | 1 365 | 6.3 | 21 730 |
| SVK | 2 122 | 2.3 | 2 346 | 2.5 | 1 305 | 1.4 | 5 773 | 6.2 | 93 787 |
| CZE | 5 459 | 2.9 | 2 026 | 1.1 | 3 783 | 2.0 | 11 267 | 5.9 | 191 356 |
| NLD | 22 985 | 2.8 | 6 051 | 0.7 | 17 441 | 2.1 | 46 477 | 5.7 | 814 540 |
| FRA | 65 637 | 2.5 | 22 032 | 0.8 | 55 123 | 2.1 | 142 791 | 5.4 | 2 620 850 |
| ITA | 53 451 | 2.7 | 19 156 | 1.0 | 32 657 | 1.7 | 105 265 | 5.3 | 1 978 296 |
| SVN | 923 | 2.1 | 662 | 1.5 | 652 | 1.5 | 2 237 | 5.0 | 44 331 |
| DNK | 8 227 | 2.6 | 2 358 | 0.8 | 4 964 | 1.6 | 15 549 | 5.0 | 312 320 |
| BEL | 13 317 | 2.7 | 463 | 0.1 | 9 835 | 2.0 | 23 616 | 4.8 | 490 249 |
| AUT | 8 055 | 2.0 | 1 591 | 0.4 | 7 162 | 1.8 | 16 809 | 4.2 | 399 466 |
| DEU | 84 109 | 2.4 | 4 743 | 0.1 | 57 172 | 1.6 | 146 024 | 4.1 | 3 573 024 |
| MLT | 147 | 1.5 | 63 | 0.7 | 163 | 1.7 | 373 | 3.9 | 9 680 |
| FIN | 4 755 | 1.9 | 983 | 0.4 | 2 899 | 1.2 | 8 637 | 3.5 | 244 885 |
| GBR | 38 812 | 1.4 | 9 759 | 0.4 | 45 301 | 1.6 | 93 873 | 3.4 | 2 783 344 |
| SWE | 7 073 | 1.3 | 935 | 0.2 | 5 838 | 1.1 | 13 846 | 2.6 | 527 118 |
| LUX | 309 | 0.5 | 125 | 0.2 | 399 | 0.7 | 833 | 1.4 | 60 472 |

Source: own calculations based on data retrieved from the World Input–Output Database.

of the 2nd aggregate in countries at higher levels of development. However, some exceptions exists, such as Ireland, Spain or Slovenia. The two former, despite a high development level, exhibit a relatively large share of agribusiness GDP in the entire economy. This is best illustrated by the example of Ireland where the 3rd aggregate (directly related to the food industry) holds a very high share of ca. 5%, whereas

the 1st aggregate (supply) has the largest contribution to GDP (6.5%) of all the countries. Things look similar in Spain where the share of the 2nd aggregate is relatively small while that of the 1st and 3rd aggregate is large. In turn, Slovenia, as mentioned earlier, reports a low contribution of agribusiness GDP to the national economy while being at a relatively lower level of development. This can have multiple reasons, probably including the adverse natural conditions affecting the agricultural business (the national territory is mostly covered by forests, highlands and mountains). On the other hand, the 3rd aggregate has a relatively low contribution to GDP. This can suggest that the Slovenian food industry is less developed than in highly developed countries.

A relationship between the contribution of different agribusiness aggregates to GDP and the development level can be observed throughout the European Union. Better developed countries exhibit a clearly larger gap between the contribution of the 2nd aggregate (which is low) and that of the 1st and 3rd aggregates. This results from a pattern well known in economic theory: as the economy grows, the share of agriculture in the national economy declines. Production shifts to the industrial and service sectors (Kuznets, 1973). Slovenia and Slovakia can be regarded as an exception from this pattern. When it comes to Slovakia, this is probably because of the topography: as the country is mostly covered with mountains, the agriculture must be relatively more efficient. In turn, when it comes to Slovenia, the reasons are similar to those presented in the first relationship discussed.

## CONCLUSIONS

The analysis of the amount and share of agribusiness GDP in total GDP of European Union countries proved the existence of two major relationships involving the level of economic development: (i) the higher the development level of a country, the lower the share of agribusiness GDP in the national economy; (ii) as the country develops, the share of the 2nd agribusiness aggregate in the GDP becomes relatively smaller compared to that of other agribusiness aggregates. Note however that a few exceptions can be found.

The studies on agribusiness measurement for all European Union countries in one period are relatively scarce in the relevant literature. A known problem faced in these analyses is that the I/O tables are published with a huge delay and are only available for some countries. With the World Input–Output Database, it was possible to carry out a study for a relatively recent period. Moreover, a proprietary method of agribusiness GDP measurement was used which takes account of the particular role of the food industry.

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# USING OF FUZZY MODELLING IN ANTI-CRISIS MANAGEMENT OF AGRICULTURAL ENTERPRISES

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## ABSTRACT

The article systematizes the different views of scientists in relation to the anti-crisis management of enterprises and emphasizes the importance of its use in enterprises. There was noted the necessity to introduce the perspective directions of economic activity of the enterprise, forming its image, ensuring competitiveness, profitability, and development. In order to make effective management decisions under uncertain dynamic environment, it is suggested to use fuzzy modelling for the prevention of the crisis occurrence. In order to present the possibility of using such an approach in the practical activity of agricultural enterprises, in particular which are engaged in dairy farming, we proposed an informational and logical model for determining the forecast average price of milk, taking into account the indicators of its quality, that is based on the theory of fuzzy sets and fuzzy logic. In the context of anti-crisis management, there was substantiated the possibility of using the proposed model, as a basic one, in any agricultural enterprise in order to improve its activities.

**Key words:** anti-crisis management, agricultural enterprise, quality, products, fuzzy logic, fuzzy modelling
**JEL codes:** C45, L26, L15, O13, Q19

## INTRODUCTION

In the current conditions of globalization, the issues of providing high-quality food products to the population, creating a high-quality raw material base for industries, forming export potential and food supply of the state are crucial. Agricultural production is an important sector of the Ukrainian economy, it plays a key role in assuring the food security. In Ukraine in 2017 there functioned 45,558 agricultural enterprises of various organizational and legal forms of management, in the general structure of which 74.9% were farms. At the same time, these agricultural enterprises produced 56.4% of total volume of agricultural products (including 8.7%, which was produced in farms) and the rest 43.6% was produced by households. The households – producers executing their economic activity for both purposes – self-sufficiency by foodstuff and production of commodity agricultural output. This category of producers also

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includes entrepreneurs working in the agricultural field (State Statistics Service of Ukraine, 2018). But households are not accounted as farms. It was only in July 2018 that the Verkhovna Rada adopted a special Law of Ukraine on amendments to the Tax Code of Ukraine and certain laws of Ukraine on promoting the establishment and activity of family farms, which provides the regulation of issues related to the activity of family farms. However, there are still many unsolved issues.

It should be noted that a significant number of Ukrainian agricultural enterprises are loss-making (their share in the total number of enterprises in 2017 was more than 13%) (State Statistics Service of Ukraine, 2018). Overcoming such a situation requires the application of the appropriate anti-crisis management measures. Modern anti-crisis management involves not only eliminating measures, but first of all, the preventing ones. It means, that the system of anti-crisis management should contain three elements: implementation of measures to overcome the crisis; prevention of the crisis; forecasting the crisis (Adamska, 2018).

There is no single approach among experts for content interpreting of the anti-crisis management and the nature of the crisis. Usually the term "crisis" is understood as a difficult and problem situation. In the modern sense, the crisis is often seen as the extreme aggravation of contradictions in the socio--economic system (organization), which threatens its sustainability in the environment (Korotkov, 2010).

Anti-crisis management is a system of strategic measures aimed at preventing a crisis situation, and in case of its emergence – a system of measures to overcome the crisis, taking into account all the available opportunities with minimal losses and future positive result achievement (Korotkova and Yehorova, 2011). Groh (2014) states that crisis strategic management is a special type of management, which has common management features and non-specific characteristics. Its principles are: the early diagnosis of the crisis in the financial activity of the firm, the speed of the reaction to the crisis phenomena, the adequacy of the reactions to the real threats to financial wealth, and the achievement of total potential in order to overcome the crisis. Some authors argue that for anti-crisis management, it is essential to ensure such conditions that financial difficulties could not be of a permanent and stable nature (Goodhart, 2006; Bragg, 2012; Brauer, 2013). The issue of anti-crisis management was reasonably characterized by Lihonenko (2001). He believes that one has to understand the anti-crisis management as a continuous process of identifying the signs of crisis phenomena and also as the implementation of the general plan to prevent the spread of these phenomena together with the stagnation of the business entity throughout the period of its functioning. It means, that anti-crisis management is a special, constantly organized management aimed at the most prompt detection of the crisis situation signs and the creation of appropriate prerequisites for its timely overcoming in order to ensure the viability of the business entity, preventing the emergence of its bankruptcy.

Anti-crisis management is aimed at adapting the activities of enterprises to the constantly changing environment and benefiting from new opportunities. At the same time, the main factor in the implementation of such management is the rejection of unpredictable entity activities directions and the identification of the most promising ones that ensure its competitiveness, profitability and development.

Agricultural enterprises associate their production activities with the introduction of new approaches to business planning and product quality management. Quite often, business executives do not have enough reliable information. Under such conditions, it is expedient to use fuzzy modelling. Fuzzy logic, which is the basis for the implementation of fuzzy control methods, describes the nature of human thinking and the course of thought more accurately than the traditional formal-logical systems.

The American mathematician Zade (1976) invited a formal apparatus of fuzzy algebra and fuzzy logic to solve logic processing issues in the early 1970s. This contributed to the development of a flexible scientific approach to the modelling of complex systems, whose predicted behaviour is better described by linguistic than numerical variables.

Leonenkov (2005) considered fuzzy simulation tools to solve specific practical problems in the MATLAB environment and fuzzy TECH. Under fuzzy simulation, he understands the information-logical model of the system, which is based on the theory of fuzzy sets and fuzzy logic.

The question of modelling the development of enterprises with using fuzzy multiple approaches in the context of introducing fuzzy technologies into brand management was thoroughly investigated by Rotshtein (1999) and Shtovba (2007).

Protsjuk (2007) considered the using of a fuzzy logic apparatus for modelling a product quality management system in agricultural enterprises.

However, the analysis of the scientific papers proves that little attention is paid to the study of using the fuzzy modelling possibility in the process of anti--crisis management in agricultural enterprises.

Dairy cattle breeding traditionally is one of the most important branches of agriculture in Ukraine. Favourable climatic conditions and the availability of land use by agricultural producers of 42.7 million ha of agricultural land and 32.5 million ha of arable land give rise to the potential for the production of high-quality milk and dairy products. But taking into account that the functioning of agricultural enterprises under current conditions of economic activity is characterized by crisis features, it is necessary to take into account aspects of anti-crisis management when planning and developing measures at all stages of the enterprise's activity.

It is especially important to take it into account at the stage of formation of the indicators of milk quality in agricultural enterprises, since in the conditions of Ukraine's integration with the EU, the requirements for the indicators of milk quality have significantly increased. In accordance to the current standards of Ukraine, the milk received for processing is divided into the following classes: extra, higher, first, second. In 2018, Ukraine produced 2,755.7 t of milk, the average price of which amounted to 7,385.9 UAH per 1 t, which is 4.6% more than in 2017.

The consequences of reforming the agrarian sector, changes in the system of pricing and deterioration of the demographic situation in the countryside have led to the fact that agricultural enterprises have become unprofitable for milk production, and as a result there has been a reduction in their number. Under such conditions, the producer should be able to predict the average price of milk and, accordingly, the performance of the enterprise in order to make optimal managerial decisions.

The purpose of this study is to determine the role and justification of the expediency of fuzzy modelling in anti-crisis management at agricultural enterprises to increase their competitiveness in conditions of uncertainty using the example of Ukrainian enterprises.

## MATERIALS AND METHODS

In the course of the study, a dialectical method of cognition was used to collect, analyse, evaluate information and formulate conclusions, also we used monographic and fuzzy modelling methods.

On the basis of fuzzy logic, fuzzy analogues of all mathematical concepts can be built and the necessary formal apparatus for modelling human reasoning and the human way of solving problems can be created. The theory of fuzzy sets operates with the human knowledge, which is called the expert information (Zade, 1976; Rotshtein, 1999; Leonenkov, 2005).

Fuzzy control provides a formal methodology for representing, manipulating and implementing the heuristic knowledge of a person on how to manage a system.

A fuzzy set $\tilde{A}$ on the universal set $U$ is a collection of pairs $(\mu_A(u), u)$, where $\mu_A(u)$ is the degree of the membership of the element $u \in u$ to the fuzzy set $\tilde{A}$. The degree of affiliation is the number that is in the range [0, 1]. The higher the degree of affiliation, the greater the element of the universal set corresponds to the properties of the fuzzy set. The membership function (FN) (membership function) allows for an arbitrary element of a universal set to calculate the degree of its membership in a fuzzy set. If the universal set is finite $u = \{u_1, u_2, \ldots, u_k\}$, then the fuzzy set is written in the form of the formula (1) (Shtovba, 2007):

$$\tilde{A} = \sum_{i=1}^{k} \mu_A(u_i)/u_i$$

or $\qquad\qquad\qquad\qquad\qquad\qquad$ (1)

$$\tilde{A} = \left( \mu_A(u_1)/u_1, \ \mu_A(u_2)/u_2, \ \ldots, \ \mu_A(u_k)/u_k \right)$$

The fuzzy system has four main components: "fuzzy knowledge base" in the form of a set of fuzzy rules; mechanism of the conclusion; a fuzzification unit and a block of defuzzification (Leonenkov, 2005).

To develop the model, the Fuzzy Logic package of MATLAB engineering and scientific calculations and Simulink dynamic systems developed by Math-Works were used.

There are certain advantages in developing a fuzzy system. The first is that the rules of fuzzy control, being conditional expressions such as IF – THEN, are logical. The use of rules is carried out through the mechanism of logical conclusions. Logical management means that the logic of expert management is easy to represent, and a variety of prerequisites can be brought into line with some action. The second feature is to display the model not using one formula (classical methods), but using a large number of private rules with the help of fuzzy logic. Each rule operates in a specific area of the information space used in development. When developing a fuzzy system, one can successfully consider all the various options for a given task, and even those that are mutually contradictory. The third feature of developing a fuzzy system is that it is possible to organize management in the form of dialogue with an expert, since the rules of management are written in the form of expressions IF – THEN (Rotshtein, 1999).

The linguistic variable is called a variable whose values may be words or phrases of a certain natural language, and its value is determined by a set of verbal (that is, verbal) characteristics of some property (Leonenkov, 2005).

The term set is the set of all possible values of the linguistic variable. The term is any element of the term set. In the theory of fuzzy sets, the term is formalized by a fuzzy set using the membership function (Shtovba, 2007).

Thus, fuzzy logic provides the opportunity to successfully present a person's thinking, namely, ways of making decisions by a person and ways of modelling complex objects using natural language. The model allows to combine the using of quantitative data expressed by numbers, as well as – fuzzy, based on expert information under uncertainty.

**RESEARCH RESULTS AND DISCUSSION**

To present the possibility of using fuzzy modelling in the practical activity of agricultural enterprises, there was proposed an informational and logical model for determining the forecast average price for milk taking into account the indicators of its quality. It is based on the theory of fuzzy sets and fuzzy logic. The modelling was carried out on the materials of agricultural enterprises that are located in Khmelnytskyi region, Ukraine. These enterprises produce different agricultural products including milk.

When developing the model, it was stated that various factors influence the price of milk: the amount of milk sold as the higher class, the first or the second class; the content of fat and protein. That is why the idea of developing a fuzzy model for estimating the possibility of high prices depending on the discounts and allowances for milk classes is proposed in order to make decisions on improving the economic efficiency of the enterprise functioning. In this case, we use a fuzzy input system with subsequent input and output variables as a fuzzy logic model.

The meaningful interpretation of the fuzzy model implies the choice and specification of the input and output variables of the corresponding fuzzy system (Protsjuk, 2007).

In this case, there are used five input variables and one output variable in the fuzzy model. The first input variable is the quantity of higher quality milk sold, which directly evaluates the profitability of the enterprise, taking into account the quantity of milk sold by a particular enterprise. Obviously, the higher this estimate is, the higher the price is. The second input variable is the quantity of milk sold as first class. The third input variable is the quantity of milk sold as the second class. The fourth input variable is the fat content in milk. This variable is closely related to the milk quality parameters. The fifth input variable is the protein content in milk.

The starting variable is the price of milk which is the basis for decision making by the heads of enterprises on the development of measures on how to improve the quality of milk.

Fuzzification of input and output variables is made. The system state parameters are considered to be linguistic variables. It was evaluated with the help of verbal terms at five and three levels:

$$higher\ class = \begin{cases} very\ low\ (VLT\ class) \\ low\ (Lclass) \\ medium\ (Mclass) \\ high\ (Hclass) \\ very\ high\ (VHclass) \end{cases}, \quad 1^{st}\ class = \begin{cases} very\ low\ (VL\ 1^{st}\ class) \\ low\ (L\ 1^{st}\ class) \\ medium\ (M\ 1^{st}\ class) \\ high\ (H\ 1^{st}\ class) \\ very\ high\ (VH\ 1^{st}\ class) \end{cases}$$

$$2^{nd}\ class = \begin{cases} low\ (L\ 2^{nd}\ class) \\ medium\ (M\ 2^{nd}\ class), \\ high\ (H\ 2^{nd}\ class) \end{cases} \quad fat\ content = \begin{cases} low\ (Lfc) \\ medium\ (Mfc) \\ high\ (Hfc) \end{cases}$$

$$protein\ content = \begin{cases} low\ (Lpc) \\ medium\ (Mpc), \\ high\ (Hpc) \end{cases} \quad price = \begin{cases} very\ low\ (VLp) \\ low\ (Lp) \\ medium\ (Mp) \\ high\ (Hp) \\ very\ high\ (VHp) \end{cases}$$

In the fuzzy knowledge base a functional dependence is obtained (formula (2)):

$$price = f\ (higher\ class,\ 1^{st}\ class,\ 2^{nd}\ class,\ fat\ content,\ protein\ content) \quad (2)$$

The use of fuzzy logic equations implies the presence of membership functions (FN) of fuzzy terms that make a part of the knowledge base. The most widespread fuzzy sets in the theory of functions have membership functions in the form of triangles (Leonenkov, 2005).

To simplify the problem, the necessary membership functions are given in the form of triangles. In order to obtain the possibility to prove the solution to the numbers, it is provided that the variables measurement ranges (universal sets) "H class", "1st class", "2nd class", "fat content", "protein content", "price" make up [0 ... 10,000], [0 ... 3,000], [0 ... 400], [1 ... 5], [1 ... 5], [0 ... 150] respectively.

As a term set of the first input variable, the "V class" there is used the set T1 = {"very low", "low", "medium", "high", "very high"} or in the symbolic form T1 = {DNVg, NVg, SVg, VVg, DVVg} with the term membership functions.

As a term set of the source linguistic variable "price", there is used the set T6 = {"very low", "low", "average", "high", "very high"} or in the symbol form T6 = {DNs, Ns, Sc , Vc, DVc} with term membership functions.

An important stage in the construction of the model was the formation of the rules base of the fuzzy logical conclusion system. Thus, 83 fuzzy rules were used during the study.

For example, IF the class is medium AND the first class is very high AND the second class is very low AND the fat content is high AND the protein content is very high, THEN the price is very high.

IF the higher class is low AND the first class is very high AND the second class is low AND the fat content is average AND the protein content is average, THEN the price is average.

IF the higher class is very low AND the first class is very low AND the second class is low AND the fat content is average AND the content of the protein is average, THEN the price is low.

As a scheme of fuzzy conclusion, the method of Mamdani is used, so the activation method will be MIN, which is calculated by the formula (3) (Leonenkov, 2005):

$$\mu' = (y) = \min\{c_i, \mu(y)\} \qquad (3)$$

As a method of defuzzification, the method of the gravity centre, which is calculated by the formula (4), is applied:

$$y = \frac{\int_{min}^{max} x \cdot \mu(x)\,dx}{\int_{min}^{max} \mu(x)\,dx} \qquad (4)$$

where:
$y$      – result of defuzzification;
$x$      – variable corresponding to the original linguistic variable;
$\mu(x)$    – function of the fuzzy set belonging to the output variable after the accumulation phase;
min, max – the left and the right points of the interval of the fuzzy set, which is considered by the output variable.

Once the knowledge base has been introduced, the rules of the fuzzy system are obtained. At the next stage, there was formed an intellectual system for predicting the prices for milk according to the quality indicators in agricultural enterprises of the Khmelnytskyi region. Milk was used for processing by higher, the first second class in the studied aggregate of enterprises in 2018. Then a decision block was created, in which the developed Fuzzy Logic Controller is located.

The Fuzzy Logic Controller includes a pre-designed FIS FILE named FuzzyMatMod. This regulator contains a set of rules that were formed during the system training. Accordingly, blocks Rule 1, Rule 2, etc. are implemented. The COA defaulted block converts the fuzzy logical output of the system into a clear numerical representation of the price. As a result, a model based on the method of fuzzy modelling was obtained, and the price of milk of each agricultural enterprise was obtained in aggregate (Fig. 1). At the same time, changing at least one of the input parameters of any enterprise, immediately gets a new value of the price. Accordingly, the influence of milk quality parameters (H class, 1st class, 2nd class, fat content, protein content) on the average price of milk and on each enterprise is also observed.

The research was conducted on data of 11 agricultural enterprises, which are located in Polonskyi and Shepetivskyi districts of Khmelnytskyi region of Ukraine. These enterprises are selected for research, as they are engaged in dairy farming and each of them has more than 50 cows. In this region there is one branch Polonsky dairy processing factory PPKF Prometheus, which buys milk from local agricultural enterprises and households. The milk processing enterprise forms the purchase prices of milk depending on its classes.

As an example of the implementation of this model, the situation regarding the implementation of milk at agricultural enterprise Kolos of the Khmelnytskyi region was described. This company in 2018 sold for the processing 2,020.71 kg of milk with the highest class, the first – 506.21 kg, the second – 24.01 with a fat content of 3.55% and protein – 2.95%. At the same time, the average price of milk was 8.82 UAH per 1 kg, which is 0.87 UAH less than the average milk price for the studied aggregate of enterprises. According to the developed model, the average price of milk corresponds to real indicators of this enterprise, which testifies to the adequacy of the model, it characterizes the lower competitive positions of Kolos, in comparison with other milk suppliers to the processing enterprise, and determines the reserves for increasing the profitability of the enterprise by improving the structure of milk classes.

## CONCLUSIONS

In market conditions, the price of milk is formed depending on the ratio of demand and supply over the periods of the year.

The processing enterprises of Ukraine set the purchase price for each class of milk. The average price for the agricultural enterprise is formed depending on
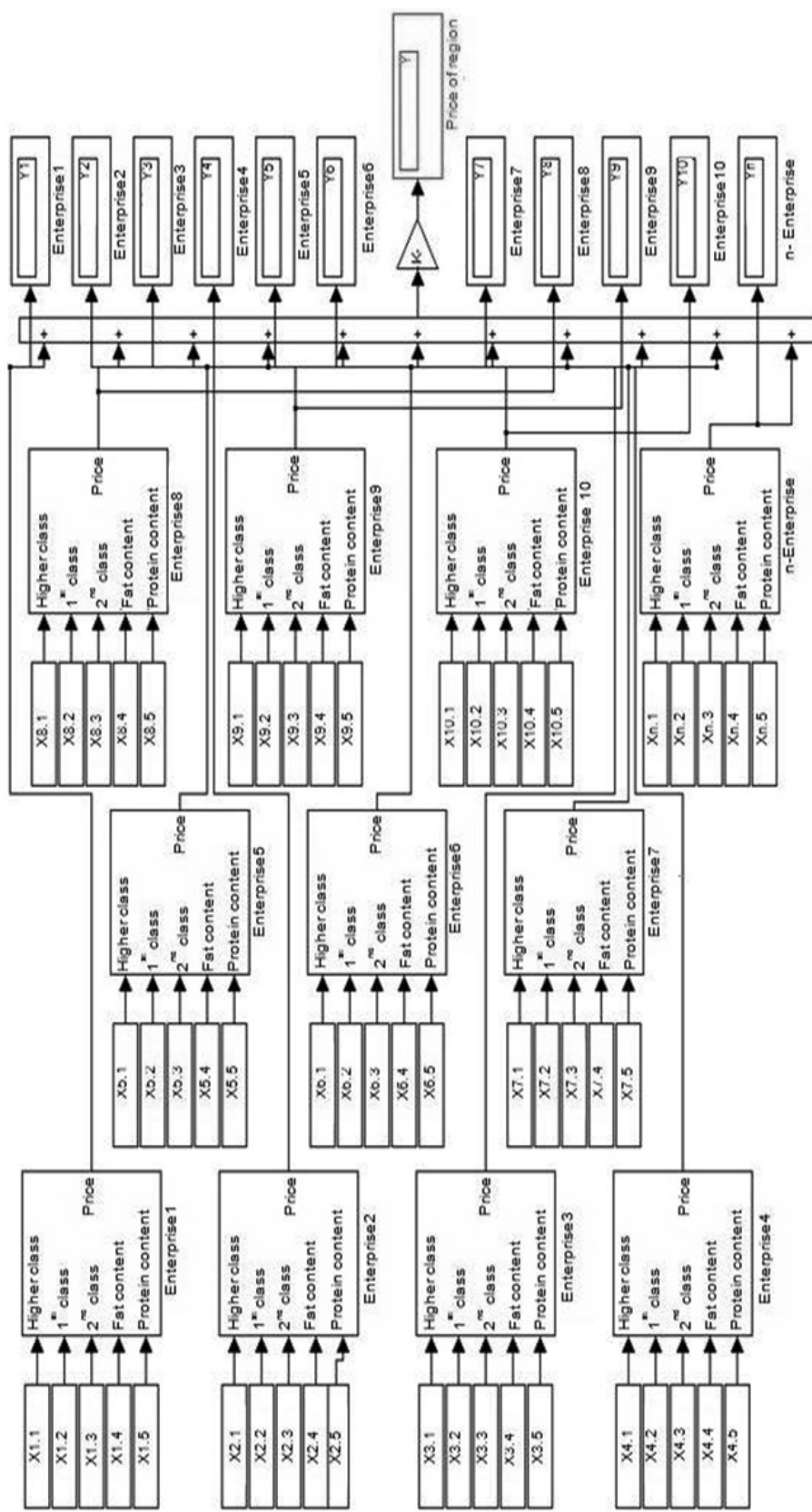
**Figure 1.** Information-logical model of determining the price of milk taking into account the indicators of its quality in agricultural enterprises

the milk quantity of each class that is sold. Therefore, the forecast average price for an agricultural enterprise, on the one hand, shows to it the limits of costs, and also what reserves need to be sought in order to raise this average price, that is to look for ways to improve the qualitative parameters of milk (in particular, improvement of feeding rations, technology of animal retention, milking technology etc.). On the other hand, comparing the average price of an agricultural enterprise with the average price of aggregate, the agricultural enterprise can estimate its competitive positions on the market.

On the basis of using the fuzzy sets and fuzzy logic theory in determining the average price of milk while taking into account the parameters of its quality, it is proposed to improve the processes of making managerial decisions for improving the economic activity of agricultural enterprises.

This informational and logical model of determination of the forecast average price of milk sales taking into account its quality indicators is basic and adapted to modern economic conditions. Potentially it can be used for any number of agricultural enterprises. Agricultural enterprises can use this price as a benchmark.

Therefore using fuzzy simulations in anti-crisis management of agricultural enterprises can help them to make informed decisions in a changing and uncertain environment, which will increase their efficiency and competitiveness.

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# PRO-ECOLOGICAL ATTITUDES AMONG STUDENTS

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## ABSTRACT

The aim of the study is to present the pro-ecological (i.e. favourable for ecology, acting in favour of environment) attitudes of people who study at the Faculty of Economic Sciences of the Warsaw University of Life Sciences – SGGW. The theoretical part discusses the concept and the essence of ecology and ecological awareness, as well as the elements and significance of ecological education. In the practical part, the attitude of the group of students of the Faculty of Economic Sciences at the WULS-SGGW to the necessity of pro-ecological behaviours and their expectations regarding the ways of propagating knowledge and activities in the field of environmental education is presented. It turned out that more than 90% of the respondents consider such behaviours as a necessary one, while around 60% believe that the entities responsible for promoting it among the society – in the form of obligatory education – should be schools and universities. Finally, the study contains original conclusions and findings regarding the observations made during the research.

**Key words:** ecological education, pro-ecological attitudes, pro-ecological behaviours, students
**JEL codes:** Q53, Q56, Q57

## INTRODUCTION

The dynamic economic development and civilization progress observed in recent decades in many countries undoubtedly contributes to improving the quality of life of their residents. Technological achievements, development of modes of transport and communication, the increasing popularity of the internet greatly simplify our lives, improve everyday tasks and even suggest how to take care of health. Unfortunately, the actions and processes that support this ever-growing welfare are, directly or indirectly, the cause of a number of problems and threats, among which there are, among others, water and air pollution, acid rains, greenhouse effect, soil degradation and finally a gigantic increase in municipal and post-production waste. The awareness of these threats and the vision of ecological disaster forces governments and numerous organizations (including global ones) to take up various pro-ecological activities carried out in the form of remedial programs and implementation of relevant regulations. A very important element increasing the effectiveness of these activities is shaping ecological awareness and dissemination of desirable attitudes and behaviours favouring the protection of the natural environment. Ecological education has an extremely

important role in this process. It starts already in kindergarten and primary classes. Pro-ecological values and models acquired by children during school education should evolve into specific and desirable attitudes and behaviours of people completing the stage of obligatory education. The aim of the study is therefore to present the pro-ecological attitudes of people who study at the Faculty of Economic Sciences of the Warsaw University of Life Sciences – SGGW.

## THE CONCEPT AND THE ESSENCE OF ECOLOGICAL EDUCATION

The term "ecology" was introduced to science and literature in the 1860s by the German zoologist Ernst Heackel and comes from the Greek words: *oikos*, which means home, place of life, and logos – word, science (Haeckel, 1866; Egerton, 2013; Terlecka, 2014). Literally, therefore, the term means the science of the place of life of organisms (environment) (Friederichs, 1958; Budniak, 2009) or the department of biology examining the relationship of external conditions with the life of organisms (Budniak, 2014). In a more detailed way, the concept of ecology is defined by Houszka (2014), who claims that it is a science involving interactions between individuals of the same species, different species, as well as living organisms and abiotic factors in the environment. The domain of ecology is therefore the interaction between living organisms and the surrounding environment.

The priority factor shaping ecological awareness, pro-ecological attitudes and behaviours is ecological (also known as natural, environmental[1]) education, which should be understood as a concept of education and upbringing in the spirit of respect for the natural environment and shaping attitudes and views of the society towards the surrounding world. It concerns the awakening of sensitivity to environmental problems, searching for causes and predicting the ef-

fects of phenomena leading to the degradation of the natural environment (Tuszyńska, 2006).

Parczewska (2009) presents a slightly more extensive and insightful definition of the term ecological education. Such education includes:
− providing information on the environment, its functioning, phenomena occurring in it and generally understood problems related to its degradation;
− influence on the emotional sphere of the child, sensitization to the beauty of nature, shaping pro-ecological attitudes;
− triggering environmental and eco-development activities.

It is worth noting that in ecological education, the natural environment can be both an object, a tool, as well as a beneficiary of educational activities. The following elements can be distinguished in ecological education (Żeber-Dzikowska, 2016):
− education in the environment – the environment is used as a source of knowledge and development of the child's versatile abilities;
− education about the environment − transferring knowledge about the local and global environment and relationships between them, which aims to facilitate the understanding of the principles of the coexistence of the natural world and the human world; education about the environment is also aimed at shaping the skills of integrated recognition of the socio-natural environment;
− education for the environment – shaping the full care of the approach to the environment and instilling such values, so that everyone can feel responsible for his actions in the natural world.

Ecological education is therefore an element of upbringing, where a positive and responsible attitude to nature should become a permanent component of the value system (Strumińska-Doktór, 2007). This education cannot be limited only to the transfer of

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[4] In the scientific literature are significant discrepancies in terms of the concepts used – there are, inter alia, ecological, environmental and sozological education. The problem was discussed in detail by Dołęga (2003) or Domeracki and Tyburski (2011). Moreover, the following terms are less frequently used: education about the natural environment (Sander, 2007) and pro-ecological education (Sander, 2008). It is worth mentioning that in the National Strategy of Ecological Education, developed in 2002 by the Ministry of the Environment, due to inaccuracies in the field of terminology, the concepts of ecological education and environmental education are used interchangeably.

knowledge, but should also include raising and shaping pro-ecological attitudes (Kiełczewski, 2001), which are conditioned by ecological awareness and result in appropriate behaviour.

Ecological awareness (in a rather broad sense) can be defined as the totality of ideas, values and opinions about the environment as a place of life and human development (Papuziński, 2006). The process of shaping this awareness depends on many factors, among which one can indicate the place of residence, adopted social norms or information contained in the mass media (Nycz-Wróbel, 2012). Undoubtedly, the most important role in shaping and developing ecological awareness is assigned to formal education, which task is to direct the attention of children and youth to environmental protection and to shape their positive mindset and attitudes to the natural environment (Górska, 1995). That fact was confirmed in a research made for purpose of this paper, when students stressed the role of formal educational institutions and obligatory education in process of disseminating and propagating knowledge about pro-ecological behaviours. It should also be mentioned that shaping pro-ecological attitudes (which is the result of the acquisition of appropriate knowledge and ecological sensitivity by aware man (Nowińska et al., 2014)) and a healthy lifestyle of society is one of the main goals of education for sustainable development (UN-ECE, 2014). The idea and the essence of this kind of development is best reflected in the title of the World Commission on Environment and Development report of 1987 "Our common future" (WCED, 1987).

## MATERIALS AND METHODS

The empirical material was obtained through an reactive research, with use of a diagnostic survey as a method of data collection. The study was conducted in May 2019 with use of an online questionnaire consisting of close-ended questions. It was addressed to the students of the Faculty of Economic Sciences at the WULS-SGGW. Therefore, random and intentional selection was used in the research, as the objective of the study was to verify ecological awareness and some opinions about ecological education among the youth (who, according to Sawitri and Widiaswati

(2018), may become leaders capable of making difference in the future) of one of the national universities orientated on issues related to the environment.

In total, the study included 119 people, of whom 72% were women. The large majority of the respondents, more than 90%, were full-time bachelor students, represented in 88% by students of the second and third year of studies (in similar proportions). The most numerous group of people studied in the field of "Tourism and recreation" (almost 43%), every fifth represented "Economics" and "Logistics", while less significant rest studied "Management" and "Finance and accounting" – therefore such group cannot be claimed as a representative for the whole Faculty of Economic Sciences. Respondents came from diverse settlement units – every third one was classified in the "village" category, while slightly less numerous group was from cities over 100,000 residents. Despite this diversity, almost 90% of the respondents at the time of the research lived in the capital city (every 2 out of 3) or its nearest surroundings (up to 30 km).

## RESULTS AND DISCUSSION

Respondents, defining their own attitude in the field of pro-ecological behaviour, appeared to be divided into two almost identical in size groups – 49.5% declared themselves as consumers trying to behave pro-ecological, others stated that they cannot be included in this group. What is interesting, however, there was much more unanimity in the research sample in terms of recognizing the need for such behaviour, as shown in Figure 1.

It turns out that over 92% of the respondents are aware of the need for such behaviour, while the percentage of other unconvinced groups is marginal. It can therefore be concluded that in terms of awareness of the importance of human behaviour towards the natural environment, those young people are well--formed and understand the importance of maintaining the balance of ecosystems in which they function. Unfortunately, it apparently does not involve active actions that may support it. However, it should be noted that such high percentage of positive answers may also be the result of greater participation of women in the sample – it has been proven that
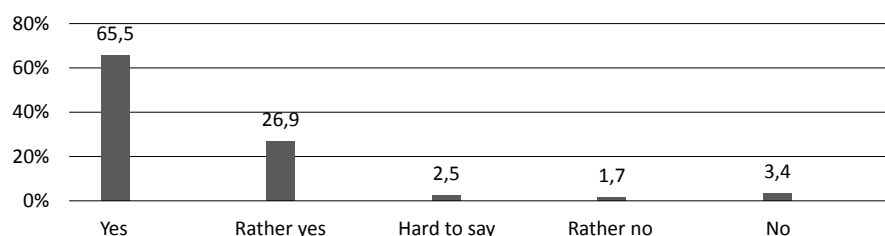
**Figure 1.** Necessity of pro-ecological behaviours in society in the opinion of the respondents

Source: own research.

gender influences an environmental attitude and behaviour and women are those who seem to be more likely to act environmentally friendly, regardless the economic circumstances (Zelezny, Chua and Aldrich, 2000; Vicente-Molina, Fernández-Sainz and Izagirre-Olaizola, 2013).

In connection with the above, the question arises: who should be responsible for spreading knowledge about pro-ecological behaviours and whether, in turn, the indicated entities have a chance to stimulate or even enforce real activities in this area? The distribution of respondents' answers in the first of these issues is presented in Figure 2.

The most often indicated institutions were those usually associated with the education of the society – schools and universities. Those answers therefore are consistent with theories presented by Górska (1995) and Kiełczewski (2001), who stressed the

role of formal educational institutions in shaping pro-ecological attitudes. Educated people are more concerned about the environment and, at the same time, more aware of damages that mankind may cause in the world of nature (Lozano, 2006). Higher level of education usually results in better knowledge about the environment, and – consequently – in taking pro-environmental actions (Schlegelmilch, Bohlen and Diamantopoulos, 1996). Therefore answers of the surveyed students confirm fact that role of the schools and universities seems to be indispensable in the process of disseminating knowledge about pro-ecological behaviours. Nearly half of the respondents also indicated the media, probably primarily because of their potential in terms of mass impact. It is worth noting, however, that these are the entities that in the first place can mainly meet the demand for disseminating knowledge and its



**Figure 2.** Entities responsible for disseminating knowledge about pro-ecological behaviours in the opinion of the respondents (more than one answer could be indicated)

Source: own research.

appropriate use, while having practically no means of influencing the real activities of educated individuals. Such possibilities are available only to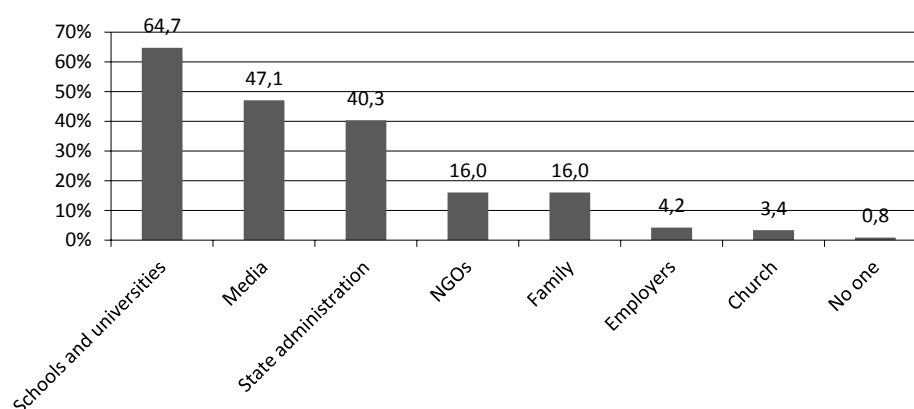 the state administration (the third most frequently indicated entity), which through legal coercion may impose specific solutions in the field of dealing with the natural environment. Unfortunately, a very worrying fact is the small weight attached by the respondents to family impact in the analysed scope, because it creates the first level of education, and many pro--ecological behaviours (e.g. saving resources, waste segregation, respect for nature) actually refer to a model of conduct carried out by young people from home, as a result of adaptation of actions taken by the first authorities – parents. Also surprises in such case the marginal role of such an opinion-forming institution as the denominational community.

The last element, which is worth devoting more attention in the context of environmental education, is the issue of how to disseminate knowledge about pro-ecological behaviours. Respondents' opinions in this topic are presented in Figure 3.

Among the answers received, two issues are worth noting. The first is the trust of young people in the effectiveness and scope of contemporary media and, at the same time, faith in their informative role, because they were first indicated as the subject which should take on the main burden of knowledge transfer in the discussed area, what confirms Nycz--Wróbel (2012) observations about significant role of mass media in shaping ecological awareness. At the

same time, however, there can be expressed doubts about the interest of these media, operating mainly on market principles, in this type of activity. The second is the awareness of obligatory implementation of knowledge on this subject – this is consistent with observations of Tezel, Ugural and Giritli (2018), who claimed that education is an inseparable part of sustainable development, taking into account environmental problems. Also Vicente-Molina, Fernández-Sainz and Izagirre-Olaizola (2013) observed that formal education clearly influence pro-environmental behaviour, although the relation between those two aspects is complex and needs further research. Two other, most often indicated ways of disseminating information in the field of ecology, were methods based on coercion (school, law). Unfortunately, this may suggest the lack of a bottom-up will to transform and willingness to take certain behaviours, which is all the more surprising in the context of the group of respondents – students, and therefore the youth, which is associated with the change and in the future will be responsible for the decision-making process, also in the field of ecology.

## SUMMARY

Undoubtedly, the surveyed students of the Faculty of Economic Sciences at the WULS-SGGW are aware of the need for pro-ecological behaviours, and their general awareness in this area indicates the proper formation of young people during their compulsory
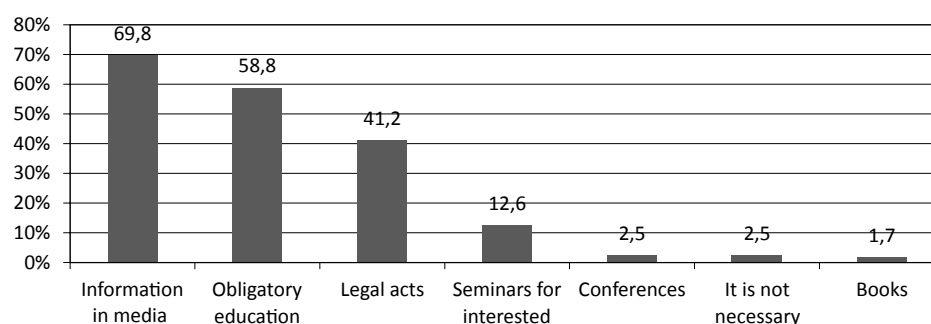


**Figure 3.** Ways of propagating knowledge about pro-ecological behaviours in the opinion of the respondents (more than one answer could be indicated)

Source: own research.

education. Unfortunately, this does not result in the attitudes presented by them – the outcome of previous educational activities is only half of success, and it is only possible to confirm in the issue of self-determination of the respondents. However, the possible connections between such declaration and specific actions requires further research and exceeds the scope of this study. It is alarming that, despite the declared awareness, young people point to the necessity of coercion when implementing and promoting pro--ecological behaviours, while at the same time they relieve their closest social environment in the form of a family from this obligation. Unfortunately, this suggests that this model of thinking will be passed on to future generations, instilling an inertia and lack of personal responsibility in the field of environmental education in society, as – according to Vicente-Molina, Fernández-Sainz and Izagirre-Olaizola (2013) – today students will create future societies, thus the importance of their environmentally oriented education is crucial for progress toward sustainable development.

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# MULTICRITERIA EVALUATION OF THE USE OF ICT IN RURAL AREAS IN THE EUROPEAN UNION COUNTRIES IN 2018

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## ABSTRACT

Information and communication technologies (ICT) are becoming more accessible and more widely used in different areas of socio-economic activity and in various territories, including rural areas. There is a noticeable increase in the interest of rural residents in modern technologies, especially those supporting communication. At the same time, it should be noted that despite the small level of ICT skills and competences, rural areas have great potential that can be expressed in: human resources, the natural environment biodiversity, and raw materials. Therefore, rural areas in Europe should be similar in terms of the use of ICT and should not differ from the level observed in urban areas.

The article presents the use of the AHP method (Analytic Hierarchy Process) for multicriteria decision analysis of the use of ICT by natural persons living in rural areas of the European Union (EU), in 2018. The empirical material used in the research came from the resources of the European Statistical Office (Eurostat). The result of the survey is the ranking of 27 EU countries (Great Britain was omitted). The obtained results showed large disproportions in the use of ICT in rural areas between the countries of the European Union. In the extreme case, between Denmark being the leader of the ranking and Bulgaria, which was in the 27th place, this differences amounted to 70.7%.

**Key words:** level of ICT use, natural person, rural areas, European Union, MCDA, AHP
**JEL codes:** C38, O35

## INTRODUCTION

At present, the transformation of the global economy towards the digital economy can be seen, and information and communication technologies (ICT) have become its foundation. These changes influenced the functioning of societies and all branches of the economy, thus opening up large opportunities in terms of: innovation, stimulating economic growth and creating jobs. In May 2015, the European Commission adopted the Digital Single Market Strategy for Europe (European Commission, 2015) as one of the top ten political priorities. According to the creators of the strategy, the uniform digital market is a space in which the free movement of goods, persons, services and capital is ensured and a high level of protection of

consumers and personal data, and citizens and businesses can get access to or provide online services without hindrance and fair competition rules, regardless of citizenship or place of residence.

The elaboration of the new rural policy presented under the OECD's Rural Policy 3.0 (OECD, 2018) discusses six major trends that analysts believe will be observed in these areas in the 21st century. A technological breakthrough has been mentioned among a number of global changes. It is expected that many new communication technologies and digital skills, including automation and artificial intelligence, cloud processing and use of the Internet, as well as nanotechnologies, will lead to significant savings, expansion of production capabilities, overcoming distance barriers and changing the ways of access to goods and services. The use of such solutions as 3D printing or the use of drones is not excluded.

The aim of the article is to classify EU countries in terms of the use of ICT by natural persons living in rural areas in 2018. The studies used the method of multicriteria AHP decision support. The empirical material used in the research came from the Eurostat data (Statistical Office of the European Union).

## USE OF ICT IN RURAL AREAS (LITERATURE REVIEW)

Among the interesting topics discussed in recently published papers on the use of ICT in rural areas in the EU there is the digital literacy of older rural community representatives using a social network with linear navigation (Castilla et al., 2018). Cavicchi et al. presented a case of an international student competition which aim was to actively promote one of the Italian regions (Fermo, Marche region) via social media (Cavicchi et al., 2018). The issue related to e-administration and research on its impact on rural development is included in the article (Rana, 2018). Changes in the last dozen or so years in the availability and use of broadband connections in rural areas in the UK have been highlighted by the authors of the article (Price, Shutt and Sellick, 2018). The paper contains proposals for business support that can contribute to increasing access to new technologies in rural areas. Nagy et al. presented their thoughts on

smart cities and villages. They characterized barriers and limitations that occur in rural areas and focused on the assessment of human resources as one of the most important preconditions to become intelligent (Nagy, Káposzta and Varga-Naget, 2018).

Szeles presented a new perspective on the phenomenon of digital exclusion in the European Union (Szeles, 2018). The author listed the following as the factors that could alleviate the regional digital divide: stimulating regional economic growth, increasing the achievements of higher education as well as spending on research and development and discouraging early educational leave. The next publication in this area focuses on the potential benefits and challenges facing ICT in the rural community (Treinen, Van der Elstraeten and Pedrick, 2018).

Nosecka and Zaremba characterized the information society in rural areas in Poland against the background of other EU member states (Nosecka and Zaremba, 2018). They pointed out that the society, regardless of the place of residence, relies primarily on knowledge, and is characterized by: a desire to learn, increase work efficiency and introduce modern ICT and innovation. The authors of the article (Costea, Arionesei and Hapenciuc, 2018) focused on determining the current state of ICT use by the population of EU countries living in the central and eastern parts of Europe. The authors carried out a detailed analysis between Romania and Bulgaria. The factors that contributed to the poor use of ICT in the analysed countries include insufficient development of ICT infrastructure in rural areas, caused by low: economic development, population purchasing power and educational level in the use of ICT. Similar analyses and forecasts of the phenomenon of digital exclusion in the countries of Central Europe are presented in the works (Becker et al., 2018; Ziemba and Becker, 2019) and in Poland (Becker and Becker, 2018).

## THE AHP METHOD

Saaty, the author of the AHP method, began work on the construction of the algorithm in the 1970s (Saaty, 1977, 1980, 2008; Saaty and Tran, 2007). In many publications, this method is presented as an effective tool for solving complex decision problems that can

be presented in the form of a multi-level hierarchical structure. It is useful in situations where the criteria are qualitative, and the assessments are subjective and result from the knowledge and experience of the analyst.

The literature discusses many applications of the AHP method in various areas of socio-economic life, e.g. multicriteria rating of: real estate offers (Becker and Becker, 2017), techno-entrepreneurship projects (Unutmaz Durmuţođlu, 2018), risk in supply chain (Butdee and Phuangsalee, 2019). Over 400 examples of decision problems, both at governmental level and of private organizations, have been published in the book by Saaty and Forman (1996). Among the works published in the recent period, which address the problems of rural areas and present solutions using AHP, the article by Kumar and Kansara (2018) deserves attention. The authors set a goal of finding possible barriers to IT applications in the sugar industry supply chain system in India. Another offer was created by the article by Jafari, Jafari and Shahbazi (2018), which focuses on the selection of the location of a rural waste landfill and the complex issues of managing it. The paper by Ma et al. (2018) contains an assessment of the impact of the policy protecting land with the urban-rural construction policy on the future rural landscape. Interesting results are presented in the article by Zhang, Yang and Zhao (2018). The authors used AHP and FCE to assess the performance of various rural heating systems and determine the most appropriate type of system.

Using the AHP procedure, we begin by defining the purpose and by defining a coherent family of criteria relevant to the decision problem. Then, comparison matrices for criteria and decision variants are constructed and appropriate calculations are made to determine priorities in the form of scale vectors and their aggregation. A detailed description of the AHP procedure is presented, among others, in the works of Saaty (1980, 2008) and Trzaskalik (2006).

The aggregation of assessment in the AHP method takes place according to the additive utility function, synthesizing the weight fractions or criteria and the values of the degree of fulfilment for the fractional objective function by each criteria. Assessment of the degree of the fulfilment of these criteria for the considered decision variants are obtained by the Saaty method of pair comparisons, used to determine the normalized eigenvector (Saaty, 2005, 2008).

## USE OF ICT BY INDIVIDUALS IN RURAL AREAS (EMPIRICAL MATERIAL)

The empirical material containing information on the use of ICT by natural persons in the European Union (EU), in 2018 came from Eurostat data resources (Eurostat, 2019a). Participation in the direct interview was voluntary, and participants were 16–74-year-olds living in rural areas of the EU-28 member states. The published data is collected annually by national statistical offices and is based on the annual model questionnaires of Eurostat on the use of ICT by natural persons. A large part of the collected data is used to monitor the digital economy and society; project for 2016–2021 (Eurostat, 2019b).

Analysing the collected empirical material, we can conclude that digital technologies play an important role in the everyday life of most Europeans. In 2018, almost 70% of people living in rural areas of the EU used the Internet every day. The highest percentage of network users was recorded in Denmark (80%) and the Netherlands (88%), while the lowest in Romania and Bulgaria (42%). In Poland, this percentage was 54%. The most popular types of broadband access to the Internet was a digital subscriber line (DSL), almost universally available across the EU, or a less widespread cable (optical fibre). The dominant Internet connection, at the level of 85%, was the broadband connection. The inhabitants of the rural areas of the Netherlands (98%) most often used this type of connection. In turn, the lowest percentage of broadband access was found in Bulgaria (60%) and Greece (63%). In Poland, this solution was at the level of 82%.

Below the average, the Internet was used to communicate with public authorities. In 2018, in the EU, it was at the level of 47%, in Poland – 25%. However, in Denmark, this percentage was very high and amounted to 90%. While the lowest percentage was recorded in Romania – 6%. Among reasons that limited contact with the administration via the Internet, there was a lack of skills and knowledge. At the same time, only 4% of the surveyed residents of rural areas

of the EU and 5% of inhabitants of Poland were characterized by this feature. There were also countries where no such obstacles were noticed, for example, in Finland, France and Portugal.

e-Commerce is an important area of ICT interest in the EU's rural areas. More than half (56%) of the surveyed residents of these areas made online purchases − in Poland 46%. The highest percentage of clients was recorded in Denmark (82%) and the Netherlands (78%), while the lowest in Romania (14%) and Bulgaria (13%). The smallest percentage of people made online purchases: from sellers of unknown country of origin and computer hardware. The purchases most willingly bought were: from domestic sellers, clothes and sports articles, household goods, films, music or books, magazines, e-learning materials or computer software, and accommodation reservations were made (Eurostat, 2018).

## RANKING OF EU COUNTRIES IN TERMS OF THE LEVEL OF ICT USE IN RURAL AREAS

The aim of the study was to assess the level of ICT use by natural persons living in rural areas in 27 EU countries in 2018. Due to the lack of data, Great Britain was omitted. The research used a set of four main criteria, which included the:
- $C_1$ − frequency of Internet access: once a week, including every day ($w_1 = 0.210$);
- $C_2$ − household Internet connection type: broadband ($w_2 = 0.098$);
- $C_3$ − e-government activities of individuals via websites ($w_3 = 0.346$):
  - $C_{3.1}$ − Internet use: obtaining information from public authorities web sites ($w_{3.1} = 0.196$),
  - $C_{3.2}$ − Internet use: downloading official forms, last 12 months ($w_{3.2} = 0.311$),
  - $C_{3.3}$ − Internet use: submitting completed forms, last 12 months ($w_{3.3} = 0.493$),
- $C_4$ − Internet purchases by individuals ($w_4 = 0.346$);
  - $C_{4.1}$ − last online purchase: in the 12 months ($w_{4.2} = 0.5$),
  - $C_{4.2}$ − online purchases of products and services ($w_{4.2} = 0.5$), this criterion consists of purchases of:
    $C_{4.2.1}$ − food/groceries, $C_{4.2.2}$ − household goods,

$C_{4.2.3}$ − clothes, sports goods, $C_{4.2.4}$ − films/music or books/magazines/e-learning material or computer software, $C_{4.2.5}$ − computer hardware, $C_{4.2.6}$ − electronic equipment, $C_{4.2.7}$ − tickets for events, $C_{4.2.8}$ − travel and holiday accommodation, $C_{4.2.9}$ − telecom services (all of the weights are equal: $w_{4.2.1}, w_{4.2.2}, …, w_{4.2.9} = 1/9$).

All criteria were measurable and expressed in percentages. These values on each undivided criterion ($C_1$, $C_2$, $C_{3.1}$, $C_{3.2}$, $C_{3.3}$, $C_{4.1}$ and $C_{4.2.1}$, …, $C_{4.2.9}$) were transformed into the form of scale vectors, where element totals (27 countries) equalled one. The weight values for individual criteria are shown in brackets. Weight vectors were determined using the Saaty method, comparing pairs of criteria at each level of the hierarchical structure. The principle was applied, according to which higher priority was given to criteria reflecting the use of ICT with a higher degree of advancement. The set of main criteria most strongly preferred $C_3$ − *e-government activities* ($w_3 = 34.6\%$) and $C_4$ − *Internet purchases* ($w_3 = 34.6\%$). The weights of sub-criteria for $C_3$ were also differentiated, placing $C_{3.3}$ in the first place − *submitting completed forms* ($w_{3.3} = 49.3\%$), $C_{3.2}$ in the second place − *downloading official forms* ($w_{3.2} = 31.1\%$) and $C_{3.1}$ in the last place − *obtaining information from public authorities web sites* ($w_{3.1} = 0.196$).

The AHP computational procedure was performed twice and two rankings were obtained (Fig. 1). The first ranking was made for comparative purposes, without taking into account the designated priorities (all criteria are equally preferred), the second one with their inclusion (the criteria for using advanced internet services are more preferred). The assessments of the countries that created the second ranking are additionally presented in Figure 2. The results of both analyses indicated stable (independent of changes in preferences) positions in 14 out of 27 surveyed countries. The highest level of ICT use in rural areas in 2018 was obtained by Denmark. The Netherlands came second with 93.2% and with Sweden following it (92.9%). The next two places were taken by: Finland (87.6%) and Estonia (86.6%). The last, 27th place, in the ranking was obtained by Bulgaria, in which the level of using advanced Internet services in rural areas constituted only 29.3% compared
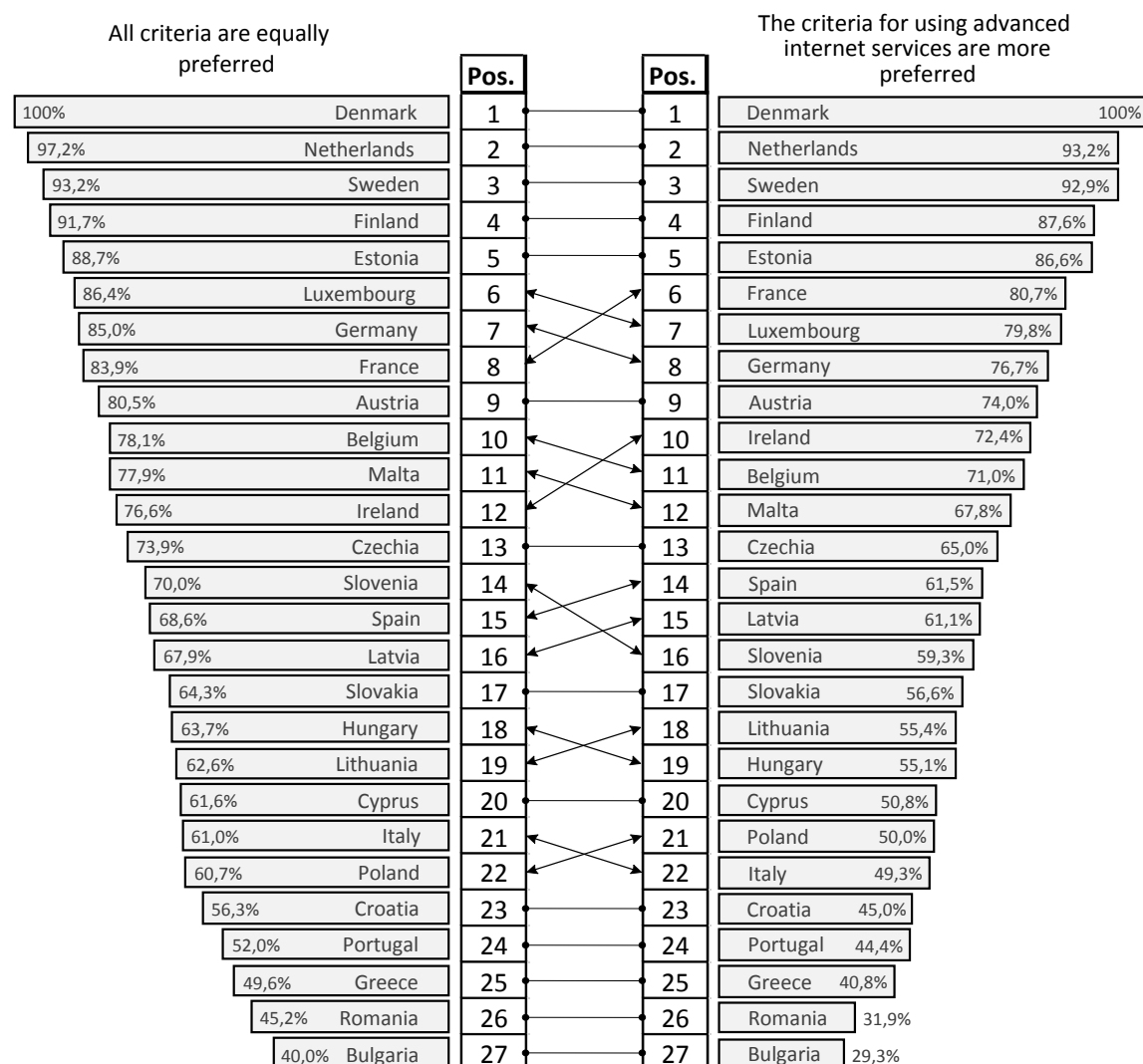
**Figure 1.** The ranking of EU countries in terms of the level of ICT use by individuals in rural areas in 2018

Source: own study based on Eurostat data (Eurostat, 2019a).

to Denmark. Bulgaria was ranked just before Bulgaria (31.9%). Slightly better evaluations were obtained by: Greece (40.8%), Portugal (44.4%), Croatia (45%), Italy (49.3%) and Poland (50%).

Comparison of the positions of the countries in both rankings distinguished France and Ireland, which initially, in the ranking with aligned priorities for the criteria, took the 8th and 12th place, respectively, and after considering the higher rank for *e-government activities* and *Internet purchases* they advanced two positions. The reverse phenomenon

was observed in the case of Slovenia, which dropped by two positions in the ranking highlighting the level of use of advanced Internet services.

**SUMMARY**

Considering the use of ICT by natural persons in rural areas in 2018, there are significant discrepancies between member states. Northern and western EU countries have higher ICT usage than countries located in the south or east (Eurostat, 2018). Based

on the results of the study, it can be concluded that the rural areas with the lowest use of ICT and at the same time with a high degree of risk of physical exclusion of natural persons were: Bulgaria, Romania, Greece, Portugal, Croatia, Italy and Poland (Fig. 2, the lightest shade). The evaluations of these countries did not exceed half (50%) of the rating obtained by the leader, i.e. Denmark. Together with Denmark, the Netherlands, Sweden, Finland, Estonia, followed by France, Luxembourg and Germany (Fig. 2, the darkest shade) qualified for the group of countries least exposed to the phenomenon of digital exclusion in rural areas. These countries scored more than 75% of the best result.

The reasons that led to the disproportion presented include: low income, lack of infrastructure in rural areas, which limited access to digital technologies and their availability, insufficient education and computer skills, as well as cultural factors. In order to reduce regional disparities, one should strive to raise social capital, activate the unemployed, pensioners and promote the use of ICT in professional and private life.



**Figure 2.** The levels of ICT use by natural persons in rural areas of EU countries in 2018

Source: own study based on Eurostat data (Eurostat, 2019a).

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# COLLECTIVE ACTION THEORY OF MANCUR OLSON ON THE EXAMPLE OF INTEGRATED FRUIT AND VEGETABLE PRODUCERS

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## ABSTRACT

The aim of this article was to answer the question – do integrated fruit and vegetable producers act in accordance with the assumptions of "the logic of collective actions" by Olson, or want to increase the market organisation level, as suggested by Docian Ciolos, increasing the number of existing groups/organisations? Basing on a library query, the assumptions of the "logic of collective actions" are presented. Using the data provided by the European Commission, a significant negative relationship was found between the average size of the group/organisation and its effectiveness. In addition, there was a regress of organising the fruit and vegetable market in the European Union. Therefore, it is suggested that according to the assumptions of Mancur Olson's theory, selective stimuli (institutional support) motivating members of groups/organisations to produce a common good that can be, i.a., overcoming the barrier of production scale or competitiveness of the sector should be applied.

**Key words:** fruit-vegetable producers' groups/organisations, group activity, free-rider
**JEL codes:** Q13, P32

## INTRODUCTION

Collective action is an activity undertaken by various size groups of entities, people or organisations, connected by a common goal, which in this way can be more easily achieved than in the case of individual actions (Grodzicki, 2015). Promoting the idea of collective action is to eliminate the effects of market imperfections as a mechanism to optimize the allocation of resources and the distribution of income, and to justify state intervention in economy. However, according to Sadłowski (2018), the unreliability of the state in these activities prompts reflection. In his opinion, the imperfection of the market in a given area is not a sufficient condition for intervention.

Supporters of state intervention in agriculture point to a number of reasons that should prompt governments to take corrective actions and recommend the use of specific agricultural policy instruments. On the other hand, opponents of the statist approach question both the premises of intervention and the possibility of achieving the assumed goals with the help of remedies proposed by interventionists.

One of the intervention instruments is a program supporting the organisation of the fruit and vegetable market. Over the years, it has been modified, and the assessment of its effectiveness is not unambiguous. Undoubtedly, in the countries of the so-called new union, the program was an accelerator of integration activities. The wide stream of co-financing resulted

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in increased interest in collective activities of producers. However, the short period of its validity caused this process to be stopped. A drop in the number of producer groups/organisations is noticeable in almost every EU country. So the question arises – is the suggestion made by Ciolos that the organisation of the market should be developed by increasing the number of existing groups, and not by establishing new organisations, correct? Searching for the answer, the author relied on the considerations of "the father of the theory" of collective action – Mancur Olson. His "Logic" makes the matter intuitively obvious: the greater the number of people or companies that could benefit from the collective good, the smaller the share of profits from acting in the group interest that will be charged to the person or company that takes action. Thus, in the absence of selective incentives, the motivation for collective action decreases as the size of the group increases, so that large groups are less able to act in the common interest than the small ones (Congleton, 2015).

## THEORETICAL BASIS

In the sphere of sociology and political sciences, Olson was the first one to draw attention to the contradiction between individual rationality and collective rationality, which prevails on every group undertaking. He did, however, approach the matter as an economist. From economics, he borrowed assumptions about the nature of man as a rational and driven by his self-interest *homo oeconomicus*, a technique of analysis based on the calculation of marginal costs and benefits and the theory of public goods, which turns out to have many points in common with the theory of groups and organisations. Using these tools, Olson came to completely different conclusions about the functioning of groups than traditional sociology. He questioned the view that groups organise themselves and interact in their own interest in a natural way, guided by some "social instinct" because it is "functional". On the contrary, he said that while there are no mechanisms forcing members of a group to promote a common interest, rational individuals will not take action on its behalf. The theory shows that most organisations produce what economists call a public good, that is, goods or services available to each member, regardless of whether they have borne costs associated with their delivery or not. In the opinion of Olson, if an unorganized group can secure a certain amount of public good, it is only thanks to the fact that it will be provided by the person who cares about that most. All other members of the group will use public goods for free.

His second thesis was about the relationship between the size of the group and its ability to secure public goods. Olson claimed that while a small group can be "privileged", large groups are always "hidden". In his opinion, in groups small enough, it is possible to create a certain suboptimal amount of public good through the voluntary involvement of individual members. In large groups, however, there are no economic incentives to create, by independent members, any amount of public good. Therefore, in small groups, acting for the common interest is possible without the so-called selective stimuli, while in large ones, such additional stimuli are necessary (Ostrowski, 2012).

However, as noted by Grzybek (2016), Olson created a model in which the individual rationality of individuals leads to a situation in which the public good will not be created due to the problem of the free-riding. The possibility of using the common good without bearing the costs of its creation creates the temptation of passive expectations. Rational consumers will choose this attitude (free-riding), and thus as a result the common good will not be delivered at all. According to Olson, there is a clear difference in coping with the problem of free-riders between large and small groups. Small groups will overcome it relatively easily, as the costs of cooperation are low and the participants' control options are significant. Large groups are unlikely to form effective coalitions without having the opportunity to involve potential members in participation. It is noted that at the level of group interests, there is a tendency to achieve the objectives of small groups by neglecting the needs of larger communities. The actions of individuals in favour of the group often conflict with their individual interests, and the short-term, own benefits of group members constitute a barrier to achieve a common goal in the longer term (Grodzicki, 2015).

The conviction that groups of people with common interests tend to support common goals is unjustified. Even if the group can be very much involved in the implementation of common goals, in most cases it can cease before the optimal level for the members of the group as a whole is reached. So the question arises – is there one goal that would generally characterize the whole organisation? Researchers analysing this problem (De Bruycker, Berkhout and Hanegraaff, 2018) argue that those who belong to an organisation have a common goal (interest), but of course they also often have their own individual goals, differing from others in the organisation. In large groups, subgroups may be created that often have separate interests different from those in the group. Olson (1971) notes that organisations that do not serve the interests of their members are nothing new. Festinger pointed out that "the attractiveness of group membership is not that farmers would be more inclined to themselves if they could achieve 'something' thanks to this membership". This was confirmed by Laski, claiming that the associations strive to meet the goals of the organisation, which are created on the basis of individual needs of people having something in common, they are to serve the interests of their members. Of course, there is no sense in the operation of the organisation, if individual, unorganized action can be used to achieve the goals of the individual in the same way, or even more effectively. A single member of a large organisation is in a similar situation as a company in a perfectly competitive market, his own efforts will not have a noticeable impact on the entire organisation, but he can enjoy all benefits resulting from the benefits of others, regardless of whether they have acted for him or not. The problem with a free-rider is easier to be solved in small groups with specific interests than in large groups representing multiple interests.

## MATERIALS AND METHODS

Ciolos claimed that the development of fruit and vegetable market organisation could be based on adding new members to the already existing groups, and not necessarily on establishing new organisations. Confronting this opinion against the theory of collective action by Olson, the author of this work wanted to try to answer the question which approach can be noticed among integrated fruit and vegetable producers in the EU. Based on a library query and the data from annual reports of EU member states regarding the functioning of groups and organisations of fruit and vegetable producers between 2012–2016, made available by the European Commission, the correlation between the average size of groups/organisations and their effectiveness (measured by the average value of sales) in individual countries has been measured.

## RESULTS AND DISCUSSION

According to Chaddada and Cook (2004) quick and fundamental structural changes taking place in the global food system caused by industrialisation expose agricultural producers to increased domestic and international competition. These changes suggest that it is important to consider whether organisational structures that have evolved in the past will be appropriate in the future. The success of groups/organisations in response to the challenges resulting from the industrialisation of agriculture will probably depend on both the competitive strategy and the organisational structure. It is important that the leaders of these organisations, considering the organisational changes, remember that the decision depends on the fundamental orientation of the owners/producers. Hart notes (2003) that Olson's hypothesis, in its strongest form, indicates that it is more likely that highly focused industries will be represented in the policy making process than those less concentrated. Agriculture, which has many producers is characterized by significant barriers to collective actions. Identifying the beneficiaries and directing effective public policy instruments that would convince them that there is a sufficient number of them, that in the absence of selective incentives, it is expensive. It is said that in such conditions "free riding" on the efforts of others is very likely. Farmers, like other dispersed social groups, will usually be "hidden", which means they have a common political interest, but it remains unrepresented. According to Ząbkowicz (2016), a member of the group/organisation makes decisions primarily for the sake of self-interest. Because people

do not have access to all the necessary and important information or have uneven access, their calculations do not always give the optimal effect. "Calculation" rationality is limited by information asymmetry. Individuals, comparing the benefits and costs of achieving their own preferences, take into account expectations regarding the behaviour of other people. In addition to economic effects, they are driven by the desire to achieve social and psychological goals, such as gaining prestige, respect, friendship, etc. Bringing the interest to material benefits, therefore, seems to be a simplification that has been outgrown in economics. Individual interest, at least from the point of view of modern institutionalism, consists of achieving one's own preferences to a satisfactory degree, but also of avoiding condemnation or gaining recognition, which come from social networks.

Some organisations, due to their ignorance, may neglect the cooperation of their members. The existence of formal or informal groups is obvious, because it results from the basic tendency to instinctive joining as, according to Olson (1971), following Mosca, in the name of "fighting together with another herd". Large fragmentation of agricultural holdings and the progressive consolidation of the processing industry and the growing importance of super- and hypermarket chains, mean that the terms of contracts concluded by small farms with processing plants or large retail chains are often imposed by the other party. Farmers are then unable to gain sufficient profits allowing them to function on the market. The factor influencing the bargaining power of entities is the amount of resources held, and the ability to adapt them to the changing market conditions. Cooperation may increase the bargaining power of agricultural producers through the impact on the market structure (in the case of creation of formal producer groups), the size of economic resources (through joint investments or the joint use of resources, such as agricultural machinery) and reducing transaction costs (e.g. by joint use of means of transport). However, as studies conducted in Poland indicate, traditional forms of cooperation characterising small farmers help them only to survive. Only more advanced forms of cooperation – like participation in producer groups – constitute a development strategy. It is worth noting that the

level of organisation of farmers in the countries of Central and Eastern Europe is unfortunately rather low. Partial explanation of this phenomenon refers to negative experiences from the period of collective agriculture in the communist period, however, market and political factors cannot be neglected either (Mielczarek-Andrzejewska, 2012).

One of the political incentives to overcome the barrier of the scale of supply in agriculture was a program supporting horizontal links of entities and their joint activities within economic organisations, which according to Nosecka (2017), allowed to broaden the scope of instruments of competing agricultural entities for marketing activities, logistic and quality ensuring the fulfilment of market requirements. Nosecka (2017) also notes that Polish gardeners were the largest beneficiary of this EU program because they absorbed 95% of the total support paid to these units. Despite the fact that the program supporting integration activities among gardeners inspired them to establish groups and organisations of fruit and vegetable producers thanks to its size, observing their durability on the market, it should be stated that it was too short. For example, in Poland, the register kept by the President of ARMA shows that 344 entities have been established since the beginning of the program, and at the end of 2018 there were only 272, which means that this number decreased by almost 21%. In the Czech Republic and Slovakia, 305 producer groups received support. Many of the supported units are no longer active. In these countries, only over twenty organisations still operate, but they do not have a significant impact on the increase in the added value of the agricultural sector (Kotyza et al., 2018). In Slovakia, we also note that reducing the number of groups by 40% resulted in a decrease in the number of associated members by 49%. Only Romanian gardeners in 2012–2016 showed increased interest in cooperation, the number of associated members increased almost fourfold, while the number of groups/organisations increased by only 60%. A different situation was noted in Italy, where the number of organisations increased by 8%, but the number of integrated members decreased by 30%. In the figure below, we see that as the average number of members in the group/organisation increases, the average
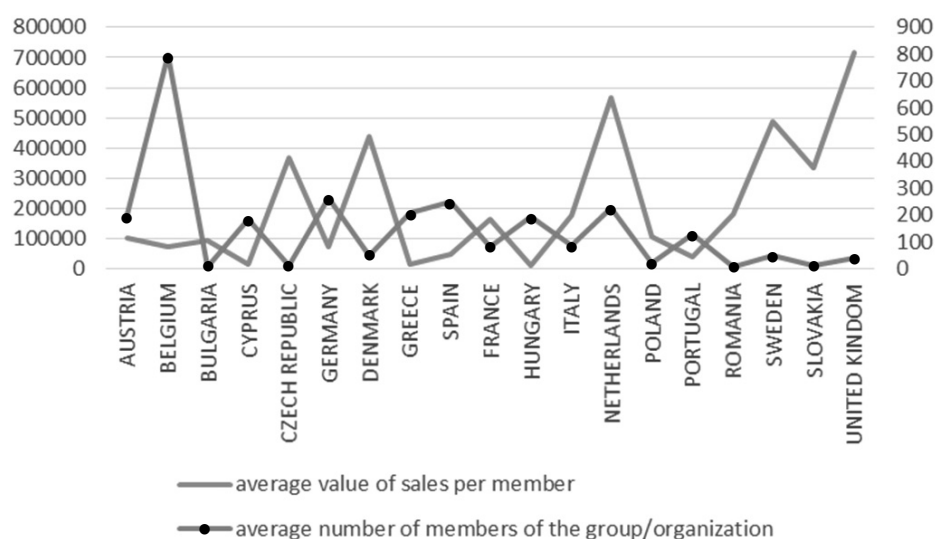
**Figure 1.** Average number of members of fruit and vegetable producer groups and organisations in the EU and average value of per capita sales in 2012–2016

Source: own study based on annual reports sent by the countries to the European Commission.

sales per capita decreases. Correlation between these variables is significant, negative (–0.34), which confirms that larger groups are characterised by lower efficiency of operation.

Other studies, although much more limited, as carried out in Poland, in Kujawsko-Pomorskie Voivodeship, where about 15% of Polish fruit/vegetable producer groups/organisations operates, also confirm greater efficiency of smaller groups, as the relationship indicated by logit regression showed that the decrease in the number of group members increased by 10% the chances of obtaining a competitive advantage (Bieniek-Majka and Matuszczak, 2017).

## SUMMARY

Observing the changes in the organisation of the fruit and vegetable market in the European Union, it seems that the logic of functioning of groups by Olson finds its justification. The observed fact of a faster rate of decrease in the number of associated members than the number of groups and organizations, proves the regression of market organisation and is the opposite of the theory of positive effects resulting from synergy and scale. It can also be suggested that most entities

were established due to the selective stimulus which was the relative ease of obtaining funds. Establishing selective incentives (institutional support) motivating to organize, is in itself a collective good (Grodzicki, 2015), that is, according to theory, it should be delivered continuously, not temporarily, because it causes the cessation of joint action as the example of Poland or the Czech Republic as well as other countries, with the exception of Romanian gardeners, has shown. Especially because gardening is very much exposed to agrometeorological factors, it should be covered by long-term interventionism, which allows for levelling fluctuations resulting from factors independent of gardeners. It would be advisable to continue the support (spread over time) to create conditions for the further organisation of the fruit and vegetable market, since its level, especially in the countries of Central and Eastern Europe, is insufficient, which reduces the competitiveness of gardeners on the international arena. This is also confirmed by Nosecka (2017), indicating that without external support and creating financial incentives, it is unlikely that the process of overcoming the barrier of the scale of production in farms will be faster by creating larger economic organisms – producer groups and organisations.

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# CHANGES IN THE ORGANIC PROCESSING IN POLAND IN THE YEARS 2004–2017

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**ABSTRACT**

The processing of organic products in Poland develops, the number of organic entities increases and there are changes in the structure in individual industries. The aim of this article was to evaluate the trends and the degree of changes that have occurred in the number of processing plants and the structure of organic processing industries in Poland in the years 2004–2017. The analysis covered eight industries of processing organic products. Over thirteen years, there has been a steady increase in the number of organic processing plants, despite the low amount of organic production and the lack of developed and sustainable forms of cooperation at various levels – from the producer to the consumer. The low consumption of organic products (compared to European countries) also shows down and shapes changes that occur in the structure in particular processing sectors.

**Key words:** organic processing, organic farming, processing industries
**JEL codes:** Q, O

## INTRODUCTION

The organic processing is a key segment of the food system and it is directly connected with the development of the organic farming sector. Concentration of organic production and processing is needed (Gołębiewski, 2019). Organic processing in its production mainly uses raw materials from organic farming. Other authors emphasize the great importance of ecological production and quality of the natural environment in the implementation of sustainable rural development at regional and local level. The condition for implementing individual components of the sustainable development paradigm is the active participation of rural residents and other people (Diez, Izquierdo and Malagon, 2016; Rotaru et al., 2017). It is subject to strict regulations on the basis of Community and national acts that are related to the organic farming and processing.

Pursuant to the applicable regulations, a processed product may be labeled as organic if it includes at least 95% of ingredients of agricultural origin and if it is produced from products obtained with the use of ecological methods. The other ingredients that may be used are listed in Annex IX of the EU Commission Regulation 889/2008 or permitted on the basis of a temporary permit issued by a Member State.

The market of organic products in Poland is still shaping. There are dynamic changes in this market.

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Not only the quality of products, but also the degree of their processing and availability has become important (Nowogródzka, 2012). The specific determinants of the market for organic products also include the level of economic development, specific behavior and ecological awareness of consumers, wealth of society and agricultural policy (Domagalska and Buczkowska, 2015). According to the report of the International Federation of Organic Agriculture Movements (IFOAM), the EU and the Institute for Organic Agriculture Research FiBL, in 2017, retail sales in Europe amounted to 37 billion EUR (34.3 billion EUR in the European Union). In particular countries, the sales amounted to 10 billion EUR (Germany), 7.9 billion EUR (France) and 3.1 billion EUR (Italy). In Poland, the value of retail sales amounted to 235 million EUR (Willer and Lernoud, 2019). Demand for organic products is growing dynamically, both in the EU and in our country. Unfortunately, in Poland it is not fully satisfied with domestic production – both in terms of quantity and variety of assortment.

The development of organic processing is one of the most important factors determining the improvement of the supply side of the organic food market (Śliwowska, 2012). The development of organic food processing has also been noticed in the Framework Action Plan for Food and Organic Farming in Poland for the years 2014–2020, which is additionally included as one of the strategic projects in the Strategy for Responsible Development.

The aim of the article was to present a view about the processes that took place in the number and structure of organic processing in Poland in particular industries in the years 2004–2017.

## MATERIAL AND METHODOLOGY OF RESEARCHES

The source material included data from the Agricultural and Food Quality Inspection (Polish acronym IJHARS) contained in the reports and information on the state of organic farming in Poland in the years 2004–2017 and data from the International Federation of Organic Agriculture Movements (IFOAM) and the Institute for Organic Agriculture Research (FiBL). Scientific studies were used in the discussion.

The researches were carried out in processing enterprises referred to as preparation entities. According to the definition indicated in Art. 2 letter i of the Council Regulation (EC) 834/2007, "preparation" means preservation or processing operations for organic farming products, including slaughter and cutting of products of animal origin, as well as packaging, marking or making changes in the labelling relating to the organic production method. The collected data were grouped and indicators of the dynamics of the structure for organic processing in Poland were calculated – broken down by industry. Moreover, statistical data was analysed. The results are presented in a descriptive form, tables and figures.

## RESULTS AND DISCUSSION

Changes in the number of organic processing plants in Poland in the years 2004–2017 have an increasing tendency (Fig. 1). In the analysed period, the number of processing plants increased – from 55 in 2004 to 795 in 2017, i.e. by 1,345.45%, and the dynamics of changes was varied in individual years. Despite the thirteen-fold increase in the number of organic processing plants, Michalik (2016) thinks that some of these plants do not start processing due to limited access to raw materials. As it is pointed out by Łuczka (2016) in her researches, the majority of entities (80%) simultaneously carry out processing of conventional and organic raw materials, and their share in particular processing plants is diversified.

Since Poland's accession to the European Union, the number of certified organic farms has increased several times. In 2004, there were 3,705 organic farms, and in 2017 – 20,257 organic farms – despite the decrease in their number from 2014 (the Agricultural and Food Quality Inspection webpage https://ijhars.gov.pl/raporty-i-analizy.html). Unfortunately, the dynamic growth in the number of farms does not translate into the same degree of growth in commodity production. The decrease in the number of organic farms since 2014 by 4,572 farms and their area by 162,923 ha has not translated into a reduction in the number of organic processing plants and there is still a rising trend of these plants. As noted by Kułyk and Michałowska (2016), until 2013, a significant part of
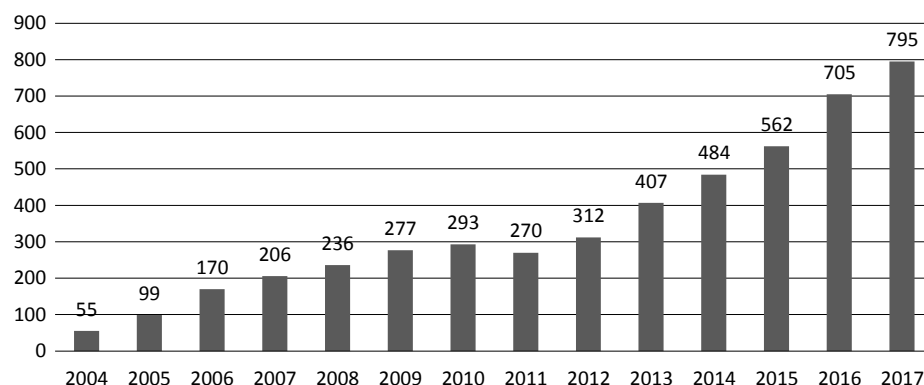
**Figure 1.** The number of organic processing plants in Poland

Source: own study based on reports on the state of organic farming in Poland available at the Agricultural and Food Quality Inspection webpage https://ijhars.gov.pl/raporty-i-analizy.html

the certified organic area included permanent pasture. In the structure of crops with plants for feed, permanent pasture constituted 66% (Agricultural and Food Quality Inspection, 2013–2014, 2015), with a small share of farms with animal breeding (Brodzińska, 2014). In the following years, this trend did not change significantly, and in 2016 – both of these groups accounted for 58%, and farms conducting (simultaneously) plant and animal production had only 16.8% of share, with 83.2% of farms carrying out only plant production (Agricultural and Food Quality Inspection, 2015–2016, 2017). Researches of Jasiński, Michalska and Śpiewak (2014) additionally indicate that the adopted support system does not

encourage the development of production that would be directed to the market. This translates into a high index of organic farms in Poland per one processing plant with (at the same time) low market value. In 2017, on average, there were 25 agriculture producers and 482 ha of organic arable lands per one processing plant after the conversion period (the Agricultural and Food Quality Inspection webpage https://ijhars.gov.pl/raporty-i-analizy.html).

The currently available data shows that the largest share in the processing of organic products in the years 2010–2016 had fruit and vegetable processing industry (Table 1). The share of this industry fluctuated during the analysed period – on average, it was at

**Table 1.** Share of industries in the processing of organic products in Poland in the years 2010–2016 (%)

| Specification | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Processing of fruits and vegetables | 32.4 | 32.0 | 31.6 | 29.2 | 34.1 | 32.1 | 31.1 |
| Processing of grain mill products | 20.1 | 23.5 | 24.2 | 23.8 | 19.8 | 20.3 | 17.2 |
| Processing of coffee and tea | 6.0 | 6.0 | 5.0 | 6.3 | 4.8 | 5.0 | 4.9 |
| Processing of meat and fish | 5.1 | 6.5 | 7.0 | 4.9 | 7.0 | 7.7 | 6.1 |
| Processing of milk and cheese production | 2.7 | 3.0 | 4.7 | 3.6 | 3.1 | 3.1 | 4.9 |
| Processing of vegetable and animal fats | 1.3 | 1.8 | 2.4 | 2.7 | 2.4 | 2.4 | 3.5 |
| Processing of sugar | 0.3 | 1.0 | 0.3 | 1.6 | 1.5 | 1.2 | 1.5 |
| Processing of other agri-food products | 32.1 | 25.8 | 24.8 | 27.9 | 27.3 | 28.2 | 30.8 |

Source: own study based on data from the reports about the state of organic farming in Poland in the years 2011–2012, 2013–2014, 2015–2016.

the level of 31.8%. The highest share was recorded in 2014, at the level of 34.1%, and the lowest one – a one year earlier (4.9% less). When analysing the dynamics of changes, the highest and the only increase in dynamics occurred in 2014 – by 16.8% in relation to 2013 and by 5.2% in relation to 2010 (Table 2). On the other hand, the largest decrease in share (by 7.6%) occurred in 2013, and in 2015 (by 5.9% compared to the previous year). Nowak and Szewczyk (2015) indicate that the majority of companies are engaged in the processing of fruits and vegetables, because they are relatively the most easily available. In Poland, there are relatively many organic farms that deal with cultivation on a large area, and the share of this production group in Europe is significant (Komorowska, 2014).

The second place in the processing industry, according to the industries, is occupied by the processing of grain milling (Table 1). Until 2012, the trend was growing, and then (from 2014) there was a downward trend. The average share of this industry in the analysed period was 21.3%. The highest one was in the years 2011–2013, over 23.5%. The lowest share occurred in 2016, only 17.2%, i.e. 7% less than in 2012 (with the highest share). The highest increase in the share of cereal milling processing was in 2011, by 16.9% in relation to the previous year and in the years 2011–2013 in relation to 2010 (Table 2). On the other hand, the highest reduction in share was recorded in 2014, by 16.8% and in 2016 – by 15.3% in relation to the previous year.

The share of the tea and coffee processing was characterized by a variable trend, ranging from 4.8% (in 2014) to 6.3% (in 2013) (Table 1). The last three years presented a stabilized level, but with the lowest share. The largest increase in the share in the processing of coffee and tea was noted in 2013 (by 26%) compared to the previous year, while the larg-

**Table 2.** Dynamics of changes in the share of processing of organic products broken down by industries (%)

| Specification | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Processing of fruits and vegetables | *a | −1.2 | −1.3 | −7.6 | 16.8 | −5.9 | −3.1 |
| | **b | −1.2 | −2.5 | −9.9 | 5.2 | −0.9 | −4.0 |
| Processing of grain mill products | a | 16.9 | 3.0 | −1.7 | −16.8 | 2.5 | −15.3 |
| | b | 16.9 | 20.4 | 18.4 | −1.5 | 1.0 | −14.4 |
| Processing of coffee and tea | a | 0.0 | −16.7 | 26.0 | −23.8 | 4.2 | −2.0 |
| | b | 0.0 | −16.7 | 5.0 | −20.0 | −16.7 | −18.3 |
| Processing of meat and fish | a | 27.5 | 7.7 | −30.0 | 42.9 | 10.0 | −20.8 |
| | b | 27.5 | 37.3 | −3.9 | 37.3 | 51.0 | 19.6 |
| Processing of milk and cheese production | a | 11.1 | 56.7 | −23.4 | −13.9 | 0.0 | 58.1 |
| | b | 11.1 | 74.1 | 33.3 | 14.8 | 14.8 | 81.5 |
| Processing of vegetable and animal fats | a | 38.5 | 33.3 | 12.5 | −11.1 | 0.0 | 45.8 |
| | b | 38.5 | 84.6 | 107.7 | 84.6 | 84.6 | 169.2 |
| Processing of sugar | a | 233.3 | −70.0 | 433.3 | −6.3 | −20.0 | 25.0 |
| | b | 233.3 | 0.0 | 433.3 | 400.0 | 300.0 | 400.0 |
| Processing of other agri–food products | a | −19.6 | −3.9 | 12.5 | −2.2 | 3.3 | 9.2 |
| | b | −19.6 | −22.7 | −13.1 | −15.0 | −12.1 | −4.0 |

*a – dynamics previous year = 100; **b – dynamics year 2010 = 100.

Source: own study based on data from the reports about the state of organic farming in Poland in the years 2011–2012, 2013–2014, 2015–2016.

est decrease a year later – by 23.8% (Table 2). The largest decrease in the share in relations to the base year (2010) was recorded in 2012 and in the years 2014–2016.

The processing of meat and fish is characterized by a trend of cyclical fluctuations (Table 1). In 2010, the share decreased from 6.6% to 5.1% (Agricultural and Food Quality Inspection, 2009–2010, 2011). From 2011–2012, the share of meat and fish processing increased from 5.1% to 7%, and in 2013 in decreased to 4.9%. Next to, it increased to 7% and 7.7% (respectively) in the next years 2014–2015. In 2016, the share decreased again to the level of 6.1%. The largest increase in the share of meat and fish processing was recorded in 2014 as compared to the previous year, by 43%, and the largest decrease was observed a year earlier, by 30% (Table 2). An increase by 51% in the share of processing occurred in 2015 compared to 2010.

Łuczka (2016) indicates a small number of meat processing plants and slaughterhouses, because animal production in many farms is small or mainly concentrated in Podlaskie and Małopolskie Voivodeships.

Milk processing and cheese production had the highest share in the processing of organic products in the years 2012 (4.7%) and 2016 (4.9%) (Table 1). The share in the examined period fluctuated between 2.7% and 4.9%. It is difficult to indicate the trend. The highest increases in the share of milk and cheese processing occurred in 2012 and 2016 – respectively by 56.7% and 58.1% compared to the previous year and by 74.1% and 81.5% in relation to 2010 (Table 2). Milk processing and cheese production are not sufficiently developed. The situation of milk processing is better. There is shortage of highly processed milk products such as yogurt, kefir and homogenized cream cheese on the market (Łuczka, 2016).

The processing of vegetable and animal fats was characterized by an upward trend (Table 1). Starting from the share at the level of 1.3% in 2010, the share grew to 2.7% in 2013, and then it slightly decreased by 0.3% in the next two years. In 2016, it reached the level of 3.5%. By analogy, the only decrease in the share in relation to the previous year was recorded in 2014, by 11.1% (Table 2). High increases in com-

parison to the base year occurred in 2016 (169%), 2013 (107.7%) and in years 2012, 2014 and 2015 (84.6%).

The share of organic processing of sugar is at a very low level – it did not exceed 1.6% in the analyzed period (Table 1). The lowest share was recorded in the years 2010 and 2012 – at the level of 0.3%. Since 2013, the share of sugar processing has stabilized and it is on average at 1.45%. The dynamics in sugar processing was very variable (Table 2). In 2011 and 2013, the share increased by 233% and 433% (respectively) compared to the previous year, and in 2012 – it decreased by 70%. In all years, a high increase in the share of sugar processing occurred also in relation to 2010, expect for 2012, when the share of processing was the same as in the base year.

A large share presents the group of processing of other agri-food products, which includes spices, beverages, cocoa, chocolate, confectionary, ready meals and other processed products. The highest share of this group in the processing of organic products was observed in 2010 – 32.1%. In 2011 and 2012, the share was reduced to 6.3% and 7.3% (respectively) as compared to 2010 (Table 1). Since 2013, there is an upward trend. In 2016, the share was higher by 6% and amounted to 30.8% compared to the lowest one, which occurred in 2012. The dynamics index was negative in each subsequent year compared to the base year, i.e. 2010 – the highest decrease occurred in 2010 – by 22.7% and in 2011 – by 19.6% (Table 2). On the other hand, the highest increase in the share of this industry was noted in 2013, by 12.5%, but in relation to the previous year.

American researches show that organic production gives the opportunity to obtain high-quality, natural and safe products. Therefore, despite its niche range, it is growing dynamically all over the world. The support received by organic production is differently assessed by organic producers. Processing and consumers play an important role in the development process of this production, because the demand for organic food is growing rapidly (Dimitri and Oberholtzer, 2005).

Production and processing in Poland, despite many favourable natural, economic or social condi-

tions, is not at an optimally high level, especially in comparison to Europe. The development of processing is heavily dependent on consumer consumption. In the European Union, in 2017, an average resident spent 67 EUR on organic products. In Europe, it was 47 EUR (Willer and Lernoud, 2019). In 2017, the highest amount on organic products per one resident was spent in Switzerland – 288 EUR, Denmark – 278 EUR and Sweden – 237 EUR (Fig. 2). In Poland, about 6 EUR per person is spent on organic products, i.e. approx. 11 times less than the average resident of the European Union and 48 times less than a resident of Switzerland.

The most commonly purchased organic products include: fruits, vegetables, dairy products, cereal and soy products. Consumers point to the lack of meat and its products, as well as dairy products (Komorowska, 2009). Customers on the organic food market expect greater diversity of assortment, in particular they are looking for dairy, meat and confectionery products (Śliwowska, 2012; Łuczka, 2016).

Food processing, especially organic processing, depends to a large extent on the raw material base and sales market (Śliwowska, 2012), which (in turn) translates into changes in the share in the structure of each industry. According to Kociszewki (2014), production and processing are a weak link in the organic food economy characterized by poor coherence of its components. In researches of Łuczka (2016) and Śliwowska (2012), agricultural producers usually indicated the lack of sufficient number

of processing plants as one of the reasons for difficulties in selling some products, such as milk and meat. In turn, processors think that the low level of production is caused by the lack of continuity of supply and dispersion of organic farms. According to Brodzińska (2010), agri-food processing requires spatial concentration. The results of Kociszewski's studies (2014) indicate that organic farmers are weakly connected with formalized distribution channels. Śliwowska (2012) indicates inadequacy of supply to the demand's place of occurrence. A very good example for the realization of the concept of sustainable development and reconciliation of the production, processing and sale of organic products is Bavaria, where many organizations help in maintaining the highest quality of production. Such an example in Bioland (study trip to Bavaria in June 2018 within the framework of the RDP 2014–2020 technical assistance program).

## SUMMARY

The analysis shows that the number of organic processing plants is systematically growing in Poland, which should be evaluated as a very positive phenomenon. The largest share in the processing of organic products was demonstrated by the processing of fruits and vegetables and the processing of grain mill products. The share of these industries remained in the analyzed years at a relatively equal level with a slight downward trend. Based on the literature, it has
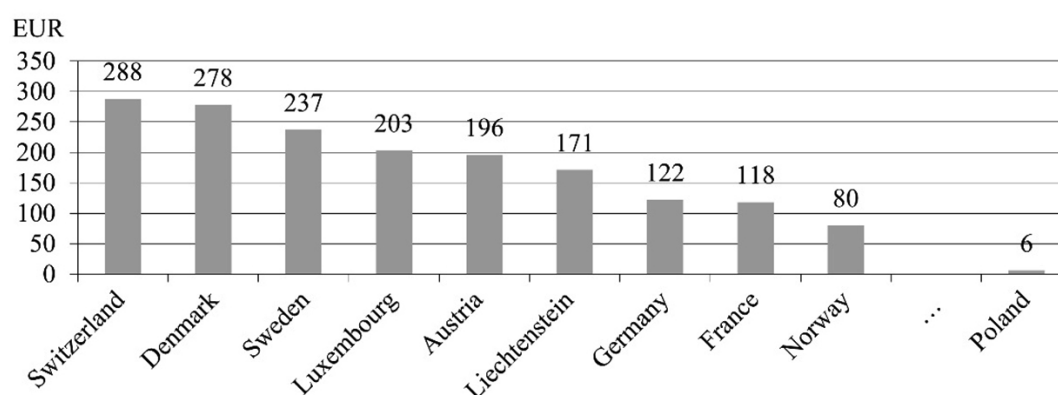
**Figure 2.** Countries in Europe with the highest consumption of organic products per one person in 2017

Source: own study based on Willer and Lernoud (2019).

been found that there are barriers in the development of processing, e.g. lack of developed and permanent forms of cooperation at various levels (from the producer to the consumer). Low consumption of organic products (compared to European countries) also slows down and shapes changes that take place in the structure in individual industries of processing. In order to improve the production capacity of organic processing plants, it seems necessary to change the financing of the organic production, as well as closer forms of cooperation between farmers and processors in order to meet the needs of the processing industry and the entire organic market.

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# FARM TAXATION POLICY IN UKRAINE AND POLAND

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### ABSTRACT

The article discusses the shortcomings of tax policy in the agrarian sector of the economy of Ukraine, which has created non-competitive conditions for small farms. Large agricultural enterprises in Ukraine use the existing special tax regime as an optimization of tax liabilities. This has led to such negative economic, social and environmental consequences as the development of landlands, the deterioration of agricultural landscapes, the increase in export-oriented production, the growth of unemployment in the village and the migration of the rural population. While small farms, without state support, provide the population with basic foodstuffs. The purpose of the article is evidence of the use of a special tax regime only for small farms, based on an analysis of the special tax treatment regime in Polish agriculture and an analysis of the differential rent methodology laid down in the basis of a special tax regime, as well as the development of practical recommendations for Ukraine.

**Key words:** tax regulation, special tax regimes, land rent, agrarian sector, agriculture, foreign experience
**JEL codes:** H3, Q01

## INTRODUCTION

The role of small farms is reinforced by the FAO doctrine developed at the 1996 European conference. According to this doctrine, the economic function of agriculture is complemented by such important non-market functions as: social (food security, employment, solution of demographic problems) and ecological (conservation of soil fertility, the formation of rational agricultural landscapes, protection of water resources) European Council (1996). As a result of the 2001 European conference in the global agrarian economy, it acquired the name "multifunctional agriculture" European Council (2001). The desire to maximize profits through the concentration and intensity of production, lead the loss of agriculture, not only environmental, but social functions.

Therefore, government regulation of such instruments as special tax regimes should be conducive to the development of small forms of management, providing the concept of multifunctional agriculture.

In Ukraine, due to the lack of a doctrine of development of multifunctional agriculture and the corresponding state regulatory policy, classic capitalist enterprises are rapidly developing. At the end of the 1990s, the institutional structure of the agrarian sector consisted mainly of concentrated private enterprises, formed through the reorganization of collective agricultural enterprises. The peasants, who received land plots of approximately 2 ha, leased them or cultivated

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them on their own. The production and profitability of the corporate sector during the independence of Ukraine was falling at an enormous pace, and by 1998 93% of agricultural enterprises were already unprofitable (Ivasko, 2010). Private farms, on the contrary, showed an increase in production. The current economic situation was favourable for the introduction of a special tax regime in order to regulate the organizational structure in favour of unbundling overly large corporations into separate independent business entities and forming a class of family farmers. But in the agrarian sector of Ukraine, a special tax regime was applied specifically to support agricultural producers. In transition economies, a weak institutional environment and "soft" fiscal constraints reinforce an enterprise's incentives for vertical integration, as a mechanism for adapting to institutional inefficiencies (Dannikov, 2015). The effect of such a special regime for 20 years distorted the structure of the industry and caused the formation of latifundia in the agrarian sector, which, due to the scale of production, displaced small farms from the market, monopolizing it.

In the countries of the European community, in particular, in Poland, a special tax regime is aimed at supporting, first of all, small producers. Therefore, it became necessary to study foreign experience in applying a special tax regime in the agricultural sector and to carry out a comparative analysis of the application of these regimes in agriculture of Ukraine and Poland, in view of the similarity of the methodology for calculating the tax base.

## THEORETICAL BACKGROUND

The tax policy in the agricultural sector has its own characteristics, due to the specifics of this industry, its dependence on weather and climatic conditions, inelastic demand for agricultural products and a number of other factors, therefore, special (preferential, simplified) tax regimes (Shubravskaya, Moldavan and Paskhaver, 2012).

Government policies on agricultural taxation affect the competitiveness of farms and other operators in the agricultural sector (Wasilewski and Ganc, 2012). In addition, it affects the scale, structure, organization and direction of agricultural produc-

tion, and also affects the use of productive resources (Dziemianowicz, 2006; Forfa, 2011).

In Ukraine, the peculiarities of the special tax regime led to the deformation of the organizational structure of the agrarian sector in favour of large agrarian enterprises. Vertically integrated structures in the agar sector use a special tax regime that replaces profitable and land taxation as a legal form of tax evasion (Dema, 2014).

Along with the increase in the competitiveness of the agro-industrial production, the activities of agricultural holdings lead to an increase in social tensions in the village, a lack of payments to local budgets and, in general, a negative impact on the social development of rural areas (Moldavan, 2016).

The specificity of the functioning of agriculture in Ukraine at the present stage of its development lies in a significant proportion of households (small farms) in the volume of agricultural production, most of which still do not have the status of a business entity (Tulush and Hryshchenko, 2018).

Reforming the tax policy in the agar sector of Ukraine, one should take into account the specifics of taxation of farmers in EU countries, which is to simplify tax relations with small farmers and general taxation principles for large farmers and corporations.

Therefore, the development of proposals for reforming the tax policy in the agrarian sector of the Ukrainian economy, based on an analysis of the agricultural taxation policy of Poland, is of great importance.

## MATERIALS AND METHOD

The purpose of the article is evidence of the use of a special tax regime only for small farms, based on an analysis of the special tax treatment regime in Polish agriculture and an analysis of the differential rent methodology laid down in the basis of a special tax regime, as well as the development of practical recommendations for Ukraine.

The methods of analysis and synthesis are used in the study of individual composite objects and the generalization of the results obtained, as well as comparative and economic-statistical methods in the process of analysing special tax regimes in the agar

sector of Poland and Ukraine. Methodological principles and methods of a systematic approach are taken as a basis for research. They most fully take into account all aspects of the formation of tax policy for the development of small business in the agricultural sector on the basis of rental relations, taking into account the concept of the development of multifunctional agriculture.

## RESEARCH RESULTS AND DISCUSSION

The organizational structure of agriculture in Poland is, by definition, 99% represented by family farms. These farms have small plots, 56% of which range from 1 to 5 ha, and the average farm size is 9.5 ha (Statistics Poland, 2011).

Family farms include:
− crop farms with an area of more than 1 ha of agricultural land,
− other farms with an agricultural land area of less than 1 ha, including without agricultural land (the so-called special branches of agricultural production). These include the cultivation of vegetables, fruits and berries in greenhouses, livestock and poultry farms (Agricultural Tax Act of 15 November 1984). The regulation of the category "family farm" in Poland was introduced in 2003. According to the Act, a farm is considered family if it meets two criteria: (1) the area of a family farm is limited to 300 ha; (2) managed by an individual farmer. These standards are introduced to limit the excessive concentration of productive capital.

Agrarian policy of Ukraine determined the creation of a class of family farms nominally for the last decades as a priority. This is confirmed by the concept of the State target program for the development of the agrarian sector of the economy for the period up to 2021, adopted by the Cabinet of Ministers of Ukraine (Resolution of 20 December 2019 No 1437-r). However, during this time, the prerequisites for the formation of a class of effective owners and the growth of incomes of peasants on the ruins of the reorganization of the collective form of business (collective farms-state farms) were not prepared, tax measures to support small producers were not created.

Only in 2018, it was decided to amend the Farm Act of 19 June 2003, which provides households with the status of a family farm. According to this Act, these include:
− individuals – entrepreneurs;
− activity: production of exclusively agricultural products, their processing and delivery;
− do not use the work of hired persons;
− only family members of this person can be members of a family farm;
− the area of agricultural land owned and/or used, the lands of the water fund used by members of the family farm may be not less than 2 ha but not more than 20 ha.

It should be noted that the institutional structure of the agricultural sector of Ukraine is heterogeneous. These include partnerships and cooperatives (18.4%), individual enterprises, including farms – legal entities (78.4%), state-owned enterprises (0.6%), and other forms of business (3.6%).

Statistics of Ukraine keeps records of farms only legal entities. The share of such farms in Ukraine among agricultural enterprises is 70%. The distribution of agricultural land between them is uneven. Thus, the largest number of farms (33.3%) has from 20 to 50 ha of farmland in use and covers only 9.6% of the total land area, and 0.2% of farms that manage more than 4,000 ha each cover 7.7% of the total area of agricultural land, the average size of the Ukrainian farm is 106 ha. Less than 2% of agricultural enterprises of other legal forms cover 30% of the total area of agricultural land, the average area of which is more than 9,000 ha[3].

In Ukraine, according to unofficial statistics, at the end of 2011 there were 80 agro-industrial trading companies, and 93 in 2017. The land bank of these structures grew by 6.3% over this period and amounted to about 5.95 million ha (Polyvka, 2018).

A comparative analysis of the organizational structure of the agrarian sector of Ukraine and Poland

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[3] Official site of the State Statistics Committee of Ukraine (in Ukrainian Gosudarstvennogo komiteta statistiki Ukrainy). Retrieved from: http: www.ukrstat.gov.ua [Access 15.04.2019].

according to the size of the land shows that a large group of landowner enterprises has been formed in the Ukrainian agricultural sector, therefore most of the small farms are non-competitive, both in production costs and production volumes (Dannikov and Ivasko, 2019). Accordingly, during periods of sharp collapse in demand in the markets and falling prices, such agricultural producers are isolated from the international market.

In our opinion, this does not correspond to the European business model, which can be demonstrated by the example of Poland, in which the number of farms with an area of more than 100 ha is only 0.85% (Pylypchuk and Ivasko, 2013). We believe that an imperfect tax system of Ukraine plays a significant role in this imbalance and distortion of the competitive environment in the agricultural business.

We will conduct a detailed analysis of the special tax regime for the Polish agricultural sector. Family farms in Poland enjoy a special tax regime in the form of agricultural tax (Agricultural Tax Act of 15 November 1984), which replaces the income tax. This tax is based on the cadastral valuation of land fertility according to the type, quality and location of the land plot. From a methodological point of view, the agricultural tax of Poland is a tax on land rent, that is, on the average yield from the land.

In Poland, depending on the natural qualities of the soils, which determine the yield of agricultural crops, the land is divided into 10 main classes. Depending on the economic and production conditions in Poland, there are four tax districts with different coefficients.

The subjects of taxation are individuals and legal entities that are engaged in agricultural activities. The tax base is the number of hectares of land multiplied by the coefficient calculated in accordance with the classification of agricultural lands, including those allocated for agricultural buildings.

The tax rate is equal to the cash equivalent of the cost of 2.5 kg of rye, which is calculated based on the average purchase price of rye for the 3 quarters preceding the current financial year. It is assumed that the market value of rye correlates with the profitability of the farmer. As the analysis of the agricultural tax component of Poland shows, the average cost of

1 centner of rye for taxation purposes in 2015–2017 decreased by 22% compared to 2014 and in 2018 it rushed to growth.

This preferential tax treatment applies only to agricultural activities defined by law. Farmers who engage in activities in the field of special branches of agricultural production in excess of established standards pay income tax. In Poland, income taxation is progressive, but profits from special sectors of agricultural production, regardless of size, are subject to a flat rate of 18%.

A legal entity that engages in mixed activities is exempt from paying income tax if, for the previous fiscal year, the amount of income from agricultural activities was at least 60% of the income from all types of activities.

In Ukraine, a special tax regime, as in Poland, is based on cadastral valuation of land. The basis of this regime is the normative monetary value of one hectare of agricultural land. The standard monetary valuation of 1 ha of agricultural land is a complex aggregate indicator that expresses the average income of the land – the differential rent.

The tax amount is calculated by multiplying the standard monetary value by the rate and area of agricultural land. Rates depending on the territorial conditions for arable land is 0.57% and 0.95%, for perennial plantations – 0.19% and 0.57%, for production on protected ground – 6.33% (Tax Code of Ukraine).

Since the beginning of its existence, the main essence of the special tax regime was to reduce the tax burden and simplify the payment of 12 taxes and fees, including income tax, land tax, deductions to the Pension Fund and the Social Insurance Fund. Since 2011, their number has decreased to 4, including income tax and land tax.

During 2008–2018, it could only be used by legal entities, regardless of their legal form, whose share of agricultural production in the previous tax (reporting) year is equal to or exceeds 75%. Since 2018, not only legal entities, but also individuals can take advantage of a special tax regime.

Analysis of the dynamics of changes in the normative monetary value of land in Ukraine relative to 2014 shows its rapid growth of +50% over the course

of 2016–2017 through the use of a cumulative index-ation rate. By 2019 in Ukraine, tax rates for farmers increased more than 5 times. Thus, the fee for 1 ha of farmland has increased to 20 USD (at the rate of National Bank of Ukraine at 1 March 2019), which is 7 times more than in 2014.

In 2012, enterprises paid 1–1.3 USD per ha of agricultural land (at the NBU rate in 2012), while in Poland the agricultural tax for 1 ha of land was about 60 USD (at the rate of pulp and paper industry in 2012). A paradoxical fact was that the Ukrainian personal peasant farms could not apply this special tax regime and paid land tax, the rates of which were several times higher.

Special tax regime in the agricultural sector of Ukraine is based on the differential land rent type I. Differential land rent type I occurs due to differences in fertility and the location of the land and agricultural activities by the extensive method. This method of cultivation of land is characteristic only for small forms of management.

Differential land rent type II arises in connection with additional capital investments in land plots such as: fertilization, improvement of agricultural technology, and reclamation work. They create "artificial" or economic fertility and increase productivity. When a farmer does business in his own land, differential rent type II remains entirely in his ownership. If the owner of the land rents it, then he receives only part of the differential rent II in the form of rent. Scientists argue that a differential land rent type III arises on the scale of a vertically integrated structure (Borodina et al., 2012).

In all cases, the source of differential rent is the excess profit received by the tenant or the owner of the land. From a methodological point of view, excess profits are the basis for calculating the income tax. And it proves the imperfection of the special tax regime in the agar sector of Ukraine, which is replaced by income tax for large agricultural enterprises.

Thus, in the agrarian sector of Ukraine, a monopoly of agricultural land is developed, where, as an object of management, it is in the monopoly use of capitalist entrepreneurs who will not allow capital investments by other such entrepreneurs on it and thus receive surplus surplus value over average profit.

## CONCLUSIONS

As the analysis showed, the institutional structure of agriculture in Poland is homogeneous, the majority of which are non-food farms. This argues that the preferential tax regime based on rental income applies only to small family farms. This mode simplifies tax calculations based on the average yield of agricultural land and allows you to save on additional costs.

Analysis of the methodology for the formation of differential rent of the first and second types helped to identify the shortcomings of the methodology of the current simplified tax regime in Ukraine. This mode allows large agricultural enterprises to earn excess profits by assigning a differential rent of type II and type III, which is the basis for the payment of income tax.

Thus, our study proves that the application of a special tax regime with a simplified nature to high--yield farmers, as well as to vertically integrated companies, is unreasonable.

Therefore, in order to regulate the taxation policy of farms in Ukraine, it is necessary to establish restrictions in the application of a special tax regime, which will exclude the possibility to use it by large agrarian enterprises in order to reduce their tax liabilities and increase non-taxable excess profits.

According to Poland's experience, it is also necessary to exclude farms conducting special activity in agricultural production from preferential taxation in Ukraine, which do not depend on climatic conditions, seasonality and have a short period of capital turnover. For this, it is necessary to legally define the norms of non-production in such industries.

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# PERSPECTIVE DEVELOPMENT OF THE GRAIN MARKET AND ITS REGULATION MECHANISM IN UKRAINE

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## ABSTRACT

The article gives an economic assessment of the current state of the grain industry development, determines the main factors influencing the formation of demand and supply on the grain market. The lack of efficiency of the mechanism of regulation of the grain market in Ukraine is substantiated on the basis of the obtained values of "market price support" indicators per 1 t of grain and "nominal coefficient of protection of producers" used in the countries of the Organization for Economic Co-operation and Development (OECD). The forecasts of gross collections of cereals and legumes, as well as their volumes of domestic consumption in Ukraine for the period up to 2025 are estimated. The state of transport and logistics infrastructure of the grain market of Ukraine is estimated. Based on the analysis carried out, strategic guidelines for the development of the grain market and its regulation mechanism are proposed.

**Key words:** grain market, grain production, mechanism, state regulation, logistics, export potential
**JEL codes:** Q13, Q18, O21

## INTRODUCTION

In recent years, Ukraine has significantly increased grain production and entered the cohort of its major producers and exporters. Despite the positive dynamics, there are a number of problems that hinder its further development. In particular, infrastructure costs for grain exports remain at a rather high level, which reduces the competitiveness of domestic grain in the foreign market. The transport infrastructure does not quite meet the needs of the grain market due to the operation of the railway transport, the unpredicted increase in tariffs for the transportation of grain by rail, mainly the unsatisfactory state of highways, the lack of development of river transport. To date, the problem with logistics was less felt, since export volumes were significantly lower, and high grain prices with surplus blocked additional logistics costs. However, in the context of the decline in world prices observed during 2013–2017, the inefficiency of transport and logistics infrastructure on the grain market was significantly affected by the income of agricultural producers.

Positive tendencies to increase the volume of production and export of grain, accompanied by

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instability of prices and incomes of commodity producers, monopolization of the market and over concentration of production by large companies, it is not always possible to balance the interests of the main market participants (producers, consumers and the state).

Practice shows that due to insufficient quality, Ukraine exports mostly cheap feed grain, while it is forced to import meat, meat and dairy products, and animal feed. From this point of view, the preservation of such trends shows that our state can remain an appendage of raw materials of developed countries, leaving them added value and creating new jobs for them. In this case, without structural changes in the agriculture sector of the domestic economy, in our opinion, it will be quite difficult to solve the problems of poverty, unemployment in the countryside and the revival and development of rural areas.

## MATERIALS AND METHODS

During the research, the following methods were used: comparative analysis and expert assessments – for the analysis of quantitative and qualitative indicators of development of the domestic grain market in the conditions of globalization; statistical-economic – for the collection and processing of statistical data, studying the dynamics of exports and imports of grain; economics and mathematics – to predict the impact of demand factors (consumption on food and feed purposes, exports and stocks) and supply (yield,

area, production, imports and stocks) on the grain market for the period up to 2025.

In order to evaluate the effectiveness of agricultural policy and the level of domestic support of agriculture there was used the methodology which is applied in the country-members of Organization for Economic Co-operation and Development (OECD). The methodology of the quantitative estimation of the state support is substantiated in the works of such famous scientists as Josling (1973), Tsakok (1990), and Webb, Lopes and Penn (1990).

In a market economy, for the development of a balanced agriculture policy it is very important to correctly determine its effectiveness, directly for those who produce agricultural products. Having this aim and according to the methodology of the OECD, and the indicator "market price support" (*MPS*) is used, which determines the monetary value of gross transfers to producers from consumers and taxpayers for the year that arose as a result of the state policy means that creates a gap between prices for a certain kind of grain in the domestic and foreign markets (OECD, 2018) – Figure 1.

Indicator *MPS* is determined in producer prices and is calculated by the formula (OECD, 2018):

$$MPS = (P_p - P_w) \cdot S_1 \qquad (1)$$

where:
$P_p$ – internal price per unit of output;
$P_w$ – world price per unit of output;
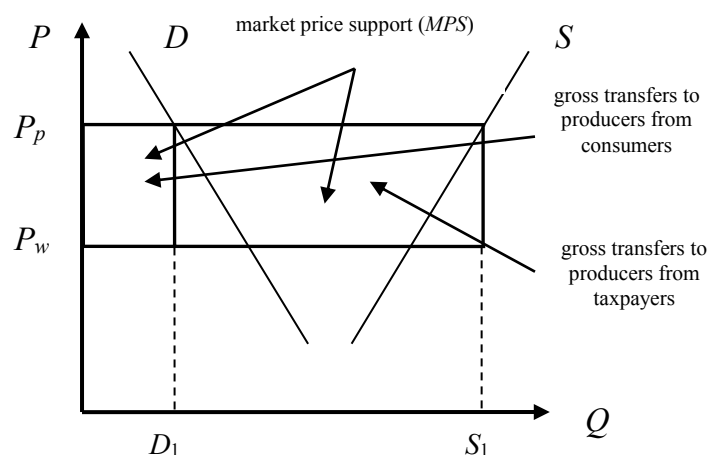$S_1$ – supply of the domestic market.



**Figure 1.** Market price support (*MPS*) for agricultural products

In world practice, the effectiveness of state support of agricultural production is determined by comparing the domestic price for it with world market prices. This approach is based on the fact that without government intervention, that is for free competition in domestic and foreign markets the distinction between domestic and world prices would have disappeared. One of the simplest indicators assessing the level of state support is nominal protection coefficient (*NPC*) manufacturers, which evaluates only the ratio of domestic and world prices (OECD, 2018).

$$NPC_m = \frac{P_i^d}{P_i^r} \qquad (2)$$

where:
$P_i^d$ – domestic price of the product *i*;
$P_i^r$ – world market price of the product *i*.

## RESULTS

The grain market of Ukraine is one of the main segments of the agro-food market, which state determines the country's food security, the results of economic activity of agricultural producers and, in general, the welfare of the Ukrainian people.

The formation of the mechanism of state regulation of the grain market in Ukraine took place in several stages: in 2000–2008, the strengthening of regulatory influence; 2008–2010 liberalization as a result of Ukraine's accession to the World Trade Organization (WTO), high yields and activity of grain business players; 2010–2011 – introduction of a mechanism for export quotation. From 2014, a new stage of deregulation of the grain market has come to the end, which resulted in the abolition of the mandatory quarantine certificate for internal grain transportation, cancelled 14 permits, 6 licenses, introduced more than 50 other changes. From 1 January 2017, all grain market participants work in conditions of complete cancellation of special regime of VAT, and from 1 April 2017 – its automatic compensation for exporters was introduced.

According to the data of Table 1 the gross grain harvest in Ukraine on average for 2015–2017 has almost doubled in comparison with 2000–2002, mainly due to increase in average yield from 24.6 to 43.2 center per 1 ha.

Among the main grain crops, the largest increase in gross volumes was achieved in corn. Thus, during the study period, it increased by 6.5 times, having overcome a 30-millionth cut in individual harvest years. This was facilitated by the expansion of the collected area from an average of 1.2 million ha in 2000–2002 to 4.3 million ha in 2015–2017, with an increase of almost twice the average yield. Moreover, the range of corn spreading through the development of breeding and the introduction of new technologies now covers virtually all natural and climatic zones of Ukraine.

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In the structure of grain and legume production in Ukraine over the analysed period, agricultural enterprises produce about 80% of the total volume, including farms – 12–13%, respectively, 20% belong to households, which mainly grow a considerable part of oats, millet and rye and buckwheat.

At the same time, large enterprises are oriented mainly on export types of grain crops (corn, wheat), which are more profitable from the point of view of profit and accordingly require more investment of resources per hectare of area (Kozak and Hryshchenko, 2016).

Analysing the current grain market, it is necessary to pay attention to the uneven development and imbalance of demand and supply in the context of individual grain crops. In particular, if in the last 5 marketing years in Ukraine the supply of wheat and maize has a tendency to increase, then rye – decreased by almost half, oats – by 25%.

The main areas of use of grain within the state are the formation of a consumption fund, a feed and seed fund, food production and industrial processing of grain (Table 2).

**Table 1.** Gross production, collected area and yield of main grain crops of Ukraine on average over the period 2000–2017

| Specification | 2000–2002 | 2003–2005 | 2006–2008 | 2009–2011 | 2012–2014 | 2015–2017 |
|---|---|---|---|---|---|---|
| Grains and legumes | | | | | | |
| Gross production (thous. t) | 34 323.0 | 33 353.0 | 38 947.7 | 47 348.7 | 57 708.9 | 62 710.2 |
| Harvested area (thous. t) | 13 828.0 | 13 498.0 | 14 333.5 | 15 122.2 | 15 074.6 | 14 512.8 |
| Yield (center/ha) | 24.6 | 24.2 | 26.8 | 31.2 | 38.3 | 43.2 |
| Wheat | | | | | | |
| Grain production (thous. t) | 17 367.0 | 13 272.9 | 17 923.5 | 20 020.4 | 20 718.6 | 26 244.5 |
| Harvested area (thous. t) | 6 264.5 | 4 853.7 | 6 172.0 | 6 564.8 | 6 068.8 | 6 463.3 |
| Yield (center/ha) | 27.1 | 24.9 | 28.5 | 30.4 | 34.0 | 40.7 |
| Corn | | | | | | |
| Grain production (thous. t) | 3 889.7 | 7 636.2 | 8 431.2 | 15 092.4 | 26 802.6 | 25 357.0 |
| Harvested area (thous. t) | 11 96.8 | 1 982.6 | 2 021.1 | 2 760.1 | 4 608.6 | 4 272.1 |
| Yield (center/ha) | 32.6 | 38.8 | 41.1 | 53.3 | 57.9 | 59.4 |
| Barley | | | | | | |
| Grain production (thous. t) | 9 140.5 | 8 964.2 | 9 977.8 | 9 805.2 | 7 848.0 | 8 669.7 |
| Harvested area (thous. t) | 3 920.9 | 4 488.7 | 4 497.3 | 4 331.5 | 3 176.4 | 2 722.0 |
| Yield (center/ha) | 23.2 | 20.0 | 22.2 | 22.7 | 24.9 | 31.9 |

Source: calculated on the basis of Prokopenko (2017).

**Table 2.** Balance of grain and leguminous crops, including grain processing products in terms of grain in 2000, 2005, 2010, 2013–2017

| Specification | 2000 | 2005 | 2010 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Production (thous. t) | 24 459 | 38 016 | 39 271 | 63 051 | 63 859 | 60 126 | 66 088 | 61 917 |
| Carry out (thous. t) | 1 329 | −314 | −2 054 | 6 933 | 2 977 | −3 204 | 2 130 | −1 465 |
| Import (thous. t) | 1 010 | 226 | 175 | 242 | 263 | 190 | 240 | 255 |
| Total supply (thous. t) | 24 140 | 38 556 | 41 500 | 56 360 | 61 145 | 63 520 | 64 198 | 63 637 |
| Export (thous. t) | 1 330 | 12 650 | 14 239 | 27 836 | 33 423 | 38 338 | 41 451 | 42 499 |
| Feed use (thous. t) | 11 056 | 13 817 | 14 787 | 16 183 | 15 678 | 14 189 | 12 278 | 11 011 |
| Seeds (thous. t) | 3 597 | 3 294 | 3 222 | 2 890 | 2 883 | 2 597 | 2 330 | 2 120 |
| Losses (thous. t) | 309 | 375 | 794 | 1 506 | 1 593 | 1 400 | 1 350 | 1 106 |
| Industrial use (thous. t) | 100 | 670 | 1 650 | 1 367 | 1 281 | 1 089 | 1 044 | 1 246 |
| Consumption (thous. t) | 7 748 | 7 750 | 6 808 | 6 578 | 6 224 | 5 897 | 5 745 | 5 655 |
| Consumption per capita (kg) | 124.9 | 123.5 | 111.3 | 108.4 | 108.5 | 103.2 | 101.0 | 100.8 |

Source: calculated on the basis of State Statistics Service of Ukraine (2018).

In the structure of grain consumption, the largest share is feed and food consumption. The decline in livestock in Ukraine in recent years is offset by an increase in the number of poultry. Given the above, feed is used in absolute values at the level of 11–15 million t, but relative – we tend to reduce. In particular, in 2017, it was 17.3%, compared to 2016 – 19.1%, in 2015 – 22.3%. Food consumption of grain is relatively stable, although in recent years there has been a tendency to decrease it. The main reasons include: reduction of the population; leaving a significant number of our citizens to work abroad; more economical attitude to bakery products; change in diet.

The analysis shows that an increase in grain production is accompanied by an increase in its export potential. Over the past two years, Ukraine has been exporting record grain volumes – more than 40 million t. However, this is not always reflected in the increase in currency earnings. For example, in the wake of 2016, Ukraine exported a record volume of grain crops – 41.5 million t, which is almost 8% higher than exports in 2015. But due to lower world prices for raw materials, record volumes of grain exports from Ukraine in 2016 did not bring record earnings. It re-

mained at almost the level of 2015 – about 6.1 billion USD. The quality of products is also a major problem in exporting grain crops. According to the results of 2016, 57.0% of the wheat sold outside the state is forage. That is, the share of non-food grain, which is reflected in the price and accordingly in export earnings, is increasing.

The research has shown that price instability in the grain market indicates a lack of effective state regulation. In particular, the following manifestations of such imperfection include: instability of prices and incomes of commodity producers; not entirely predictable state policy; it is not always possible to balance the interests of the main market participants (producers, consumers and the state).

The obtained value of the indicator "market price support" for wheat growers in Ukraine in 2000–2017 indicates a significant amount of shortfall in gross transfers from consumers and taxpayers (Fig. 2).

The obtained values of the indicator the manufacturer's nominal producer protection coefficient (defined as the ratio of the domestic purchase price to the world price) for grain producers is confirmed by price instability and insufficient efficiency of the mechanism of grain market regulation in Ukraine.
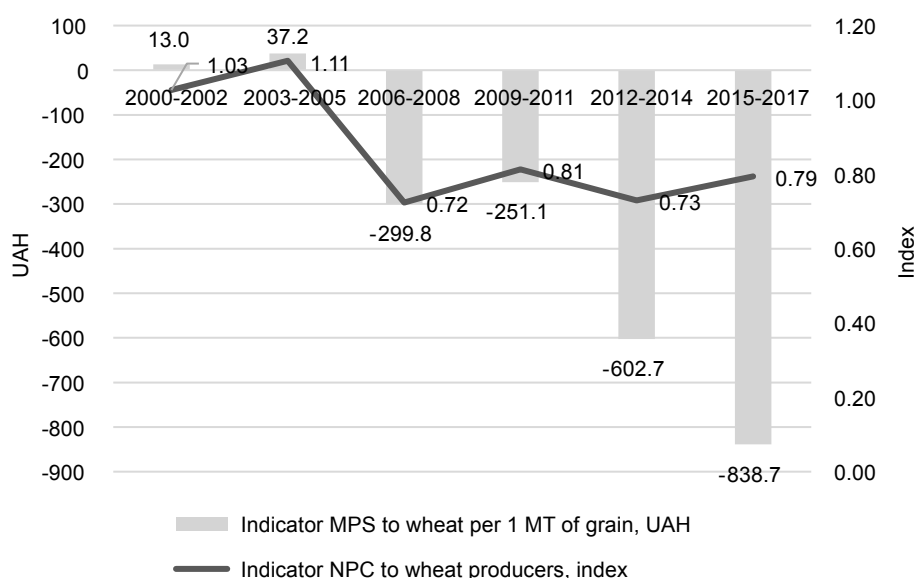


**Figure 2.** Indicators "nominal producer protection coefficient" (*NPC*) and "market price support" (*MPS*) of wheat producers in Ukraine per 1 t of grain per average period

Source: calculated on the basis of Prokopenko (2018).

In particular, as the competitiveness of domestic grain on the world market is ensured by lower grain prices, wheat exporters (grain traders) compensate for their price losses due to lower grain quality and logistic costs due to low purchasing prices. According to the calculations, wheat purchasing prices at the enterprise level on average for 2015–2017 in Ukraine were 21% lower than the world average. At the same time, agricultural commodity producers in turn compensate for price losses due to the low cost of land lease and wages of employees. Therefore, further increase in grain production in Ukraine needs a reduction in logistics costs due to the development of the transport and logistics infrastructure of the grain market in the medium and long term. Under these conditions, an important task of the state agricultural policy is the formation of a system of regulation of agro-food markets based on the expansion of the forecasting horizon.

Based on the second order polynomial trend extrapolation method developed forecasts of gross harvest of grain and leguminous and domestic consumption of grain and forage for food purposes in Ukraine until 2025 (Fig. 3).

Output data for forecasting the gross production of grains and legumes, as well as grain consumption for food purposes and feed costs were selected for the period from 2005–2016, according to the State Statistics Service of Ukraine. The predicted results showed that the production potential of grains by 2025 could potentially be around 100 million t, without structural changes in agricultural development, the consumption of grain in Ukraine would be reduced in favour of its exports. As a result, it can lead to deepening both transport and logistics and other problems of the development of the grain industry. The calculations have shown that Ukraine has a potential for increasing grain production and, accordingly, an increase in exports to 60–70 million t. At the same time, farmers must do everything necessary for the production of high quality grain.

Analysis has shown that the central link in the regulation of the grain market is its price, which should balance the interests of producers and consumers, exporters and importers. Especially acute imbalance of these interests manifests itself in the context of the financial and economic crisis.
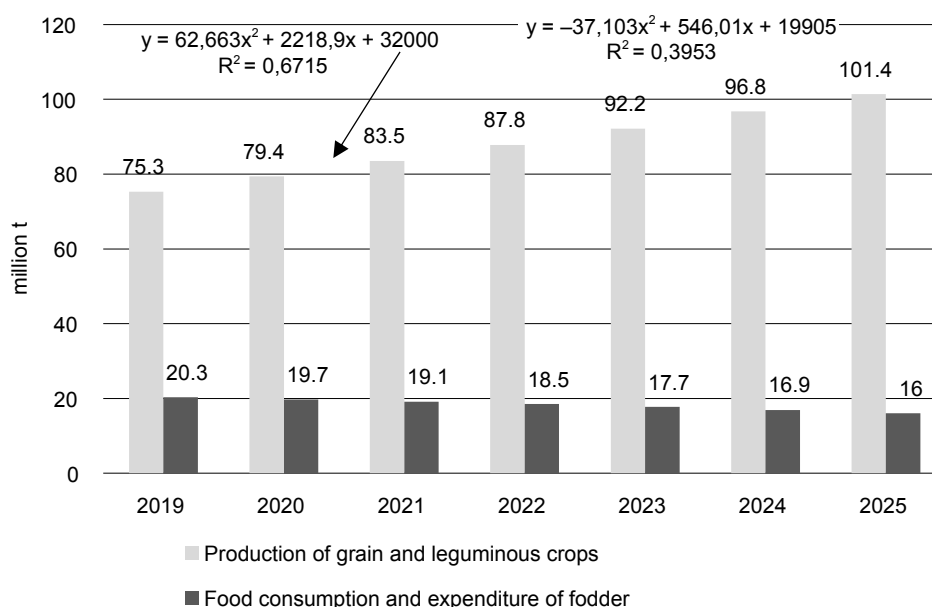


**Figure 3.** Forecasting of gross production of grain and legumes and grain consumption for food purposes and feed costs in Ukraine for the period till 2025

Source: calculated on the basis of Prokopenko (2018).

To substantiate the state management decisions in the field of agricultural production regulation, it is important and necessary to have predictions of grain prices both on the world market and on the domestic market. However, in Ukraine, the forecast of grain prices is complicated not only by price volatility, but also by the devaluation of the national currency. Therefore, in our view, in order to take into account the influence of inflation, as well as the specificity of grain production, in particular the time lag between the costs incurred and the financial results obtained, we should use the indicator of the level of profitability of grain production. The value of this indicator makes it possible to compare income (profit) and expenses in the production of grain, to answer the question whether the current procurement price ensures the processes of reproduction in the industry. Since the value of economic variables is determined, as a rule, by not one and a few factors, one of the most effective ways of measuring their quantitative effect on the resultant sign is the use of multiple linear regression.

The basis of the proposed model is the interaction of demand (domestic consumption and exports), offers (gross production due to harvested areas and yields, imports, stocks), inflation and average annual prices, and their impact on the production efficiency of wheat. With the help of multiple linear regression, the factors that most affect the level of profitability of wheat production are determined ($\hat{y}$).

The equation of multiple linear regression for the abovementioned parameters for wheat grain in Ukraine for the period from 2000/01 MY to 2016/17 MY is:

$$\hat{y} = -61.3 - 0.02x_1 - 2.27x_2 + 0.016x_3 - \\ - 0.014x_4 - 0.01x_5 + 0.014x_6 + 0.002x_7 + \\ + 0.99x_8 \quad\quad (3)$$

which:
$\hat{y}$ – profitability level (%);
$x_1$ – harvested area (thous. ha);
$x_2$ – yield (center/ha);
$x_3$ – average price of 1 t (UAH);
$x_4$ – stocks (thous. t);
$x_5$ – import (thous. t);
$x_6$ – domestic consumption (thous. t);
$x_7$ – export (thous. t);
$x_8$ – inflation level (%).

The coefficient of the multiple correlation is 0.888 (value from 0 to 1), which means an extremely high correlation between the predicted level of profitability for wheat grain and the linear combination of the above parameters. The statistical significance of the result is confirmed by a high determination coefficient of $R^2 = 0.777$ and suggests that the regression is explained by the 77.7% variance of the value of the formation of the average annual price for wheat grain. The results obtained are fully consistent with the provisions of the law of demand and supply.

Taking into account the increase of export volumes of grain in recent years and the export orientation of the Ukrainian grain market in general, port grain terminals have become the key subject of the transport and logistics system. The analysis shows that the transport infrastructure does not meet the needs of the domestic market due to the operation of the railway transport, the unsatisfactory condition of individual sections of the connecting roads of the regions with the Black Sea ports, undeveloped river transport. This can be accompanied by high tariffs for transportation, in particular, the level of costs for agrarian logistics in Ukraine far exceeds the relevant indicators in developed countries exporting grain. In particular, calculations of infrastructure costs when exporting grain from Ukraine are on average about 600 UAH per 1 t, or about 15% of all costs (Table 3).

In order to increase the efficiency of transport and logistics infrastructure, it is necessary to establish clear and transparent "rules of the game" in the market, which will stimulate competition and attract private investments to develop the objects of logistic infrastructure, development of river transport infrastructure. It is also necessary to establish clear rules and tariffs for the use of railway infrastructure, stimulate investment attraction in upgrading capacity for storage and handling of grain, automation of transport and logistics processes, which will allow not only to improve the efficiency of the logistics system, but also provide the required speed of transportation of significant volumes of grain.

**Table 3.** Infrastructure costs for grain exports (FOB terms) as of June 2017

| Costs | Standard (methodology) of calculation | Cost per 1 t of grain (UAH) | % |
|---|---|---|---|
| Transportation costs* (by rail to the seaport) | 489 km at the tariff of Ukrzaliznytsia with VAT | 256.80 | 42.7 |
| Ship loading on port | 12 USD/t | 322.56 | 53.6 |
| Total cost of certificates, total, including: | | 17.06 | 2.8 |
| certificate of origin | is included in the cost of loading services | – | – |
| quality certificate (including cost of analyses and work of survereur) | 0.3 USD/t | 1.43 | – |
| fumigation certificate | 0.5 USD/t | 0.63 | – |
| non-radioactive certificate | is included in the cost of loading services | 15.00 | – |
| phytosanitary certificate | is included in the cost of loading services | – | – |
| Cargo customs declaration | 150 USD | 5.58 | 0.9 |
| Total cost | | 602.00 | 100.00 |

Source: calculated according to the data of Ukrainian sea ports authority (2019).

## CONCLUSIONS

Positive tendencies to increase the volumes of production and export of grain observed in recent years in Ukraine are accompanied by instability of commodity producers' prices and revenues, monopolization of the market and over-concentration of production by large companies, uneven distribution of market gain, it is not always possible to balance the interests of the main market participants (producers, consumers and the state) poses a threat to food security and negatively affects the development of the grain market.

Constraining factors for grain exports is the domestic transport and logistics infrastructure, which works with low efficiency of processing and transportation of grain. In particular, the cost of grain logistics from the producer in Ukraine to the ports in the Black Sea is approximately 40% higher than the cost of similar costs in France or Germany, and 30% – than in the United States. Therefore, the contradiction between the rates of development of the grain industry and transport and logistics infrastructure becomes an urgent problem and needs to be solved at the state level through the improvement of the mechanism of regulation of the grain market.

In addition, the development of grain logistics infrastructure provides job creation, added value of products, which contributes to increasing revenues in the state and local budgets. Consequently, the reform of state regulation should be comprehensive and aimed at eliminating the barriers to private companies operating in the market of agrarian logistics and having the desire to invest in infrastructure upgrades.

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# WORK PRODUCTIVITY IN WINE FARMS IN SELECTED COUNTRIES OF THE EUROPEAN UNION

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### ABSTRACT

In the European Union, one of the industries which is of great economic and market importance and accordingly is to a large extent dependent on quantity and quality of labour resources is viticulture and wine production. The main objective of the research was to determine the productivity of work in wine farms in selected EU countries in the years 2004–2017. It was found that there was an increase in labour productivity in wine farms in almost all countries selected for research. The largest increase was recorded for Czech, Portuguese and Bulgarian farms. Nevertheless, the highest productivity of work was characteristic for French, German, Austrian and Italian farms. Additionally together with the increase in the economic size of wine farms, the productivity of work increased too.

**Key words:** work productivity, wine farms, FADN, European Union
**JEL codes:** Q12, D24

## INTRODUCTION

All production factors are involved in the production process (especially in agriculture they are: land, labour and capital as well as knowledge, which is also increasingly mentioned). However, more and more often it is indicated that the most important role is played by the effectiveness of using labour resources (Ruttan, 2002). The efficiency and competitiveness of a given sector, and in particular agriculture, depends on the level and the possibility of increasing work productivity (Sumanth, 1997). Thus, work efficiency is the main factor affecting the level of development of societies. At the same time, it should be remembered, however, that the impact of the labour factor on the efficiency and competitiveness of a given sector as well as performance of the individual farm is also determined by systemic factors, both endo- and exogenous (Lagakos and Waugh, 2013).

When analysing the agricultural sector in the European Union, it can be noticed that one of the industries which is of great economic and market importance and which is to a large extent dependent on significant labour resources is viticulture and wine production. The European Union as a whole, including in particular countries such as France, Italy and Spain, on the one hand, are leaders in the production and trade of wine, and on the other, they engage sig-

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nificant labour resources in this sector (Dirksmeyer, Strohm and Garming, 2014). However, as research shows, the quality of the work provided and its productivity differ significantly with respect to the agricultural sector in the European Union. Therefore, it is advisable to address the efficiency of the wine sector in EU countries, in particular to determine the productivity of work in wine farms.

## THEORETICAL BACKGROUND

In the agricultural sector in the European Union, a total of about 10 million professionally active people are employed, accounting for 4.4% of total employment. Of all 28 Member States, 7 in agriculture work almost three-quarters of all those employed in agriculture. They are: Germany, Bulgaria, Spain, France, Italy, Poland and Romania (Eurostat, 2018). According to research over the last twenty years, the total number of employed in agriculture has decreased, with simultaneous increase in labour productivity (Martin-Retortillo and Pinillia, 2012). As the main factor in the growth of labour productivity in agriculture, the most important is the significant increase in the use of other factors of production, in particular technical, from other sectors of the economy. According to Kusz and Misiak (2017), the technical work equipment is responsible for the increase in work efficiency in agriculture in over 60%.

It should be also emphasized that the level of labour productivity in the European Union is various in particular Member States. According to Baer-Nawrocka (2010), this diversity results from both production and economic factors, i.e. the level of economic development, the level of capital utilization, and technical labour equipment; socio-political factors, including the political system, structural changes, agrarian culture, social capital; as well as the environmental factors. In addition, Jaroszewska and Pietrzykowski (2018) pay an attention for significant regional diversification of the labour productivity level within the Member States themselves. They point out that the level of differentiation is smaller in most of the old Member States (Greece is a significant exception) and fluctuates around the average for the country, and much larger in the new Member States.

Researchers also point to other factors that systematically improve agricultural productivity. These factors can be divided into two main exo- and endogenous categories. External factors – exogenous include those for which farmers individually have no direct influence. It has been shown that one of the main such factors is the general level of remuneration in the economy, including in particular in other production sectors (Bervidova, 2002; Góral and Rembisz, 2018). It has been found that the higher wages in other sectors of the economy, the more labour resources flows out of them to agriculture, thus increasing the productivity of people who have decided to stay. The second important factor affecting labour productivity is the state's policy towards agriculture (Dorward, 2013). As underlined by (Novotna and Volek, 2016), there is a convergence effect related to the use of subsidies. Along with the increase in support for agriculture, in particular of small farms, labour productivity increases in them (Bervidova, 2002). Jarka (2013) emphasizes that the rate of change in the agrarian structure is also an important exogenous factor. Along with the increase in the size of farms and the scale of production, work productivity increases. A systemic effect is revealed here, because such farms are usually more technologically advanced. It is worth noting that farms cultivating grapevines are influenced by these exogenous factors and the work efficiency in them is also conditioned on them. As shown by Galindro et al. (2018) or Goncharuk and Sellers-Rubio (2018) in the shaping of work productivity in wine farms the remuneration offered in other sectors of the economy plays a significant role.

However, the main role in determining labour productivity in agriculture is played by factors that are internal or endogenous. These include mainly the size of the farm. Takacs et al. (2008) research shows that along with the increase in the size of the farm, work productivity also increases. At the same time Novotna and Volek (2016) show that with the increase in the size group of farms, the internal diversity of labour productivity diminishes. Another key internal factor determining work efficiency in agriculture, in particular in wine farms, is the level of their technical and technological advancement. As studies by Tomsik et al. (2016) or Török and Tóth (2013) show, vineyard

farms with a significant degree of technology implementation are characterized by higher work efficiency. In relation to agriculture in general, only a few researchers indicate the role of the knowledge factor in shaping work efficiency. This role is revealed in sectors that use knowledge intensively, also at the level of basic work. An example of such a sector are wine farms. The knowledge of those working in them influences not only the quality of the achieved results in the form of a valuable crop, but also the effectiveness of the work itself. Research by or Sellers-Rubio, Alampi-Sottini and Menghini (2016) or Goncharuk and Figurek (2017) showed that the higher the knowledge and awareness of the vineyard's farmers and employees, the higher their productivity.

## MATERIALS AND METHODS

The main objective of the research was to determine the productivity of work in wine farms in selected EU countries in the years 2004–2017. Labour productivity was defined as the net value added (farm value net added) per 1 full-time employee (AWU – annual work unit). Net value added is the total production value reduced by intermediate consumption (direct and general economic costs), including depreciation and includes the balance of subsidies and taxes related to operating activities. The work productivity study was defined for selected EU countries, including on average for the whole EU, then broken down according to the economic size criterion on average both for the EU and selected EU countries. Due to the lack of data for some countries, a detailed analysis covered only selected countries.

The study uses data from the EU's agricultural accounting system (FADN). As part of this accounting, data for 14 countries were acquired in the audited period: Austria, Bulgaria, Croatia, Cyprus, Greece, Spain, France, Germany, Portugal, Romania, Slovenia, Hungary and Italy. Wine farms for research were separated according to the Year * Country * SIZ6 * TF8 typology (Type 3 Wine and 6 economy classes). There were applied simple descriptive statistics methods, including dynamics of changes using exponential regression analysis. In order to make the value in the accounts realistically, the consumer price index

(HICP) was taken into account. In order to eliminate variability in agriculture, average 3-year studies were used for research and comparisons.

## RESULTS AND DISCUSSION

Labour productivity is the basic measure of the effectiveness of business entities management. Labour productivity is related to the best use of resources of agricultural holdings, including wine farms. Table 1 presents the productivity of work in selected wine farms in the years 2004–2017. In the analysed period, in EU countries a relative increase in labour productivity was recorded on average by 2.77%. In absolute terms, the increase in labour productivity was, on average, 1.2 thous. EUR per 1 AWU. The labour productivity amounted on average to approx. 42.4 thous. EUR.

In the analysed period, an increase in labour productivity was recorded in almost all selected countries for research, with the exception of Greek holdings. On Greek farms, a decrease of approx. 3.39 thous. EUR on 1 AWU was recorded. In the analysed period, in relative terms the highest increase in labour productivity in wine farms was recorded for Czech farms (annual average of 8.90%), then Portuguese (annual average of 5.93% and Bulgarian (average annual 4.88%). On Spanish and Italian farms and in France, an increase of 3.70%, 3.43% and 2.31% respectively was recorded. The smallest increase in labour productivity was observed in Cypriot (0.65% on average) and Greek (0.85%) farms annually. In absolute terms, in the analysed period, the highest increase in labour productivity was recorded in Czech farms (annual average of 2.6 thous. EUR), French (annual average 1.68 thous. EUR) and Italian (annual average 1.3 thous. EUR) and German farms (annually by 1.24 thous. EUR).

The highest efficiency of work was characteristic for French farms (on average 72,106.7 EUR for 1 AWU), then German (average 54,697.9 EUR), Austrian (average of 39,905.4 EUR) and Italian (average 36,406.5 EUR). The lowest labour productivity was typical for Cypriot farms (on average 9,626.9 EUR), Bulgarian (on average 10,543.9 EUR) and Croatian (average 10,823.2 EUR).

**Table 1.** Labour productivity of specialist vineyards in 2004–2017 (thous. EUR)

| Country | 2004–2006 | 2007–2009 | 2010–2012 | 2013–2015 | 2016–2017 | Average | Absolute change | Average annual change (%) |
|---|---|---|---|---|---|---|---|---|
| (BGR) Bulgaria | – | 2.47 | 4.24 | 7.82 | 5.26 | 10.54 | 2.79 | 4.88 |
| (CYP) Cyprus | 4.06 | 9.51 | 6.14 | 5.91 | 8.66 | 9.63 | 4.60 | 0.65 |
| (CZE) Czech Republic | 8.52 | 9.64 | 9.51 | 11.72 | 12.83 | 27.84 | 4.31 | 8.90 |
| (DEU) Germany | 24.68 | 25.40 | 26.89 | 30.98 | 32.99 | 54.70 | 8.31 | 2.28 |
| (ELL) Greece | 14.01 | 13.15 | 12.22 | 10.81 | 10.62 | 18.13 | –3.39 | 0.85 |
| (ESP) Spain | 12.94 | 14.93 | 16.86 | 18.87 | 20.74 | 22.04 | 7.80 | 3.70 |
| (FRA) France | 33.71 | 35.70 | 38.92 | 42.67 | 44.80 | 72.11 | 11.09 | 2.31 |
| (HRV) Croatia | – | – | – | 3.58 | 4.28 | 10.82 | 7.24 | 4.01 |
| (HUN) Hungary | 7.02 | 6.70 | 9.00 | 10.26 | 10.70 | 19.78 | 3.68 | 1.75 |
| (ITA) Italy | 17.79 | 19.40 | 20.77 | 25.91 | 29.04 | 36.41 | 11.25 | 3.43 |
| (OST) Austria | 18.10 | 20.34 | 21.82 | 17.38 | 18.97 | 39.91 | 0.87 | 2.84 |
| (POR) Portugal | 6.72 | 7.87 | 9.89 | 11.42 | 12.00 | 15.44 | 5.28 | 5.93 |
| (ROU) Romania | – | 6.26 | 6.40 | 7.84 | 9.71 | 11.77 | 3.45 | 4.41 |
| (SVN) Slovenia | 4.45 | 9.36 | 6.30 | 3.76 | 6.34 | 16.10 | 1.89 | 3.04 |
| (EU) European Union | 21.12 | 21.44 | 23.65 | 27.17 | 29.55 | 42.45 | 8.43 | 2.77 |

Slovenia data since 2005, for Bulgaria and Romania since 2007 and Croatia since 2013 (entry into the EU).

Source: author's calculations based on FADN data.

Table 2 presents the work efficiency depending on the economic size of wine farms. In the analysed period in EU countries, work efficiency in wine farms increased on average from 21,777.82 to 29,789.42 EUR per 1 AWU, i.e. by 8,011.6 EUR. The average annual increase in work productivity in relative terms was approx. 3.2%, while in absolute terms it was, on average, 802.62 EUR per 1 AWU. The coefficient of variability of work efficiency in the examined period was about 15.28%. With the increase in the economic size of wine farms, labour productivity increased. The largest one was on wine farms in the sixth class of economic size. In 2017 in the sixth class of economic size, work efficiency per 1 AWU was 61,620.39 EUR for 1 AWU. The lowest economic efficiency was in the 1st class of economic size and this year it amounted to approx. 5,188.16 EUR for 1 AWU. In the wine farms distinguished in terms of economic size, there was an increase in work efficiency in almost all classes, with the exception of the first class. In the years 2004–2017 in the first class of economic size there was an average annual decrease by – 1.67%. Labour productivity decreased from approx. 8,018 to 5,188.16 EUR for 1 AWU, that is by – 2,830.18 EUR for 1 AWU. In the remaining classes of economic size in wine growing enterprises an increase was recorded, the highest being the sixth class (annual average of 3.49%) and fourth (annual average of 1.95%). In absolute terms, the highest increase in labour productivity was also in the sixth class, labour productivity increased on average by 1,755.71 EUR per 1 AWU. While in total, in the analysed period, labour productivity increased by 19,075.59 EUR per 1 AWU. The lowest coefficient of work efficiency variability was in the fifth (9.37%) and fourth (14.19%) classes.

**Table 2.** Labour productivity (farm net value added per 1 AWU) of specialist vineyards depending on the economic size in 2004–2017 (EUR)

| Year | Economic size class | | | | | | Total average |
|------|------|------|------|------|------|------|------|
|      | 1 | 2 | 3 | 4 | 5 | 6 | |
| 2004 | 8 018.34 | 11 111.89 | 16 832.39 | 21 882.48 | 34 925.57 | 42 544.80 | 21 777.82 |
| 2005 | 4 787.98 | 9 599.85 | 15 320.50 | 20 315.26 | 34 659.51 | 46 475.53 | 20 364.38 |
| 2006 | 4 742.67 | 11 611.19 | 18 542.56 | 21 895.80 | 34 587.06 | 43 108.41 | 21 223.14 |
| 2007 | 5 308.86 | 11 720.59 | 18 136.69 | 25 048.61 | 39 123.37 | 38 744.70 | 22 462.97 |
| 2008 | 5 638.06 | 12 586.51 | 18 709.86 | 22 074.71 | 38 083.71 | 40 666.10 | 22 905.16 |
| 2009 | 3 048.87 | 7 269.95 | 10 337.31 | 15 762.65 | 31 300.78 | 36 765.46 | 18 946.07 |
| 2010 | 5 925.10 | 8 263.26 | 11 839.40 | 18 487.12 | 33 160.74 | 50 253.75 | 21 473.41 |
| 2011 | 6 328.00 | 8 821.66 | 13 513.60 | 21 628.67 | 37 525.55 | 53 850.12 | 23 970.83 |
| 2012 | 5 197.29 | 13 017.85 | 14 028.55 | 22 317.21 | 36 728.46 | 47 368.83 | 25 508.28 |
| 2013 | 3 681.63 | 11 212.36 | 14 072.06 | 22 057.10 | 35 153.59 | 52 150.35 | 24 123.81 |
| 2014 | 3 350.60 | 11 714.57 | 15 565.78 | 25 236.42 | 41 063.84 | 60 348.84 | 27 679.88 |
| 2015 | 5 245.43 | 11 748.67 | 16 682.61 | 25 333.27 | 42 305.22 | 60 766.99 | 29 716.87 |
| 2016 | 5 175.18 | 12 764.44 | 19 006.08 | 28 695.05 | 43 648.57 | 59 919.37 | 31 255.61 |
| 2017 | 5 188.16 | 13 540.52 | 18 855.98 | 26 588.50 | 40 453.13 | 61 620.39 | 29 789.42 |
| Absolute change | −2 830.18 | 2 428.63 | 2 023.59 | 4 706.02 | 5 527.56 | 19 075.59 | 8 011.60 |
| Average annual change (%) | −1.67 | 1.55 | 0.32 | 1.95 | 1.49 | 3.49 | 3.20 |
| Regression coefficient | −98.13 | 172.55 | 47.63 | 457.86 | 570.95 | 1 755.71 | 802.62 |
| Coefficient of variation (%) | 23.70 | 16.41 | 16.90 | 14.19 | 9.37 | 16.91 | 15.28 |

Economic size (thous. EUR): 1 – from 2 to < 8; 2 – from 8 to < 25; 3 – from 25 to < 50; 4 – from 50 to < 100; 5 – from 100 to < 500; 6 – ≥ 500.

Source: author's calculations based on FADN data.

Table 3 presents labour productivity depending on the economic size in individual EU countries in two sub-periods, i.e. for the years 2004–2006 and 2015––2017. As in the case of the average for EU countries, the increase in labour productivity in wine farms in particular countries occurred with the increase in economic size, for both 2004–2006 and 2015–2017. Which means that work productivity increases along with the economic size of wine farms. In the analysed period, it was also possible to observe an increase in labour productivity in the years 2015–2017 in relation to the years 2004–2006 in wine farms distinguished in terms of economic size in almost all countries selected for research, except for Greek farms. In Greek farms there was a decrease in labour productivity in wine farms in all economic size classes comparing these two sub-periods (both in the second and third class). In the analysed periods, the decline in labour productivity in individual classes was recorded in Hungarian holdings for the third grade (from 9,074.20 to 7,442.35 EUR for 1 AWU) and in Italian holdings also for third class (from 19,488.44 to 18,468.11 EUR for 1 AWU). By far the highest labour productivity was observed in both sub-periods of Italian holdings (except for the third grade in 2015–2017), followed by French, German, Spanish and Austrian.

**Table 3.** Farm net value added per 1 AWU of specialist vineyards depending on the economic size in 2004–2017 (thous. EUR)

| Country | Year | Farms by economic size | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| (DEU) Germany | 2004–2006 | – | – | 20 330.59 | 21 331.07 | 26 457.21 | 25 940.30 |
| | 2014–2017 | – | – | 26 441.38 | 27 873.87 | 37 102.52 | – |
| | change | – | – | 6 110.78 | 6 542.80 | 10 645.32 | – |
| (ELL) Greece | 2004–2006 | 10 916.41 | 13 575.49 | 16 519.64 | – | – | – |
| | 2015–2017 | – | 9 400.08 | 14 251.32 | – | – | – |
| | change | – | –4 175.41 | –2 268.32 | – | – | – |
| (ESP) Spain | 2004–2006 | 6 650.06 | 12 334.33 | 19 996.66 | 24 812.96 | 30 966.23 | – |
| | 2015–2017 | – | 16 902.27 | 20 427.73 | 28 695.24 | 34 791.55 | – |
| | change | – | 4 567.94 | 431.07 | 3 882.29 | 3 825.32 | – |
| (FRA) France | 2004–2006 | – | – | 11 888.56 | 20 428.44 | 35 881.19 | 50 208.01 |
| | 2015–2017 | – | – | 18 586.06 | 27 342.08 | 42 965.20 | 61 956.79 |
| | change | – | – | 6 697.50 | 6 913.64 | 7 084.01 | 11 748.78 |
| (HUN) Hungary | 2004–2006 | 2 665.56 | 9 916.72 | 9 074.20 | – | – | – |
| | 2015–2017 | 6 264.37 | 10 862.60 | 7 542.35 | – | – | – |
| | change | 3 598.81 | 945.88 | –1 531.85 | – | – | – |
| (ITA) Italy | 2004–2006 | 5 337.97 | 10 942.43 | 19 488.44 | 27 099.22 | 40 808.91 | 43 997.28 |
| | 2015–2017 | – | 11 726.29 | 18 468.11 | 28 730.41 | 48 648.49 | 68 289.58 |
| | change | – | 783.86 | –1 020.33 | 1 631.19 | 7 839.59 | 24 292.30 |
| (OST) Austria | 2004–2006 | – | – | 8 022.89 | 16 267.54 | 24 074.68 | – |
| | 2015–2017 | – | – | 17 215.07 | 19 733.86 | 36 430.88 | – |
| | change | – | – | 9 192.18 | 3 466.32 | 12 356.21 | – |
| (POR) Portugal | 2004–2006 | 3 238.85 | 6 459.19 | 6 561.56 | – | – | – |
| | 2015–2017 | 9 100.91 | 11 114.73 | 12 930.86 | – | – | – |
| | change | 5 862.06 | 4 655.54 | 6 369.30 | – | – | – |
| (EU) European Union | 2004–2006 | 5 849.66 | 10 774.31 | 16 898.48 | 21 364.51 | 34 724.05 | 44 042.91 |
| | 2015–2017 | 5 202.92 | 12 684.54 | 18 181.56 | 26 872.27 | 42 135.64 | 60 768.92 |
| | change | –646.74 | 1 910.23 | 1 283.07 | 5 507.76 | 7 411.59 | 16 726.00 |

Economic size (thous. EUR): 1 – from 2 to < 8; 2 – from 8 to < 25; 3 – from 25 to < 50; 4 – from 50 to < 100; 5 – from 100 to < 500; 6 – ≥ 500.

Source: author's calculations based on FADN data.

## CONCLUSIONS

Based on the research, the following conclusions were found. Labour productivity is a basic measure of the effectiveness of production of goods and services, and testifies to the level of economic development of given economies, sectors and business entities, including wine farms. In the years 2004–2017 there was an increase in labour productivity in wine farms in almost all countries selected for research, except for Greek farms. The largest increase in the analysed period was recorded for Czech, Portuguese and Bulgarian farms. Nevertheless, the highest productivity of work was characteristic for French, German, Austrian and Italian farms. Together with the increase in the economic size of wine farms, the productivity of work increased. The largest increase was recorded in the largest farms. In the smallest (first class) farms, a decline in labour productivity was noted during the period under consideration. Therefore, the largest farms have a chance to grow. Therefore, it seems advisable to increase support for economically smaller farms.

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# THE ROLE OF ECONOMIC EVALUATION IN AGRICULTURAL RESEARCH

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### ABSTRACT

On the example of the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, the scope and importance of economic assessment in agricultural research are presented.
As sources of information, IUNG-PIB reports and reports as well as selected publications were used. It was found that economic assessment enables and facilitates the selection of solutions offered in agricultural practice. Its scope is constantly expanding. It also plays an important role in decision-making processes related to the selection of the management system and a specific variant of production technology on the farm. It also allows explaining many changes and tendencies in agriculture under the influence of the Common Agricultural Policy.

**Key words:** economics, evaluation, role, agricultural research, major problems
**JEL codes:** A11, Q10

## INTRODUCTION

The transition to a market economy system, globalization processes, a wide acceptance of the concept of sustainable development in Western Europe, high dynamics of changes in economic conditions and European integration processes, as well as expectations of agricultural advisory and practice caused changes in agriculture, including a change of priorities and criteria evaluation of agricultural research results. These factors contributed to the development of new directions of agricultural research. For many years, the ultimate goal of agricultural research was to maximize production and profit, and the problems of the impact of agriculture on the environment were not taken into account.

According to Adamowicz (2006) and Harasim, Krasowicz and Matyka (2014), sustainable agriculture is a concept that goes far beyond the traditional treatment of this sector of the economy. Sustainable development is aimed at harmonizing social, economic and environmental goals that lead to an increase in the quality of life in the present, while maintaining the possibility of satisfying human needs in the future.

The concept of sustainable development supports the importance of optimal use of basic agricultural

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production factors and pay attention to ecological aspects. However, the transition to the market economy system has additionally contributed to the growing importance of economic assessment in agricultural research in the field of production organization and technology. At the same time, these changes determined the role and scope of economic assessments in research institutes conducting agricultural research, in large part with a practical dimension. Economic and organizational studies are conducted in these units. They concern the economics of production directions, the effectiveness of technology and the assessment of various management systems, and the assessment of the regional diversification of agriculture and rural areas.

The aim of the study is to present the role of economic assessment in agricultural research, on the example of the Institute of Soil Science and Plant Cultivation in Puławy. This evaluation takes into account a number of research topics of great practical significance connected with various levels of agricultural production management. It is a derivative of the Institute's scientific interests. The directions of economic evaluation at IUNG-PIB are derived from the scientific interests of the institute's employees. The main of these directions, from the point of view of economic evaluation, include:
- efficiency of agrotechnical operations and treatments as well as production technologies;
- crop rotation with a different proportion of cereals;
- possibilities of sustainable development of farms with various agricultural production directions;
- different farming systems;
- agricultural and rural areas development strategies;
- possibilities of biomass production for energy purposes;
- regional diversification of agriculture.

It is worth emphasizing that the economic and organizational research at IUNG-PIB has a long tradition and refers to the achievements of scientific institutions that have been operating in Puławy since 1862. Since 1998, these studies have been carried out by the Department of Systems and Economics of Crop Production.

## EVALUATION OF THE EFFICIENCY OF PRODUCTION TECHNOLOGY AND CROP ROTATION

Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy offers agricultural practice, based on the results of years of research, agronomic recommendations and production technology of cereals, fodder crops, energy crops, tobacco and hops. The recommended technologies vary in the level of intensity and take into account the diverse economic situation of different groups of farms, as well as the specificity of agriculture in the regions. In addition, they are aimed at obtaining products with a quality, desirable by the industry and consumers, that meet the criteria for safe food for human and animal health. In recent years, the scope of economic assessment in IUNG-PIB research has considerably expanded.

The earliest research began on the economic evaluation of cereal production technology, including such elements of agrotechnology as fertilization and plant protection. This assessment was simplified, as it concerned only direct costs, and sometimes only selected elements. It was found that from the point of view of agricultural income, the partial criterion of labour intensity is of great importance. This constituted the basis for recommending technologies and their variants depending on the diversification of farm labour force resources. These technologies represented various types of production intensification.

The economic evaluation of cereal production technology required constant improvement and enrichment of the methodology as well as extending it with new criteria and indicators. It was also necessary solution to methodological issues. An example of this is the proposal to evaluate plant production technologies as part of crop rotation. It was considered more reliable and comprehensive. An important premise of this trend of economic research is the increase in the share of cereals in the structure of sowings (Statistics Poland, 2018). The economic assessment of crop rotation with different cereal share was of great practical importance. It pointed to the possibility and rationality of applying, under certain

organizational and economic conditions, changes made only to cereals, referred to as multi-species cereal monocultures. The tendency to specialize in the production of technologically similar plants, i.e. cereals and rapeseed, is particularly pronounced in northern and western Poland (Statistics Poland, 2018).

Consistent enrichment of technological recommendations with a simplified economic assessment, contributed to the objectification of assessments and the development of opinions among farmers and advisers on the desirability and importance of economic calculation in making decisions regarding the choice of plant production technology, and even more widely in farm management.

## ECONOMIC EVALUATION OF VARIOUS FARMING SYSTEMS

Production technologies are derivatives and elements used in the practice of farming systems. The economic evaluation determines the value of individual systems, alongside production and environmental indicators.

As a result of the study work on the comparison of integrated, ecological and conventional systems, the methodology for the analysis and evaluation of agricultural systems in Polish conditions was developed. This methodology is based on the assumption that the assessment of agricultural systems should be made at the level of a farm or a group of farms, treated as an organic whole, and thus in a systemic way. This assumption refers to the view accented in literature. According to Manteuffel (1981): "There is not an abstract agricultural system. Agriculture understood as a production system always takes the form of a farm".

Interest in evaluating different farming systems is also based on the assumption that analysis is necessary taking into account the conditions in the country and the region, and uncritical reliance on foreign research results may lead to opinions and views that are inadequate to the real realities of Polish agriculture. It was found that the ecological system may

be a chance to increase the profitability of farms, provided that the development of the organic food market and the growth in demand for organic products. It is also necessary to include in the economic calculation the existing support system for organic farms.

## ASSESSMENT OF SUSTAINABILITY OF PRODUCTION IN FARMS

The factor causing the extension of the scope of the economic assessment was the change of the research subject within the framework of IUNG-PIB statutory activity. The currently implemented program of scientific and research activity "Sustainable development of crop production and management of agricultural areas of Poland", resulted in the necessity of combining the production and ecological assessment with the economic one. The implementation of the IUNG-PIB long-term program, aimed at supporting activities in the field of protection and rational use of agricultural production space in Poland and management of the quality of agricultural raw materials, also contributed to the growing importance of economic assessment in agricultural analyses.

The criteria and economic indicators have found, among others, application in the assessment of the sustainability of production in farms with various habitat conditions and production specialization. The purposefulness of their application resulted from the essence of sustainable development and the necessity to look for indicators that allow for a synthetic assessment of the farm, its internal organization and links with rural areas.

When assessing the level of production sustainability, indicators reflecting dependencies and feedbacks between plant and animal production as well as between the production and household farm of the agricultural family are taken into account.

It was found that the basic factors determining the possibility of sustainable development of a farm are the area and quality of agricultural land. The research allowed for general assessment.

The natural, organizational and economic conditions determine the possibilities of sustainable development of farms. The natural and organizational conditions determine primarily the intensity of the organization of plant and animal production, which is a derivative of the diversity of sown structure and livestock density. Economic determinants of agricultural production, resulting from existing price relations, determine primarily the intensity of management, measured by the level of material inputs and costs per 1 ha of utilization agricultural area.

The possibility of sustainability production with different objectives is also evaluated depending on the direction of production specialization. In general, it was found that farms specializing in milk production, as well as mixed farms, implemented the principles of sustainable development. Pig farms did not comply with these rules, due to ecological criteria, while farms specializing in crop production due to economic criteria.

An important direction of economic research at IUNG-PIB is also the assessment of the regional diversification of agricultural production, the intensity of the organization, use of agricultural potential, set-aside of land and agricultural competitiveness. In these studies by using the methods of multivariate analysis, the impact of different groups of conditions on regional diversification was assessed. The statement that the regional differentiation of agriculture is determined to a greater extent by economic and organizational than natural and agrotechnical factors. Important problems are also: assessment of the regional differentiation of changes in the land management in Polish agriculture after European integration, and assessment of the possibilities of implementing the Common Agricultural Policy in various regions of Poland. These assessments required consideration of economic aspects and interdisciplinary cooperation. Their results are the basis for perfecting cooperation with consulting.

The development of agriculture in less-favoured areas is an important trend of economic evaluation. In regions prone to drought, as well as in problematic and specific regions in which agricultural development faces a number of systemic and economic constraints. The economic assessment also concerns the possibility of multifunctional development.

## EVALUATION OF THE SOCIO-ECONOMIC DETERMINANTS OF BIOMASS PRODUCTION FOR ENERGY PURPOSES

Recent years have brought new challenges and problems decisive for the importance of economic assessment. Examples are biomass production as a source of renewable energy. According to Nalborczyk (2005), the development of agricultural energy requires the analysis of elements of the future system; including the economic, environmental and social indicators. "In the first place, the work will focus on the optimization of biomass production under different conditions. Particular emphasis will be placed on improving the economic and energy efficiency of production, minimizing negative ecological effects and assessing socio-economic benefits".

IUNG-PIB is conducting research on the assessment of production possibilities, development and implementation of plants cultivation technology for energy purposes, as well as on the use of other renewable energy sources. From the point of view of these studies, it is important to indicate the possibility of land use rationalization and the indication of social and economic factors determining the possibilities of using an alternative, which is plant cultivation for energy purposes. IUNG-PIB research shows that it is necessary to look at the problem of biomass production for energy purposes and adapt the proposed solutions to the existing natural and economic and organizational conditions.

In addition, these studies show that the cultivation of energy crops requires knowledge and high organizational efficiency. IUNG-PIB analyses indicate that in the situation of a relatively lower education of people living in rural areas, the level of professional knowledge and organizational skills may become one of the important barriers on the road to the development strategy of renewable energy. It

should also be emphasized that all decisions regarding the cultivation of energy crops and the selection of specific technologies should be supported by an economic calculation. In addition, due to changes in prices and their relationships, this evaluation needs constant updating. It was also found that the lack of financial support limited the interest in the cultivation of energy crops.

## CONCLUSIONS

− The growing importance of economic assessment in agricultural research is a consequence of the transition to the market economy system in agriculture and the adoption, as the overriding objective, of the concept of sustainable development.
− The economic assessment allows selection and verification of organizational solutions, technology variants and farming systems from the point of view of the possibility of achieving economic goals. It contributes to the objectivity of evaluations formulated by agrotechnics.
− The possibilities and scope of economic evaluation in agricultural research are constantly expanding, covering new issues and research trends.
− Economic evaluation plays a complementary role in agricultural research and is aimed mainly at objectivization and support of solutions offered in agricultural practice.
− Strengthening the importance of this research requires closer cooperation with specialists in agrotechnology and zootechnics as well as respect of the existing methods of economic assessment and economic categories. It is also necessary to use IT systems and collect full, reliable, current data from farms and their surroundings.

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# CONSUMERS' AWARENESS OF THEIR RIGHTS WHEN SHOPPING FOR FOOD ONLINE AMONG PEOPLE AGED OVER 45

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**ABSTRACT**

The aim of the article is to assess the awareness of consumer rights among people shopping for food online. The study was carried out on 529 respondents shopping for food online. The obtained results showed that the majority of the respondents assess their awareness of consumer rights in the purchase of food online as good. Nevertheless, part of the respondents failed to unequivocally and clearly respond to statements concerning the level of their awareness. The study findings indicate the need for education in the consumer rights of people shopping for food online. This seems to be particularly justified in light of growing interest in online shopping, including online shopping for food.

**Key words:** consumers, e-commerce, food law
**JEL codes:** K15, D18

## INTRODUCTION

The number of online shops in Poland keeps growing from year to year. The data collected by Bisnode reveal that approximately 31,000 of such shops were registered in Poland at the end of 2018. This constituted a rise of over 6.1% in comparison with the 2017 figure (Bisnode Polska, 2019).

A report of Nielsen Services Poland, a market research company, reveals that sales of FMCGs (fast-moving consumer goods) online are rising four times faster than their offline sales. What seems to underpin the trend is, among others, the ever faster pace of private and professional life and the growing popularity of the so-called convenience trend (Nielsen, 2018b). The results of research conducted by the Statistcs Poland (Polish acronym GUS) show that in 2018 approximately 1/4 of consumers purchased foodstuffs and cosmetics[3] online (Statistcs Poland, 2018). According to the report "E-commerce w Polsce 2018", online purchases are made mainly by young educated people, residents of bigger towns, describing their financial situation as good (Gemius, 2018). On the other hand, this form of shopping seems to be gaining ever greater interest among the elderly. The findings of the study made by the ARC Rynek i Opinia Market Research Agency reveal that over 1/3 of respondents over the age of 57 want to spend more money online shopping (Portal slowoseniora.pl, n.d.).

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[3] Figures for foodstuffs alone were not made available.

Earlier studies carried out by Gemius reported that online shopping consumers seek information on food products mostly on web pages of traditional shops and via Internet browsers. The most common factor discouraging Internet users from buying food online is their concern about the freshness of products and lack of a possibility to see or touch them. Respondents also pointed to other potential barriers to online shopping for food, namely, the high cost of delivery and the long waiting time related to the delivery (Gemius, 2014).

What should be emphasized is that the general regulations of consumer and food law apply to both the food sold online and the food purchased in the traditional way, at all stages of food production, processing and distribution. An important solution concerning distance selling was introduced by the Act of 30 May 2014 on Consumer Rights and the Regulation (EU) 1169/2011 on the provision of consumers with information on food. It is entrepreneurs involved in online sales that are to bear responsibility for providing consumers with reliable information.

It is worth mentioning that the European Commission is in the process of preparing a draft of amendments ("New deal for consumers") aimed at ensuring better protection of consumer rights in general and online shopping consumers in particular. The draft provides, among others, for the introduction of a new information obligation in online transactions. The consumer will have to be informed about who they are performing a legal act with, i.e. whether with the entrepreneur or with another entity. The postulated change is intended to ensure the consumer a possibility to see whether in a given transaction the consumer is protected by the rights the consumer is entitled to where a transaction is between an entrepreneur and a consumer (Podrecki et al., 2018).

## MATERIALS AND METHODS

The study was carried out in November 2016 on a randomly selected sample of 529 Polish residents aged over 45[4]. The selection of the study sample involved the selection of typical respondents which consisted in choosing a respondent group from among people shopping for food online. The research agency to carry out the study was selected through a bidding procedure. The study used the CATI (computer assisted telephone inquiries) method.

The study was conducted with the use of a questionnaire prepared by the author. The questions concerning respondents' demographics allowed for characterizing them in terms of features such as: sex, age, education, place of residence and financial status. The obtained results were processed statistically. Nonparametric $Chi^2$ Pearson test was used to examine the statistical significance of the differences. Spearman's rank correlation coefficient was applied to analyse dependence between two variables expressed on an ordinal scale. A statistical significance level of $\alpha = 0.05$ was adopted.

## RESULTS AND DISCUSSION

The study sample consisted of a total of 529 people and included 194 people aged 45–49 (36.7%, 174 people aged 50–54 (32.9%), 90 people aged 55–59 (17.0%) and 71 people aged 60–64 (13.4%). Women constituted 50.5% of the studied population sample. The respondents were inhabitants of both rural and urban centres. Inhabitants of towns with a population of over 100,000 accounted for 27.2% of the study sample. Barely every 5th respondent was a resident of a rural area (Table 1).

More than 40% of the respondents declared doing online shopping for food once a month and over 1/3 admitted doing it a few times a year. Every 10th respondent reported making online food purchases once a week.

Asked about their assessment of their awareness of the rights of online food buyers, almost a half of the respondents declared their awareness of them to be good or very good. In turn, 39.5% of the respondents assessed their knowledge as limited. Only as few as 4.7% of the respondents admitted having little knowledge of the subject. Men and people with higher education declared a higher knowledge of the subject, 79.6% and 78.2%, respectively. As regards

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[4] Findings concerning young consumers and their awareness of their rights were described in another article.

**Table 1.** Demographic characteristics of respondents

| Variables | | % |
|---|---|---|
| Gender | women | 50.5 |
| | men | 49.5 |
| Age | 45–49 years | 36.7 |
| | 50–54 years | 32.9 |
| | 55–59 years | 17.0 |
| | 60–64 years | 13.4 |
| Education | elementary and vocational | 19.6 |
| | secondary | 40.1 |
| | university | 40.3 |
| Locality | rural | 17.8 |
| | urban, up to 50 000 | 26.1 |
| | urban, 50 000 to 100.000 | 2.9 |
| | urban, over 100 000 | 27.2 |

Source: own research.

education, the dependence was statistically significant. The need of the awareness of consumer rights in the area of online food purchases gains significance when we look at the European Commission data assessing the situation of consumers in the EU. Poland recorded the poorest results as regards the observance and execution of regulations concerning the protection of consumer rights. Research conducted among entrepreneurs revealed that, as a rule, entrepreneurs notice unfair market practices only when used by their competitors (Podrecki et al., 2018).

The analysis of the replies of the respondents to individual statements concerning online purchases showed that over 3/4 of the respondents declared trust in the good quality of online sold food (Table 2). The trust was more frequently expressed by women and people aged 50–54. In terms of gender, this dependence was statistically significant ($Chi^2$; $p \geq 0.05$). A high level of consumer trust was also recorded with respect to the procedure of placing online orders. Trust in this respect was more frequently declared by women ($Chi^2$; $p \geq 0.05$). Research conducted among

**Table 2.** Responses to selected statements relating to the purchase of food

| Variables | Answer (%) | | |
|---|---|---|---|
| | strongly agree and agree | undecided | disagree and strongly disagree |
| I have trust in the quality of online sold food | 77.5 | 18.7 | 3.8 |
| I have trust in the rules of online order placement | 74.1 | 23.4 | 2.5 |
| Access to information about the rules of lodging claims is easier in the case of online food purchases | 68.1 | 25.5 | 6.4 |

Source: own research.

Ceneo.pl Service clients revealed that 65% of people over 55 years of age consider online shopping as at least equally safe as traditional shopping (Portal slowoseniora.pl, n.d.).

The Nielsen Market Research Company report showed that consumers are becoming ever more open to online shopping for food, among others, when the quality of the purchased products is guaranteed. Approximately 50% of consumers would feel more encouraged to online food purchases if they had a guarantee of a refund of money for products which do not correspond to the ordered ones (Nielsen, 2018a).

Every $4^{th}$ respondent found responding to the statement "Access to information about the rules of lodging claims is easier in the case of online food purchases" difficult. Czarnecka (2017) remarks that the scale of seeking information by consumers depends, among others, on how much they need the information to satisfy their needs or on the availability of different data sources. Eurostat research revealed that one of the problems most frequently reported by EU consumers were, among others, difficulties related to placing a claim and receiving a reply to a claim (Eurostat, 2017).

In the question which followed, the respondents were asked to respond to five statements the aim of which was to see their awareness of the rights of the online food-buying consumer (Table 3). The respondents had the least problem with giving a correct answer to the statement "every online shop should have the rules of work placed on their web page". A statistically significant response to this statement was given more frequently by respondents aged 50–54 (Chi$^2$; $p \geq 0.05$). Over 80% of the respondents knew that a distance contract can be cancelled within 14 days without giving a reason. The highest level of awareness in this respect was shown also by the respondents aged 50–54. In turn, every $5^{th}$ respondent was not able to respond to the statement "if a consumer cancels a distance contract, he also bears the cost of the goods being sent back to the entrepreneur", and every $4^{th}$ respondent was not able to unequivocally state whether "access to information about the claim-lodging rules is easier in the case of online food purchases".

The statistical analysis with the use of Spearman's rank correlation coefficient showed the existence of weak, positive dependence between the respondents' awareness of selected rights of consumers shopping for food online and their subjective assessment of their general awareness of consumer rights in online food purchases (Table 4).

The results show that in spite of the fact that the majority of the respondents assess their awareness of their rights as very good or good, it is not always

**Table 3.** Awareness of the individual rights of consumers making online food purchases

| Variables | Correct answer | Answer (%) | | |
| --- | --- | --- | --- | --- |
| | | strongly agree and agree | undecided | disagree and strongly disagree |
| Every online shop should have their rules of work placed on their web pages | true | 95.6 | 3.6 | 0.8 |
| A distance contract can be cancelled without giving a reason within 14 days | true | 83.7 | 14.6 | 1.7 |
| If a consumer cancels a distance contract, the consumer bears also the cost of the goods being sent back to the entrepreneur | true | 73.3 | 20.4 | 6.3 |
| Food sold online is subject to the same control as food sold in traditional shops | true | 70.7 | 24.2 | 5.1 |

Source: own research.

**Table 4.** Dependence between the assessment of the awareness of the rights and the awareness of selected food-selling rules

| Variables | Value of Spearman's rank correlation coefficient |
|---|---|
| | Level of the awareness of the rights |
| A distance contract can be cancelled without giving a reason within 14 days | 0.263* |
| Food sold online is subject to the same control as food sold in traditional shops | 0.235* |
| If a consumer cancels a distance contract, the consumer bears also the cost of the goods being sent back to the entrepreneur | 0.164* |
| Every online shop should have their rules of work placed on their web pages | 0.146* |

*$p \leq 0.01$.

Source: own research.

reflected in their actual knowledge of the subject. Czarnecka (2017) remarks that the multitude of information which has to be passed to consumers causes that they can feel disoriented. On the one hand, it is necessary to provide them with obligatory information and, on the other, we are facing an information overload which requires from customers being able to orient themselves in the environment in conditions of excess information.

## CONCLUSIONS

The study findings reveal growing legal awareness of consumers. The majority of the respondents were aware of consumer rights relating to online food shopping. Yet, part of the respondents was not able to unequivocally respond to the statements referring to the level of their awareness. The obtained results point to the necessity of educating consumers in their rights relating to online food purchases. The authors believe that in the educational effort emphasis should be put on developing skills necessary to successful, broadly understood information processing.

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# THE ROLE OF NUTRIA MEAT PRODUCTION IN THE CONTEXT OF UKRAINE FOOD SECURITY

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## ABSTRACT

The article presents the role and potential of the nutria breeding development as an alternative livestock sector in the context of Ukraine's food security. A comparative analysis of qualitative characteristics of meat by species of animals was conducted. The efficiency of nutria breeding by types of enterprises with a short-term forecast is analysed. By expert evaluations determined the weight of the five main problems of the industry, which constitute the next steps of a comprehensive research of nutria breeding.

**Key words:** food security, meat production, nutria breeding, effectiveness of production, expert evaluations
**JEL codes:** C13, C43, O13, Q12, Q18

## INTRODUCTION

The basis for maintaining food security is always in all countries of the world is the development of its own agricultural production in order to become the main source of food supplies. There is enough capacity in the world to produce food in such amount as to provide everyone with adequate nutrition; in spite of the successes achieved over the last two decades, 805 million people, or every ninth inhabitant of the planet, continue to suffer from chronic hunger (Vasylieva, 2018). According to the words of the FAO Director-General Jose Graziano da Silva: "The destruction of hunger requires commitment of everyone: neither

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FAO nor any other institution will be able to win this battle alone" (FAO, 2018), it should be noted that each country must take responsibility for bringing all the opportunities to improve the situation inside the state and help others.

The Ukrainian agrarian sector with potential for production, which significantly exceeds the domestic market needs, can promote the national economy development and its effective integration into the world economy, and consequently, an income increase of the rural population, involved in the agrarian economy, which accounts for more than one third of the country total population, and it also can provide a multiplier effect on other sectors of the national economy development (Regulation of Cabinet of Ministers of Ukraine No 806-r, 2013). But in crisis conditions, due to constant civil strives, lack of legal environment, weakness of state power, a country with huge potential, loses impulse for self-development, and as a result – loses stability.

The issues of food security were studied by Kyrylenko (2014), Vasylieva (2018), Pogrishhuk (2019) and Zaliznjuk (2019). Besides the meat production included nutria breeding was discussed by Volkov (1983) and Parhomec' (2015). The methodology of expert evaluations was describe by Grabovec'kyj (2010).

## GOAL AND RESEARCH METHODS

Investigation of the role, opportunities and problems of the development of the nutria breeding industry as an alternative to livestock industry with the goal of increasing meat products supply to Ukraine population in the food security system.

The study is based on data from the Food and Agriculture Organization of the United Nations, the Ukraine State Statistics Service, the Dnipropetrovsk region enterprises' reports on the food situation and the meat products production, including nutria meat. The correlation and regression analysis and trend lines were used to determine the development trends, and the method of expert evaluations was used to identify the main factors of the industry development problems and to establish the degree of opinions consistency.

## RESULTS AND DISCUSSION

Food security is the food production state in a country that can fully meet the proper quality food needs of society every member, provided it is balanced and accessible to every member of society. The main indicators of food security include: daily caloric diet of humans; the production and consumption ratio of meat and meat products, milk and dairy products, eggs, sugar, potatoes, vegetables and food melons per capita; grain production per capita per year; the cereal stocks level by the end of the period and the share of sales of imported food products through the trade network of enterprises (Pogrishhuk, 2019).

Assessments of Ukraine's food security level are made on indicators, operated by the FAO, as well as in accordance with the methodology approved by the Ukraine Cabinet of Ministers order "Some food security issues" from 05.12.2007 No 1379 (FAO, 2018). According to these standards, the daily energy value of a human diet is defined as the products sum of a mass unit of some products, consumed by a human during the day, and their energy value. The limit criterion is set at 2,500 kcal per day, while 55% of the daily ration should be provided by the consumption of animal origin products (Table 1).

In 2017, in Ukraine 29% of the average human daily ration was provided by consumption of livestock products. Thus, on average, the EU-28 calorie content is 3,400 kcal, which is by quarter higher than in Ukraine. At the same time, the animal products share in the EU diet is at the same level. In relation to the structure of consumer food costs, there were no significant changes in comparison with the previous year, the places on expenditures as follows: meat and meat products – 24% (827 UAH per household per month), bread and bakery products – 15% (511 UAH), milk and dairy products – 14% (494 UAH), fish and fish products – 5% (170 UAH), eggs – 3% (102 UAH), sunflower oil and other oil products – 3% (102 UAH), fruits – 7% (238 UAH), vegetables – 9% (307 UAH), potato – 3% (102 UAH), sugar – 8% (273 UAH), non-alcoholic drinks – 6% (204 UAH), other – 2% (68 UAH) (Zaliznjuk, 2019).

Sustainable economic development of the state, improvement of welfare and living standards of the

**Table 1.** Consumption of basic food products by Ukraine population (kg per capita per year)

| Indicator | Food types | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | meat and meat products | milk and dairy products | eggs (pcs.) | fish and fish products | sugar | sunflower oil | potato | vegetables and melons | fruits, berries | bread and bread products |
| Regional nourishment norms | 80 | 380 | 290 | 20 | 38 | 13 | 124 | 161 | 90 | 101 |
| Minimal nourishment norms | 52 | 341 | 231 | 12 | 32 | 8 | 96 | 105 | 68 | 94 |
| 1990 | 68 | 373 | 272 | 17.5 | 50 | 11.6 | 131 | 102 | 47 | 141 |
| 1995 | 39 | 244 | 171 | 3. 6 | 32 | 8.2 | 124 | 97 | 33 | 128 |
| 2000 | 32.8 | 199.1 | 166 | 8.4 | 36.8 | 9.4 | 135.4 | 101 | 29.3 | 124.9 |
| 2005 | 39.1 | 225.6 | 238 | 14.4 | 38.1 | 13.5 | 135.6 | 120 | 37.1 | 123.5 |
| 2010 | 52 | 206.4 | 290 | 14.5 | 37.1 | 14.8 | 128.9 | 143 | 48 | 111.3 |
| 2015 | 51 | 210 | 280 | 8.6 | 36 | 12.3 | 138 | 161 | 51 | 103 |
| 2016 | 51 | 210 | 280 | 8.6 | 36 | 12.3 | 138 | 161 | 51 | 101 |
| 2017 | 51.7 | 200 | 273 | 10.8 | 30.4 | 11.7 | 143.4 | 159 | 52.8 | 100.8 |
| 2017 in % vs 1990 | 76.1 | 53.6 | 73.2 | 61.7 | 60.1 | 100.1 | 109.5 | 121.4 | 112.3 | 71.5 |
| Minimal norms | 99.4 | 58.7 | 118.2 | 90 | 95 | 146.3 | 149.4 | 151.4 | 77.6 | 107.2 |
| Rational norms | 71.4 | 52.6 | 94.1 | 54 | 80 | 90 | 115.6 | 98.8 | 58.7 | 99.8 |

Source: FAO (2018).

population is impossible without the effective functioning of the agro-industrial sector. Agricultural production of today and the Ukrainian agro-industrial complex as a whole are at the centre of public attention, as our already poorly-off table has recently become particularly poor, the food prices have risen sharply, causing great concern for the Ukrainian population and sharpening social tensions. This situation has led to the search for new alternative types of food and income sources. One of these areas is nutria breeding, the current state of which indicates the existence of a certain set of problems that require in-depth study from different parties for further substantiation of the industry meaningful development strategies.

The main advantage of nutria breeding is the fact that this branch is one of the fastest growing, along with rabbit and poultry husbandry. Nutria females are naturally highly fertile farm animals that give birth to high-grade young animals. One nutria female provides about one kilo of meat and over 10 nutrias (skins) a year, as well as high-quality by-products: fat and manure, including offsprings. For high-fat characteristics, meat of nutria has been widely recognized as a dietary product. Meat yield depends on age, sex, and animal fat and ranges from 46% in young to 60% of live weight in adult males. By-products amount 4.5% (Table 2). One adult animal weighing 6–8 kg provides 3.2–4.3 kg of meat.

Nutria meat (without bones, intramuscular fat and by-products) is characterized by a high content of valuable protein and at the same time has a relatively low calorie content (Table 3).

The nutria meat by essential amino acids content is equivalent to beef and chicken, according to vitamin and mineral composition it is practically incommensurable with any other kind of meat. It is especially useful for people in need of complete protein

**Table 2.** Comparative characteristics of meat and by-products yield by animal species (%)

| Type of animal | Meat with bones | By-products | Altogether | Hypodermic fat |
|---|---|---|---|---|
| Nutria | 54.5 | 4.5 | 59.0 | 6 |
| Rabbit | 56.9 | 3.8 | 60.7 | 7 |
| Small hens | 58.0 | 6.0 | 64.0 | 7 |
| Beef of 2$^{nd}$ class | 46.0 | 2.8 | 59.0 | 3 |

Source: Volkov (1983).

**Table 3.** Chemical composition of meat of main agricultural animals

| Indicators | Nutria | Rabbit | Beef | Chicken |
|---|---|---|---|---|
| Water (%) | 67–73 | 69.3 | 72.2 | 72.8 |
| Protein (%) | 20.8 | 24.5 | 20.6 | 20.0 |
| Fat (%) | 4.1–10 | 8.0 | 5.5 | 5.1 |
| Minerals (%) | 1.1 | 1.2 | 1.2 | 1.1 |
| Caloric value (kcal) | 156–200 | 168 | 178 | 166 |

Source: Volkov (1983).

products. This meat contains by 50% more amino acids than in pork, and 4% more than in rabbit meat, nutria fat is a record-holder on the percentage of unsaturated fatty acids (up to 61.2%). Compared to the meat of other animals, nutria meat has a significantly low cholesterol and sodium content, which makes it a very attractive product for healthy nutrition. The nutria meat is easily digestible by humans and is valued as a dietary product; in the European markets, it is by 2–3 times more expensive than other meat products.

In 2018 Ukraine produced 1,535 thousand t of meat (all categories) in slaughter weight, which provide high-quality food for 18.7 million inhabitants (41.7% of the population). The main share falls on the production of poultry meat – 70.7%, pork – 23.4%, beef and veal – 5.7%, other species account for only 0.2% of total production (State Statistics Service of Ukraine, 2018). In the last 10–15 years the supply of beef meat in all regions has decreased, the cattle meat industry has become unprofitable. Pork production is unprofitable in 14 regions of the existing 25, the most abandoned locations are in the Zhytomyr, Transcarpathian, Kirovograd, Mykolaiv, Odessa, Kharkiv, Chernihiv and other regions. The reason for such situation of the main meat sectors of Ukraine is that the animal productivity is low, and the cost of production is high, which causes losses. The nutria breeding, as practice shows, is one of the promising sectors of livestock farming in Ukraine, but for a long time (for over 25 years) it has not been given sufficient attention either from practical or scientific directions of development, and only from 2010 it begins its noticeable rise (Parhomec', 2015). Production of other animals' meat by species in slaughter weight is presented in Figure 1.

The data presented on Figure 1 show that in 2018 almost 50% belongs to nutria breeding, which in comparison with 1990 has increased by 5 times. In natural terms, this figure is 1.4 thousand tons of meat, which makes it possible to feed 17 thousand inhabitants of the country (0.04% of Ukraine population). Here it is necessary to clarify that the data presented is related only to agricultural enterprises. At first glance, this data is quite insignificant, but on the other hand, taking into account the industry's potential, its speed and profitability rate of almost 70 %, the nutria breeding can become one of the alternative sources of meat products supply to the population. What is actually happening, because 80% of the industry is concentrated in population households (Fig. 2, for example, Dnipropetrovsk region).
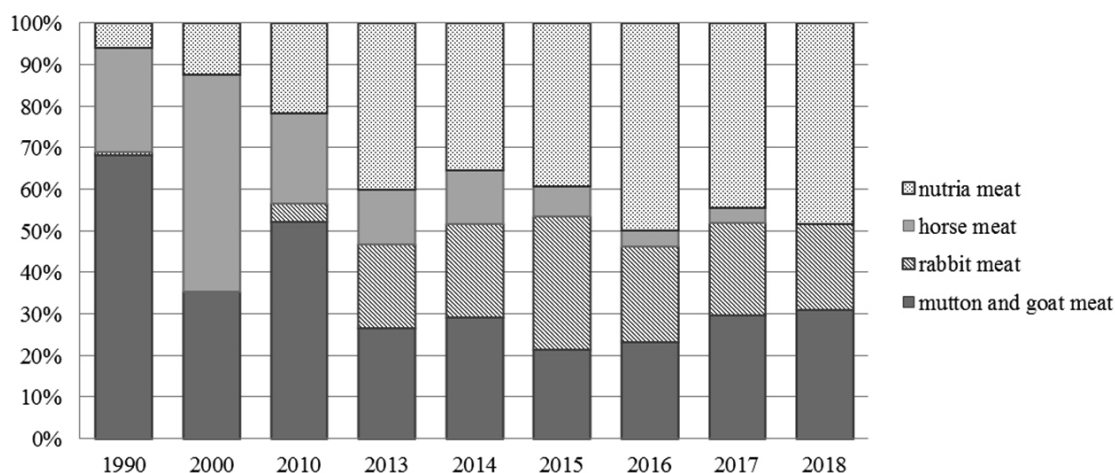
**Figure 1.** Production of other animal meat (by species) in slaughter weight in Ukraine

Source: State Statistics Service of Ukraine (2018).

The data presented on the Figure 2 show that during the construction of the trend line and the regression equation by 58%, in the next two years, an increase in the number of livestock in nutria breeding enterprises will occur, but the situation is still unstable. Analysis of activity at the level of specific farms, especially enterprises in the Dnipropetrovsk region shows contradictory results. At the same time, the nutria breeding branch began to recover gradually, first of all in Dnipropetrovsk region. There, as of

1 January 2018, the total number of nutria in agricultural organizations, farms and population households amounted 11,394 heads. The dynamics of the economic efficiency development of the nutria breeding branch in agricultural holdings is given in Table 4.

The given indicators of Dnipropetrovsk region nutria breeding enterprises showed high economic efficiency of this type of business. For example, in 2017 the regional nutria population has been increased: by 1.7 times; receipts from sales of products by 3.5
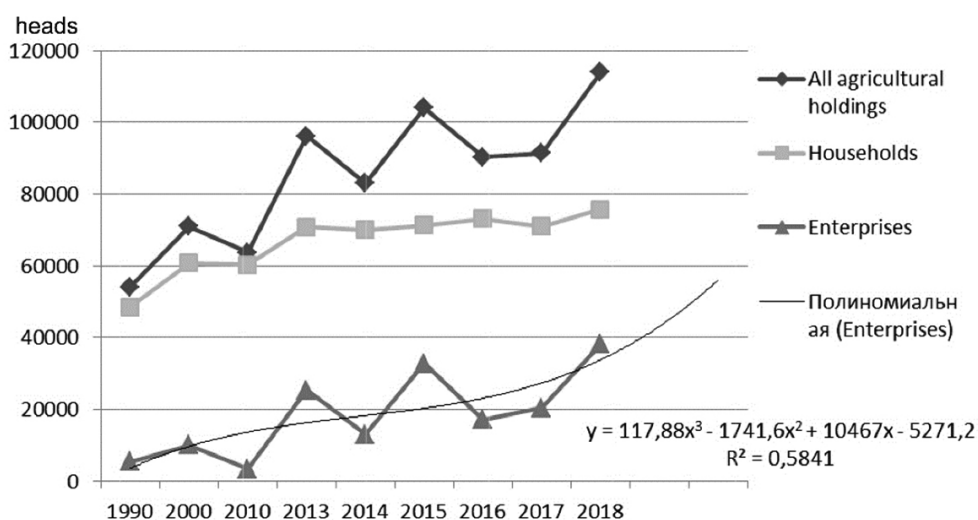


**Figure 2.** Dynamics of nutria population by household types in the Dnipropetrovsk region, Ukraine

Source: State Statistics Service of Ukraine (2018).

**Table 4.** Results of coypu husbandry enterprises activity in Dnipropetrovsk region

| Indicator | 2007 | 2009 | 2011 | 2013 | 2015 | 2017 | 2017 in % vs 2007 |
|---|---|---|---|---|---|---|---|
| Sold animals – in total | 11 812 | 5 901 | 10 233 | 18 641 | 19 114 | 20 413 | 17 282 |
| including: live weight for breeding | 1 094 | 728 | 1 015 | 1 899 | 2 001 | 1 984 | 181.35 |
| Average body weight (kg) | 3.9 | 4.2 | 3.8 | 3.5 | 3.6 | 3.8 | 97.44 |
| General expenditures (thous. UAH) | 1 577.8 | 1 192.1 | 1 415.3 | 3 786.6 | 3 968.3 | 3 994.2 | 253.15 |
| Receipts – in total (thous. UAH) | 2 041.9 | 1 200.8 | 2 030.9 | 5 547 | 6 849.2 | 7 133.9 | 349.38 |
| Profit (thous. UAH) | 464.1 | 8.7 | 615.6 | 1 760.4 | 2 880.9 | 3 139.7 | 676.51 |
| Profitability level (%) | 29.4 | 0.7 | 43.5 | 46.5 | 72.60 | 78.61 | 49.21 |

Source: calculated according to the reports of the studied enterprises.

times; the profit mass – by 6.7 times. The profitability level of the region's nutria breeding was 78.61%, which is by 49 points more than in 2007. In the structure of production costs, the largest expenditures are attributed to such indicators as: feed costs (40.8%), wages (33.9%), depreciation (17.5%).

Sharp fluctuations of line in Figure 2 point to existing development problems that need to be understood, and in the absence of a large array of statistical data, this can be done using the expert estimation method, the results of which will serve as the basis for making managerial decisions for the development of further strategies for sustainable development. For a full-fledged analysis, only quantitative indicators are insufficient, important role belongs to a qualitative component.

There are many factors affecting the industry development. Production of this type of products may be carried out in two dimensions: at the enterprises and in households. The main powerful productive force is nutria breeding enterprises, which in the future, when forming an integration association, will become the basis for the industry development. To obtain independent conclusions, there were interviewed 10 experts in the field of nutria breeding production of Dnipropetrovsk region, all of them are leading specialists of the abovementioned enterprises. Experts are invited to assess five production risk factors of nutria breeding by their importance and assign a maximum score to the most significant risk on the one hundred scale, and minimal for the least significant.

Table 5 shows the values assigned to each production risk factor for the nutria breeding enterprises by all experts. Each factor is assigned a number: 1 – the technology intensity; 2 – establishment of the sales markets system for the production of nutria products, standardization and certification of product quality; 3 – state support for nutria breeding industry; 4 – interconnection and integration of business entities in the industry; 5 – natural and climatic conditions, fashion and consumer awareness about the dietary and healing properties of nutria meat products.

When ranking objects as a measure of expert opinions consistency, the dispersion coefficient of concordance is being used (Grabovec'kyj, 2010).

Let us consider the matrix of ranking results $m$ (5) – risks $d$ (10) – experts $|r_{is}| \left( s = \overline{1, d}; i = \overline{1, m} \right)$, where $r_{is}$ – rank given by the $s$-expert of $i$-risk. We add the sum of the ranks for each risk, as a result of which we obtain a vector with the components:

$$r_i = \sum_{s=1}^{d} r_{is} \left( i = \overline{1, m} \right).$$

We shall consider the values of $r_i$ as realization of a random variable and we will find a dispersion estimation. As it is known, the optimal by minimum criterion of the average square error the dispersion estimate is being found according to the formula

$$D = \frac{1}{m-1} \sum_{i=1}^{m} \left( r_i - \overline{r} \right)^2 = 862 \qquad (1)$$

**Table 5.** Results of ranked assessments of experts of Dnipropetrovsk oblast

| Number of expert | Number of risk factor | | | | | Sum |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| | rank | | | | | |
| 1. Pryzma Ltd. | 4 | 5 | 1 | 3 | 2 | 15 |
| 2. Konar Ltd. | 3 | 5 | 2 | 4 | 1 | 15 |
| 3. Khutriane Ltd. | 3 | 5 | 2 | 4 | 1 | 15 |
| 4. MAKSITEK Ltd. | 4 | 5 | 2 | 3 | 1 | 15 |
| 5. Vyshneve Ltd. | 3 | 5 | 2 | 4 | 1 | 15 |
| 6. Farm Nahaichenko | 3 | 5 | 1 | 4 | 2 | 15 |
| 7. Farm Ranok | 5 | 4 | 2 | 3 | 1 | 15 |
| 8. Farm Kalynivka | 3 | 4 | 1 | 5 | 2 | 15 |
| 9. Standart Ltd. | 3 | 5 | 2 | 4 | 1 | 15 |
| 10. Organika Ltd. | 3 | 5 | 2 | 4 | 1 | 15 |
| Sum of ranks | 34 | 48 | 17 | 38 | 13 | 150 |
| Average meaning | 0.227 | 0.320 | 0.113 | 0.253 | 0.087 | 1 |

Source: calculated according to survey of the studied enterprises experts.

where $\overline{r}$ is the estimate of the mathematical expectation equal to

$$\overline{r} = \frac{1}{m} \sum_{i=1}^{m} r_i = 30 \qquad (2)$$

Let us give the designation

$$S = \sum_{i=1}^{m} \left( \sum_{s=1}^{d} r_{is} - \overline{r} \right)^2 \qquad (3)$$

Concordance coefficient

$$W = \frac{12 \cdot S}{d^2 \cdot \left( m^3 - m \right)} = 0.862 \qquad (4)$$

The presented formula defines the concordance coefficient in the absence of interrelated ranks, which fully satisfies our conditions.

The concordance coefficient is equal to one, if all the ranking of experts are the same, and is equal to zero, if all the ranks are different. To determine the significance of the concordance coefficient estimat-

ing, it is necessary to know the frequency distribution for different values of the number of experts $d$ and the number of risks $m$. The frequency distribution for $W$ at various values of $m$ and $d$ can be determined by statistical tables. To do this, one uses the Spearman criterion $\chi^2$. If the criterion value is more than critical, which was taken from the table of critical values of the Pearson distribution for a given significance level and the number of degrees of freedom $\chi^2 = (\alpha = 0.05;$ $k = 4) = 9.49$, then the concordance coefficient is statistically significantly different from zero and the opinion of the experts is considered concordant.

$$\chi^2 = W \cdot d \, (m - 1) = 34.48 \geq 9.49 \qquad (5)$$

In terms of production risk factors weight percentages for the coypu husbandry enterprises, they were distributed as follows: the establishment of sales markets system for the nutria breeding products, standardization and certification of product quality – 40.6%; interconnection and integration of business entities of the industry – 25.2%; availability of intensive technology – 19.9%; state sup-

port – 8.7%; natural and climatic conditions, fashion and consumer awareness about dietary and healing properties of nutria meat – 5.6%. These very factors significantly restrict the efficiency increase and sustainable development of the industry enterprises.

## CONCLUSIONS AND DIRECTIONS OF FURTHER RESEARCH

We believe that nutria breeding can take a significant place in the peasants' lives, can improve their economic and social conditions, can increase number of job places and employment in each region of Ukraine. It is important to take into account that the nutria meat from a social point of view is useful to society as a dietary product that has healing properties and can positively affect the population health. At the same time nutria meat, having dietary and prophylactic properties, is in high demand in the countries of Europe, the USA, China, Japan and other countries of the world. Taking into account this fact, our entrepreneurs should pay considerable attention and increase investment resources precisely for the development of the nutria breeding industry.

With a comprehensive strategic approach to this industry prospects, there will appear all opportunities for the nutria breeding development on the basis of small business and ultimately, due to integration processes, there can be considerably improved the economic efficiency of the nutria enterprises. There is an economic and social expediency of the nutria breeding industry production increase in each region of Ukraine, which will enable not only to improve the balance of dietary meat production and consumption, yet also to increase export deliveries of this product, lay the foundation for the development of a very important and necessary livestock branch alternative in the context of Ukraine's food security.

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# THE ROLE OF PRO-INVESTMENT MECHANISMS OF THE COMMON AGRICULTURAL POLICY IN ASSET REPRODUCTION OF FARMS IN CENTRAL AND EASTERN EUROPE

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**ABSTRACT**

The aim of this paper is to identify the role and importance of pro-investment mechanisms within the Common Agricultural Policy in the reproduction of farm assets in countries of Central and Eastern Europe. The experimental material comprised unpublished microdata of farms originating from the FADN database of the European Commission (data source: EU-FADN – DG AGRI). The time frame covered the years 2004–2015. Among all the farms selected for analyses only those ensuring data continuity throughout the entire investigated period were used in the study. In each of the studied countries farms were divided into two groups: the group of beneficiaries of CAP pro-investment funds and the control group. For each farm the value of fixed assets was determined (excluding the value of land) and next the mean value for each group was calculated in an individual country. The study showed that in most investigated countries both farms being and those not being beneficiaries of CAP pro-investment mechanisms are capable of reproducing their fixed assets; nevertheless, it is the farms receiving financial support for their investments that show a capacity to increase the value of their fixed assets.

**Key words:** Common Agricultural Policy, Central and Eastern Europe, pro-investment mechanisms
**JEL codes:** Q12, Q14, Q18

## INTRODUCTION

In order to successfully compete on the market farms have to undertake investments, particularly aiming at modernisation of their assets. These outlays are incurred to guarantee development of a given economic entity, as well as improve productivity and economic outcomes (Czubak and Sadowski, 2014). Current assets may be reproduced only thanks to purchase or self-supply of inputs, whereas fixed assets are reproduced by investment outlays (Grabowski, 1991). Fixed assets of farms determine their upper limit of production capacities, but they also serve several other functions, e.g. being securities against long-term liabilities (Matemilola and Rubi, 2015). In the case of farms investments are most frequently related with tangible components of fixed assets, which

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directly results in an increased value and changed structure of assets, in turn leading to an increase in the production capacity. In agriculture unit costs may only be reduced thanks to the application of biological progress, organisational improvements and technical change, which requires investments (Czubak, 2012). These investments focus on several basic effects, such as quantitative or qualitative increase in production, reduction of production costs, changes in production structure or rationalised use of inputs. All these effects should lead to an improvement in the economic situation of farms (Babuchowska and Marks-Bielska, 2012). Investment measures should also aim at the substitution of human labour with capital, which results from changes in prices of input costs, among which the greatest dynamics is observed for labour costs (Ziętara, 2008). Investment costs may aim at the introduction of new technologies, improvement of production quality, diversification of agricultural activity, e.g. towards non-agricultural activity, or adaptation of agricultural production to requirements related with environmental protection (Woś, 2000). Investments in the production sphere determine the development potential of farms. They indicate that farmers increase their fixed assets or improve their quality, which is to contribute to an enhanced potential of farms in the future. Improvement of technical instruments of labour, as well as introduction of modern machines and equipment in agricultural production lead to increased productivity both in the case of plant and animal production (Józwiak and Kagan, 2008).

In agriculture of Central and Eastern Europe (CEE) an increase in investments has been observed following the accession of individual countries to the European Union. Considerable improvement of the production potential was made possible by the support of EU funds (Czubak and Sadowski, 2014). The importance of CAP pro-investment mechanisms in the development of farms in analysed countries has also been stressed by Babuchowska and Marks-Bielska (2011), and Kisiel, Dołęgowska and Marozas (2012). For example, in Poland after the country's accession to the EU investment outlays in agriculture have doubled, which has contributed to improved provision of fixed assets in farms (Czubak, 2015). However, in individual countries we may observe differences in

the implementation of CAP pro-investment measures (Pawłowski and Czubak, 2018), which in turn may affect the potential to reproduce fixed assets.

In view of the above, the aim of this paper is to identify the role and importance of pro-investment mechanisms within the Common Agricultural Policy in the reproduction of assets in farms of the CEE countries.

## MATERIALS AND METHODS

The source material used in the paper comprised unpublished FADN microdata originating from the EU Directorate-General for Agriculture and Rural Development (DG AGRI) database. The unique character of investigations presented in this paper consists in the execution of research tasks based on unpublished microdata of selected farms. Moreover, the microeconomic character of the data facilitates analyses using the dynamic approach (Grzelak, 2014). Formal guidelines related with analyses of particularly sensitive data are closely regulated by firm restrictions, thus this paper may also present results aggregated for a minimum of 15 farms. The analyses were conducted on selected CEE countries, i.e. Bulgaria, the Czech Republic, Estonia, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia and Hungary. The countries were selected for the study not only because of their geographical location, but primarily the same (or similar – in the case of Bulgaria and Romania) year of accession to the EU. Cyprus and Malta were excluded from the group of 12 countries, which accessed the EU in 2014 and 2017, because – as it is indicated by the authors' previous investigations and a review of literature on the subject – agriculture in those countries is markedly different and may not be considered comparable here. The time frame covered the years of 2004–2015. The starting year for the analyses marks the first enlargement of the EU to include CEE countries, while the last year of this period results from the availability of the most recent data in the FADN database. Farm accountancy data are subjected to several stages of verification at the farm, national and European Commission levels and for this reason they are made available with some delay, thus 2015 was the last analysed year.

An identical research path was followed for each country in this study, as presented below. Among all the farms only those were selected for the investigations, which were permanently present in the FADN database in all the analysed years. Thus it was possible to determine the effect of CAP pro-investment measures on the reproduction of fixed assets in the same farms in each individual year. Thus selected farms within each country were divided into two groups according to formula (1):

$$PIM = \begin{cases} 0, \text{ if } \sum_{t=2004^*}^{2015} SIV_t = 0 \\ 1, \text{ if } \sum_{t=2004}^{2015} SIV_t \geq 5{,}000 \end{cases} \quad (1)$$

*Since 2007 for Bulgaria and Romania.

where:
*PIM* – pro-investments measures;
*SIV* – subsidies on investments value (SE406 in FADN database).

The first group (*PIM* = 0) in each analysed country comprises farms, which in the analysed period received no pro-investment subsidies. The other group (*PIM* = 1) consists of farms, for which the total amount of subsidies to investments in the years 2004–2015 was minimum 5,000 EUR. In this way farms, which received support for investments from sources other than CAP funds, were excluded from this study. The above-mentioned threshold was adopted based on the analysis of the national Rural Development Programmes, which assume that pro-investment measures (particularly Young Farmers' Start-up Aid and Farm Modernisation), target relatively high investments, most frequently exceeding 10,000 EUR.

The next step was to calculate the value of fixed assets for each of the farms, which was determined formula (2):

$$FAV_t = TFAV_t - LV_t; \\ \forall t \in < 2004, 2005, ..., 2015 > \quad (2)$$

where:
*FAV* – fixed assets value;
*TFAV* – total fixed assets value (SE441 in FADN database);
*LV* – land value (SE446 in FADN database).

In order to determine the role of CAP pro-investment measures in the reproduction of fixed assets of farms it was necessary to deduct land value (*LV*) from the total fixed assets value (*TFAV*). In this way the value of fixed assets was obtained in accordance with the theory of inputs (labour, land and capital). Thus understood fixed assets determine the production potential of farms and this is the objective of CAP pro-investment measures, while land is a separate input, affected indirectly by pro-investment measures. Next for each country the average fixed assets value (*AFAV*) was determined in individual groups in the analysed years according to formula (3):

$$AFAV = \begin{cases} \dfrac{\sum_{i=1}^{n} FAV}{n}, \text{ for } PIM = 0 \\ \dfrac{\sum_{i=1}^{m} FAV}{m}, \text{ for } PIM = 1 \end{cases} \quad (3)$$

where:
*AFAV* – average fixed assets value in each group;
*n* – number of farms in group *PIM* = 0;
*m* – number of farms in group *PIM* = 1.

In order to present the phenomenon more comprehensively, changes in the value of fixed assets in individual countries in the analysed period are given in a graphic form in the next part of this paper.

**RESULTS AND DISCUSSION**

The number of farms in the FADN database in the individual countries varies greatly (Table 1). This is first of all connected with the method applied to calculate the representative sample of farms in each of these countries.

Definitely the largest number of farms in the FADN database is recorded in Poland (approx. 12,000), while the number is lowest in Estonia, Slovakia, Slovenia and Lithuania (in all these countries the number of farms in each of the years was below 1,000). Apart from the number of farms, its stability over the analysed years is also of great importance. Most of the investigated countries have a comparable number of farms in the database in individual years.

**Table 1.** The number of farms in the FADN database in individual years

| Country | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGR | – | – | – | 1 871 | 1 950 | 1 900 | 2 291 | 2 245 | 2 180 | 2 228 | 2 228 | 2 271 |
| CZE | 1 317 | 1 303 | 1 325 | 1 323 | 1 340 | 1 417 | 1 429 | 1 417 | 1 369 | 1 401 | 1 363 | 1 365 |
| EST | 498 | 498 | 500 | 499 | 498 | 498 | 659 | 657 | 655 | 660 | 658 | 658 |
| HUN | 1 915 | 1 933 | 1 944 | 1 953 | 1 936 | 1 932 | 1 918 | 1 918 | 1 978 | 1 974 | 1 982 | 1 962 |
| LTU | 1 023 | 1 049 | 1124 | 1 145 | 1099 | 1090 | 1056 | 1098 | 1109 | 1064 | 1153 | 1117 |
| LVA | 787 | 914 | 980 | 994 | 997 | 991 | 993 | 996 | 999 | 998 | 998 | 998 |
| POL | 11 831 | 11 785 | 11866 | 12 043 | 12 273 | 12 426 | 11 194 | 11 076 | 11 114 | 12 321 | 12 315 | 12 311 |
| ROU | – | – | – | 1 008 | 1 869 | 3 346 | 5 616 | 5 729 | 5 687 | 5 885 | 4 031 | 4 681 |
| SVK | 570 | 585 | 581 | 506 | 513 | 506 | 520 | 531 | 529 | 558 | 562 | 562 |
| SVN | 524 | 697 | 752 | 755 | 826 | 856 | 959 | 929 | 1142 | 944 | 904 | 895 |

Source: EU-FADN – DG AGRI.

Romania is an exception in this respect, as in the years 2007–2010 the number of farms in the FADN database increased over fourfold.

In the case of data from individual farms the research potential is much greater than for aggregate data. While conclusions drawn from the analyses of microdata were accurate, the precondition of data continuity needs to be met, as it is absolutely essential for panel data. This means that only those entities should be analysed, for which observations are found over the entire time frame. To a certain degree this limits the study population by disqualifying some entities; however, it has a definite advantageous effect on the precision of generated results. In the case of FADN microdata considerable differences are found in the proportions between the number of farms maintaining continuous observations and the mean number of farms from the entire period. In Estonia and Hungary the share of farms with continuous accountancy data exceeds 40%, while it is approx. 30% in Poland, Latvia and Slovakia and 20% in Bulgaria and the Czech Republic (Fig. 1). The percentage of farms maintaining continuous data in the total number of farms was lowest in Lithuania (2.1%) and Romania (0.5%), where out of the mean annual number of 4,206 farms only 23 are recorded in all the years.

Due to the small number of farms maintaining continuous data in Lithuania and Romania the data concerning entities from those countries may not be published according to the DG AGRI regulations, as
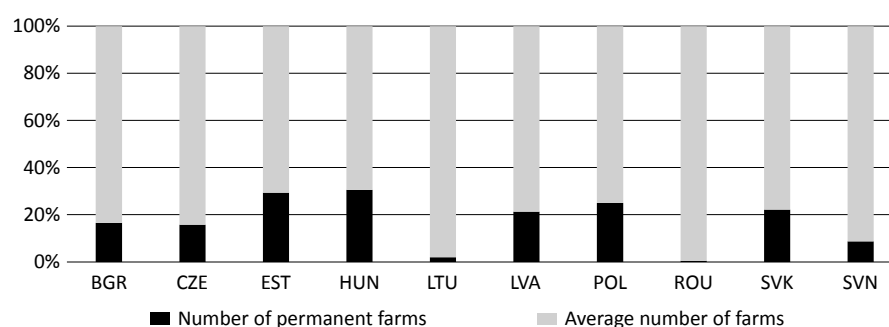


**Figure 1.** The share of farms found in the FADN database in all the years in the mean number of farms from the years 2004–2015

Source: EU-FADN – DG AGRI.

they concern an aggregate of fewer than 15 farms. In the case of the other countries the number of farms in each of the groups is sufficient to consider conclusions from this study to be presented (Table 2).

The analysis showed that in a vast majority of countries the *AFAV* in group *PIM* = 1 is markedly higher than in group *PIM* = 0. It obviously needs to be stressed that these differences were found already in the early years of analysis, which may indicate that it is farms better equipped in fixed assets that utilise the CAP pro-investment measures. This may be connected with the requirements binding at the implementation of individual instruments. However, it is of greatest importance that farms not receiving subsidies for investments are capable only to reproduce their assets, while farms receiving such subsidies increase their assets from year to year (Figs. 2–9).

**Table 2.** The number of farms according to groups

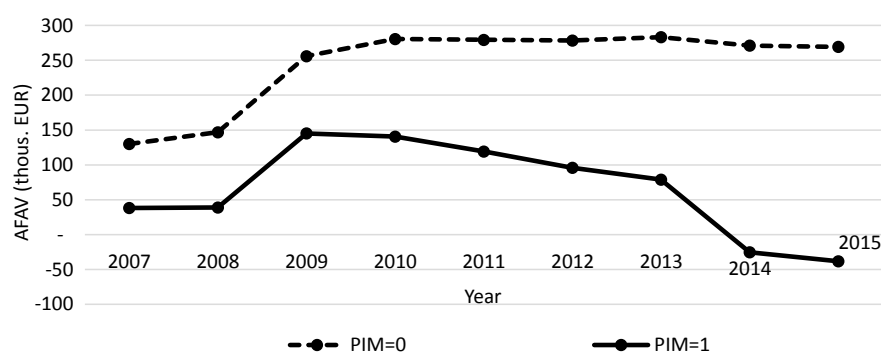| Country | PIM = 0 (*n*) | PIM = 1 (*m*) |
|---|---|---|
| BGR | 108 | 316 |
| CZE | 135 | 113 |
| EST | 183 | 43 |
| HUN | 327 | 489 |
| LTU | 19 | 4 |
| LVA | 196 | 47 |
| POL | 1 376 | 2 152 |
| ROU | 10 | 9 |
| SVK | 92 | 61 |
| SVN | 46 | 21 |

Source: EU-FADN – DG AGRI.



**Figure 2.** Average value of fixed assets in farms in Bulgaria in the years 2004–2015
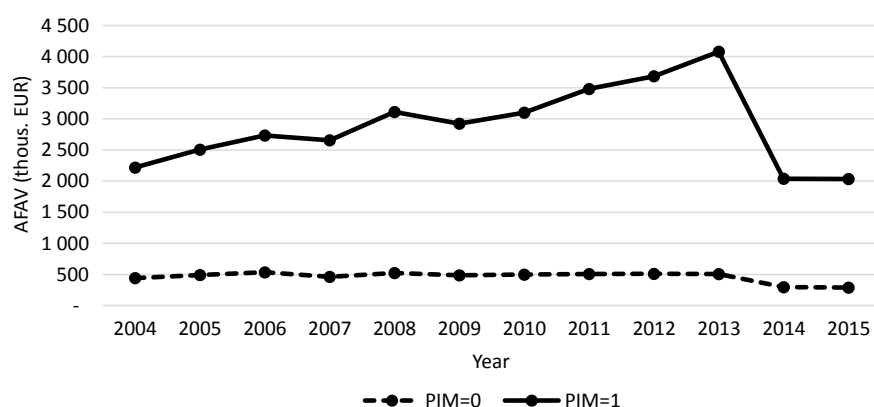
Source: EU-FADN – DG AGRI.



**Figure 3.** Average value of fixed assets in farms in Czech Republic in the years 2004–2015
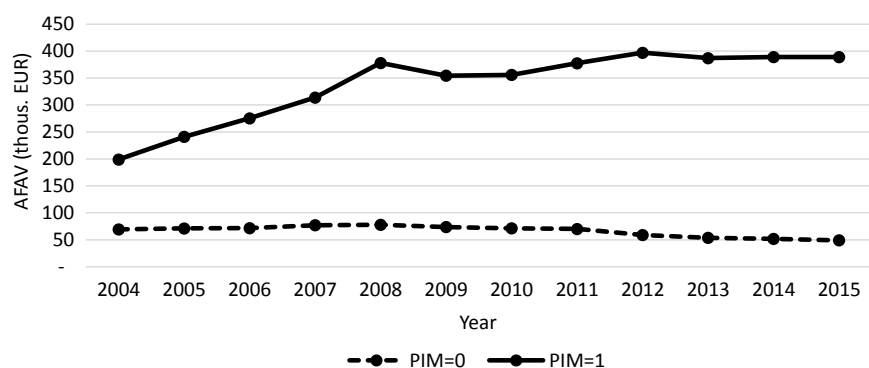
Source: EU-FADN – DG AGRI.

**Figure 4.** Average value of fixed assets in farms in Estonia in the years 2004–2015
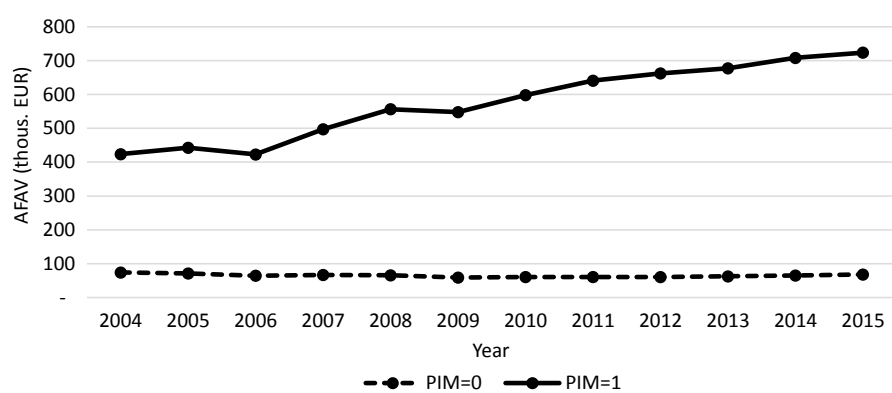Source: EU-FADN – DG AGRI.



**Figure 5.** Average value of fixed assets in farms in Hungary in the years 2004–2015
Source: EU-FADN – DG AGRI.



**Figure 6.** Average value of fixed assets in farms in Latvia in the years 2004–2015
Source: EU-FADN – DG AGRI.

Studies conducted by other authors (Grzelak, 2013; Kołoszko-Chomentowska, 2013; Hornowski, 2015) indicate that not all farms receiving pro-investment support showed a positive effect manifested in a greater value of their fixed assets. These results are confirmed based on the example of Bulgaria, where farms receiving no CAP subsidies for investments are characterised on average by a greater value of
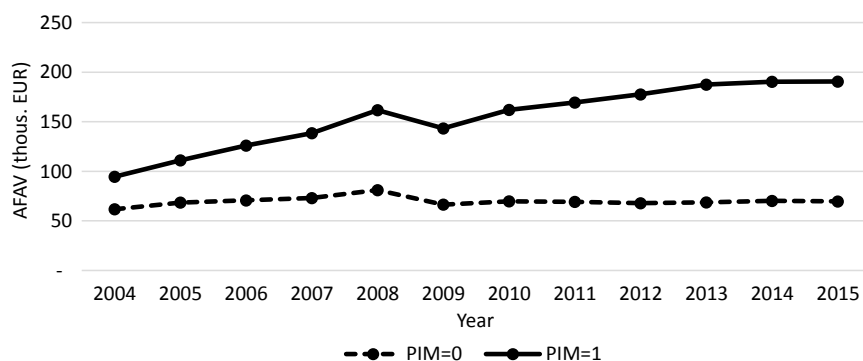
**Figure 7.** Average value of fixed assets in farms in Poland in the years 2004–2015

Source: EU-FADN – DG AGRI.
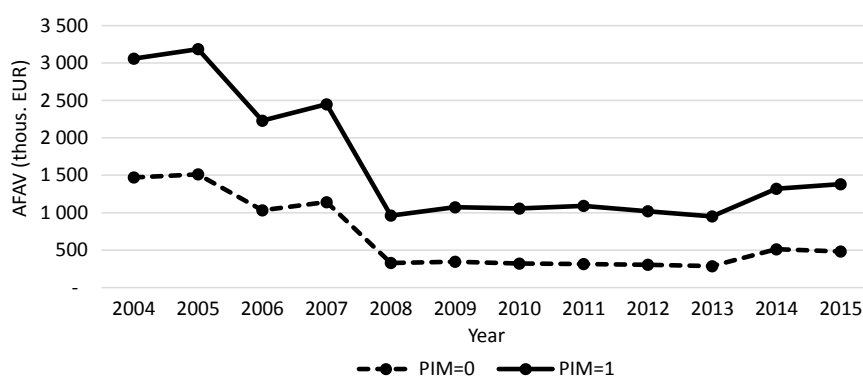


**Figure 8.** Average value of fixed assets in farms in Slovakia in the years 2004–2015

Source: EU-FADN – DG AGRI.
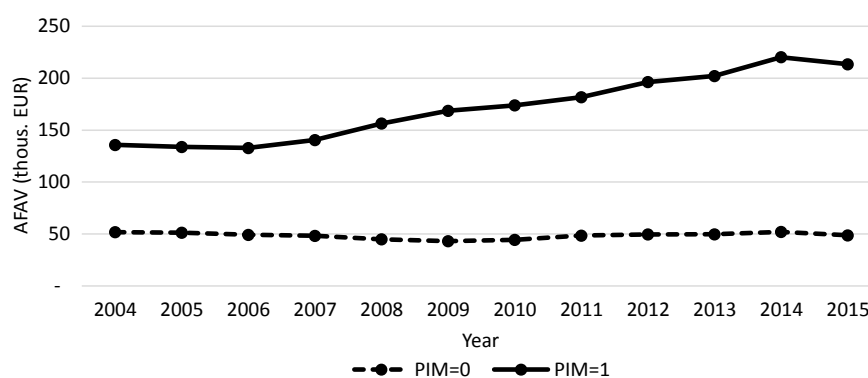


**Figure 9.** Average value of fixed assets in farms in Slovenia in the years 2004–2015
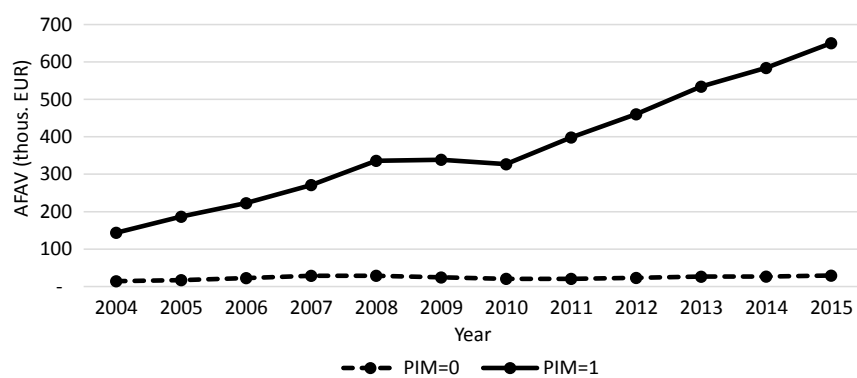
Source: EU-FADN – DG AGRI.

fixed assets. This may be related with the fact that this group comprises bigger and better developed farms, which are not eligible to apply for subsidies for investments from the second pillar of the CAP.

Also in Slovakia the trend was not consistent: in the years 2004–2008 the difference in the mean value of assets between groups *PIM* = 1 and *PIM* = 0 decreased and next it remained at a similar level.

Nevertheless, in contrast to Bulgaria over the entire period the average value of fixed assets in farms using subsidies to investments was greater than in farms from the control group. In turn, in the Czech Republic in 2014 a considerable reduction was recorded in the value of fixed assets, which seems to be connected with a change in their appraisal method. It also needs to be stressed that the Czech Republic and Slovakia are the only countries, in which the average value of fixed assets of farms is the highest, considerably exceeding the corresponding values in the other countries.

Summing up, the stimulating role of CAP pro-investment mechanisms is evident in most CEE countries. However, there are some exceptions to the observed dependence. For this reason in order to draw comprehensive and more specific conclusions, the interaction group ($PIM = 1$) and the control ($PIM = 0$) need to be selected more precisely, which is planned in the further stage of this study. This will provide an answer to the question whether it is caused by the lack of precision in the method proposed in this study or whether it is connected with an ineffectiveness of the implemented CAP pro-investment mechanisms in terms of the intended increase in the value of fixed assets in farms.

## CONCLUDING REMARKS

It was attempted in this paper to specify the role of pro-investment mechanisms within the Common Agricultural Policy in the reproduction of assets in farms in the CEE countries. Analyses showed that in most analysed countries both the farms being and those not being beneficiaries of CAP pro-investment mechanisms are capable of reproducing their fixed assets, but only farms receiving subsidies to investments are capable of increasing the value of fixed assets. However, significant differences are only found in the capacity to reproduce fixed assets in individual countries. These investigations show that it is highly advisable to conduct analyses of the effect of CAP pro-investment measures on the value of assets of farms based on more detailed and precise research methods, thus the authors of this paper intend to continue this line of research.

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# ADAPTATION PROCESSES OF THE AGRARIAN SECTOR FOR REALIZATION OF THE EXISTING POTENTIAL

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**ABSTRACT**

The agrarian sector of Ukraine with its basic component of agriculture is increasingly becoming the system-forming factor in the national economy. It creates the factors for maintaining the sovereignty of the state: food and, within certain limits, the economic and ecological, energy security of the state, ensures the development of technologically related branches of the national economy. The main aim of the study was to compare the diversity of agrarian structure and land productivity in Ukraine. The basic commodity positions of agrarian products and the existing potential for development are determined. The measures necessary for the development of the agrarian sector of Ukraine, the expansion of markets and the successful promotion of agrarian products to the world food markets are singled out.

**Key word**s: agricultural sector, adaptation processes, agricultural insurance, global agri-food system, potential
**JEL codes:** Q13, Q18

## INTRODUCTION

One of the most important aspects of the potential competitiveness of agriculture is the competitiveness of its resources and the study of potential opportunities allows us to determine the direction in the agricultural sector development strategy not only of this state but also of the whole region. The agrarian sector has its own specific features in the context of the natural, climatic, territorial, financial, material and production and national conditions of the country's development. Agrarian production in the territory of modern Ukraine is a traditional field of activity and is primarily due to the nature of the relationships of people in economic life, the type of tools and the direction of development of natural resources.

The effective development of the agrarian sector can be achieved at the organizational, economic, technological and financial and investment symbiosis of

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all units, since the basis of added value is formed at the expense of agricultural raw materials and products that are being processed for other industries. In Ukraine, the agrarian sector, in the current circumstances, is becoming a decisive component of the state's economy and plays an extremely important role in ensuring its economic and social stability. The agrarian sector needs careful attention to improving the development efficiency both in the short and long term of its development, as it is a socially important industry that produces food resources and provides food security.

## THEORETICAL BASICS

The agrarian sector is a special industry in the system of the national integral economy of Ukraine, because its development has a decisive influence on the standard of living of the people. The achieved level of competitiveness of the agrarian sector, as well as the prospects for its development in the conditions of global competition directly affect the living standards of the population, the cost of the consumer basket, the conditions and quality of reproduction of the labour force in the national economy. It is the agrarian sector that serves as an indicator of the general state of the economy, it has a leading place in addressing food issues, and the development and stability of the agrarian sector determine the normal functioning of the whole economy of the state and the welfare of its population. Today, the Ukrainian agrarian sector has a production potential that far exceeds the needs of the domestic market. It is a link that, on the one hand, can become the engine of the development of the national economy and its effective integration into the world economic space, and on the other hand, to contribute to the growth of incomes of the rural population, which accounts for more than one third of the entire population of the country.

## MATERIALS AND METHODS

The data used for documenting the paper was collected mainly through desk research. Different information sources from European and national level, such as reports, country fact sheets and articles were consulted.

The work included an analysis of available Ukrainian and foreign scientific literature on the development of agrarian business and export of products. The criterion for choosing a literature for consideration was the current and potential impact of the dynamics of agricultural production and exports, taking into account the activity of agricultural enterprises and households (small businesses). The main aim of the study was to compare the diversity of agrarian structure and land productivity in Ukraine. The analyzed changes in the agrarian structure concern, among other things, the structure of the number of farms and the structure of production in farms. The main export commodity positions of agrarian products are determined.

## RESULTS AND DISCUSSIONS

The agrarian sector occupies a special place in the structure of the national economy. The state of the agrarian sector largely determines the national economic potential, economic and political situation in the country (Friedmann, 1980). From its development, the material and social well-being of the population depend on its supply of food, the supply of raw materials of processing industries and the provision of national food security of the country, because the level of consumption of the final product of the industry affects the very existence of man, his health and productivity (Georgescu-Roegen, 1960; Bernstein, 1994). Agriculture is the core of the agrarian sector, which produces agricultural raw materials for further processing and receipt of food products and is a determining factor in the final consumption.

Agriculture is based on inter-branch production cooperation, which connects it with industries that produce means of production, process and bring food to the consumer. Agricultural production also performs a social function, providing employment for the population, creating preconditions for raising the level and quality of life in the countryside. Thus, Timmer notes that agriculture is a special sector of the national economy in which land (soil) is an important factor in productive production as the part of the production function (Timmer, 1986). The priority of attention to the agrarian sector is determined

by the indispensability of agricultural products and foodstuffs in the life of man and society, its exclusive social significance (Carter and Barham, 1996).

The agrarian sector of Ukraine with its basic component of agriculture is increasingly becoming the system-forming factor in the national economy. It creates the factors for maintaining the sovereignty of the state: food and, within certain limits, the economic and ecological, energy security of the state, ensures the development of technologically related branches of the national economy, forms the market for food products (Putsenteilo, Klapkiv and Kostetskyi, 2018).

Agricultural production serves as the core of the complex sector of the agrarian sector. This feature imposes the need for balance and proportionality between component parts (Musgrave, 1978). Consequently, the contradictions that arise and are solved in agriculture are an internal impulse for the development of the sector itself, which results in equalization of the development vectors of all branches. The main controversy is between fund-producing and consuming industries, agriculture and the industries for the processing, transportation and marketing of products (Wright and Kunreuther, 1975).

The agrarian sector of the economy is a set of industries that produce process and store and bring to the final consumer products produced from agricultural raw materials (Tomich, Kilby and Johnston, 1995). The agrarian sector of the economy includes those types of production, the functioning and development of which are subject to the creation of food. The existence of this set of industries and industries without a systemic connection is not efficient enough. Therefore, in order for the agrarian sector of the economy to fulfil its functions, it must have a certain structure (Jones and Woolf, 2006). The development of the agrarian sector is a dynamic process, each stage of which sets new tasks and needs new ways of solving them. The agrarian sector of Ukraine's economy enters into a new phase in its development – entry into the global space (Putsenteilo, 2011).

The globalization of the economy, including its agrarian sphere, is an objective reality, an inevitable process in the modern world. At the same time, this multi-dimensional and ambiguous process, which causes some controversy, promotes some of the destabilizing factors to affect the development of the agrarian sector, especially in the context of a weak national economy and ineffective government activity (Akram-Lodhi, 2007). That is why, at this stage, one of the most important areas of economic research is the study of trends and perspectives of the agrarian sector development in the context of intensifying globalization processes (Hymer and Resnick, 1969; Razavi, 2009).

One of the most important engines of transformation of the global agri-food system – and therefore of agrarian livelihoods – relates to the financial sector's recent rise in power and prominence. In the early 1970s, a suite of inter-related developments referred to generally as "financialization" initiated sweeping changes across the global economic landscape. These changes have provided powerful new mechanisms of accumulation, and they intersect in numerous ways with the current wave of land and resource dispossession (McMichael, 2012; Russi, 2013).

The development of agrarian production from a theoretical and methodological point of view is a complex process, agreed, firstly, with the decisive trends in the development of the national economy as a macro-economy, and secondly, with the requirements of adherence to the principles of a systematic approach to the formation of preconditions and factors of development, thirdly, with the requirements of the innovation and investment model of development of the industry, and fourthly, with the needs of sustainable development of rural areas, which provide for agro-industrial production, fifth, with the requirements of national security, including food safety standards, sixth, with the requirements of standardizing production and management systems based on current international standards and norms (Putsenteilo, Klapkiv and Kostetskyi, 2018).

In the broadest sense, the agrarian sector of the economy covers all enterprises of Ukraine irrespective of the form of ownership and organizational and legal form, which produce agricultural products and products of its primary processing, and associated service enterprises, as well as organizations (institutions) that develop and implementation of the state agricultural policy. In the narrow sense, it is

considered only as a sector of the economy, covering all enterprises that produce agricultural products, carry out their primary processing and serve the specified processes.

Consequently, the agrarian sector is a complex diversified set of economically interconnected production and technological division of labour of agricultural sectors specializing in the production of agricultural products, their industrial processing, storage and sale, which also covers information and scientific support systems and is characterized by deep differences and specifics of individual elements, which requires the construction of an individual organizational, economic, and technological and technological policy regarding all business entities.

According to the most general signs the organizational structure of agriculture in Ukraine is outwardly similar to that of agricultural countries in Europe. It is also possible to identify certain phenomena and processes similar to those which have taken place in the countries of the European Union: concentration and specialization of production; technical and technological re-equipment of separate industrial structures, accompanied by a decrease in the number of employees; vertical integration in the agro-food sector, etc. (Byres, 1991). However, unlike the EU countries, different types of industrial formations develop not as harmonized parts of the single complex in Ukraine, but rather differentiated, often on an antagonistic basis. A system of organizational and economic mechanisms that can provide the functioning of the agrarian sector as a whole organism, which, firstly, develops on a steady basis (with the expanded reproduction of the human, natural resources, physical, financial and other capital involved in it), and secondly, fully fulfills its tasks and functions in the process of public reproduction is not yet formed.

The central concept for analysis of agrarian social relations is the form of production. This is conceived through a double specification of the unit of production and the social formation (Friedmann, 1980).

The area of agricultural land in Ukraine is 36.5 million ha. The agrarian business in economic cultivation uses 83% of the categories of farms, including: agricultural enterprises and farms – legal entities (20.7 million ha), citizens (9.3 million ha). The rest

is used by the population for construction, maintenance of residential and utility buildings, as well as private households (5 million ha); hayfields and pastures (1.0 million ha); 2,422 (6%) of farms are engaged in agrarian business own 60% of the land with an area of over 2,000 ha; 32.0 thousand farms (71%) to the total number of agricultural formations – legal entities, which cultivate 4.6 million ha of land (23%). Among them the most widespread size of the economy is only 20–50 ha (25% – 11.8 thousand units).

The important issue for the agrarian sector of Ukraine is the protection of commodity producers, in the process of production cycle implemented through agricultural insurance (Klapkiv, 2016). The current state of development of agricultural insurance in Ukraine is not in line with its main task of managing the risks in the agricultural sector to ensure the stability of agricultural production. About three percent of the risk is insured, while in most developed countries this figure is 90–95% (Klapkiv, Niemczyk and Vakun, 2017).

The following methods can be used to improve the conditions for agricultural insurance and the involvement of agricultural producers in this area (Klapkiv, Klapkiv and Zarudna, 2018):

- reduction of the minimum yields in the legislation that will enable farmers to insure crops at any level of death;
- extension of the list of risks to crops by natural phenomena such as long-term showers, early occurrence of snow cover and freezing of the upper layer of soil;
- introduction of flexible agricultural insurance programs and state support for regions with high-risk agriculture;
- withdrawal of agricultural insurance from the "single subsidy".

## CONCLUSIONS

It is necessary the following for the development of the agrarian sector of Ukraine, expansion of markets and successful promotion of agrarian products to the world food markets:

- focus on increasing the efficiency of production of traditional Ukrainian export products (grain crops,

sunflower, livestock products) and increase the presence in promising sectors of the world food market in areas such as cannabis, sugar beet, flax, fruits and berries, with industrial their processing for sale abroad;

− to diversify the geographical structure of foreign trade in agricultural products (especially exports), while minimizing the dependence on individual countries on imports of certain types of agricultural products;

− to ensure, the balance of export and import of agricultural products at the state level, to achieve an increase in the surplus in foreign trade;

− gradually reorient the development of the agrarian sector's economy to increase export potential, with the condition of maintaining a balance between domestic and external demand for agricultural produce.

− to create an effective system of balance of interests of all subjects and participants of agricultural insurance with state support for the agrarian business, as well as to regulate the process of settlement of losses. In this case, the system created should ensure the effective implementation of insurance relations, including through the use of agricultural insurance instruments in the countries of the European Union.

Thus, the strengthening of globalization and integration processes actualizes the question of realization of agrarian potential. The current organizational and economic structure of the agrarian sector with its diversity of economic entities is outwardly similar to the agricultural system of the EU countries and still does not function as a coherent effective system, in the first place due to the failure to cover a significant part of the risks, although it can provide a rational growth in the production of quality food products.

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# THE ANALYSIS OF EUROPEAN ORGANIC FARMING PRODUCTION IN 2010–2017

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## ABSTRACT

The world sees one of the many agricultural production opportunities in organic farming. There are many challenges facing ecological producers, which on the one hand affect the income sphere of farmers, because they concern the provision of a fair existence, and on the other, farmers and organic producers must respect legal regulations and meet growing social expectations in the field of environmental protection and biodiversity. The aim of this article was to analyse data on organic farming production in Europe. Presented in it the number of organic European agricultural producers, the biggest producers, the number of organic crop area in Europe and the countries with the largest agricultural area in Europe. The article focuses on plant and animal organic production. Animal production divided into organic production of livestock of animals and organic production of animal products (excluding eggs).

**Key words:** organic farming, organic food, agricultural production
**JEL codes:** E230, Q100

## INTRODUCTION

Both in the world and in Poland there is intensive and systematic development of organic farming. The demand for organic food is also growing. Organic food is obtained from plant or animal products produced on organic farms. There are no artificial fertilizers, pesticides or food additives used on these farms.

Organic production gives the opportunity to receive high-quality, natural and safe products. Organic farms not only produce high quality food, but also care about the quality of the entire environment in which it operate. The global organic food market is facing a great opportunity for development. Together with the increase of ecological awareness and the level of affluence of societies, interest in this type of products is increasing.

Organic farming is the most pro-environmental agricultural production method, it is a very important area, but it requires constant changes to increase the share of this production sector. It can be clearly emphasized that organic farming is becoming a global trend. Ecological awareness of society is constantly increasing, which is clearly visible by the growing demand for organic products.

The dual nature of the organic farming system is very often emphasized. It is primarily a system that has a positive impact on the natural environment, which in turn contributes to the broadly understood agro-environmental benefits. On the other hand, or-

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ganic farming is a response to the changing structure of market demand. After the great fascination of the world in the production of food in industrial conditions – the consumer is increasingly of the opinion that only food was created in conditions as close as possible to natural meets his expectations.

## THEORETICAL BACKGROUND

Organic farming is a branch of the national economy characterized by a full fit to the rhythm of nature's life. Its essence is to stimulate natural processes occurring in ecosystems by using ecological resources of production. These treatments ensure further soil productivity and guarantee the health safety of all products, both of plant and animal origin (Nestorowicz and Pilarczyk, 2010).

Organic farming is therefore a system of sustainable management (not technologically processed) of plant and animal production, based on biological and mineral origin. The organic production process rejects the use of strong antibiotics, hormones, preservatives and other unnatural additives and fertilizers (Domagalska and Buczkowska, 2015).

Organic farming is very important in the concept of sustainable development. This strategy should achieve social, economic and environmental goals. It combines activities that should satisfy the basic needs of society, improve the quality of life and provide the right amount of goods and services with activities aimed at improving the condition of the natural environment (Kahl et al., 2010).

Organic farming is one of the fastest developing branches of agriculture in the world, and in particular in the European Union. The basis for organic production, both plant and animal, should be the preservation of the highest degree of biodiversity, animal welfare and the use of only natural production methods (Barłowska and Wolanciuk, 2017).

The development of organic farming, which is also called biological, has been largely influenced by conventional farming, whose impact on the environment was negative. It was, among others, pollution of surface and groundwater with nitrogen compounds and overproduction of food in highly developed countries. In organic farming, GMOs, synthetic fertilizers, pesticides, growth regulators and artificial feed additives are not used (Kowalska, 2015).

Production should be based on properly planned crop rotation, in order to preserve or improve soil fertility, and appropriate selection of plant species and varieties as well as animal species and breeds that show natural disease resistance and high adaptability to local environmental conditions. Compliance with these principles allows achieving two most important goals, i.e. environmental protection within the soil, water and landscape, and high quality of agricultural produce (Rigby and Câceres, 2001).

Products from organic farming are called organic or biological food. These are unprocessed crops originating from organic farming, as well as products made from them. We also include products and various products of animal origin produced in an organic farm (Miśniakiewicz and Suwała, 2006).

The transition from conventional to organic farming can be cost-effective, although the yields are lower, and the time of animal husbandry is doubled. Production on the farm with an organic certificate it is more profitable for farmers because the prices of manufactured products are higher compared to those from conventional farms. Organic farming requires much more work than conventional. In such farms there are more jobs, which may translate into a reduction in emigration of people from the countryside. It is also beneficial that organic farms are characterized by lower energy consumption (Kiełbasa, 2015).

## MATERIALS AND METHODS

The article uses the method of data analysis. Statistics from the Eurostat database were used as well. The research period is between the years 2010–2017 and concerns organic farming production in Europe. The data used in the article contain utilised agricultural area excluding kitchen gardens, total fully converted and under conversion to organic farming.

## RESULTS AND DISCUSSION

The greatest dynamics of the development of organic farming in the EU member states were recorded in the 1990s (Szarek and Nowogródzka, 2015). However,

its importance in the total production of food was and still is secondary. A very fast increase in the area of organic farming and the number of agricultural producers was visible only after 1999, when appropriate legal regulations concerning agriculture and organic food were introduced, as well as aid in the form of subsidies for farmers involved in such production. Also in Poland, after joining the European Union, the number of organic farms and the area of agricultural land managed in the ecological system increased significantly, similarly to earlier in other member states (Nachtman, 2015).

For the last 10 years, the organic food market has been thriving, which has intensified demand. The global market for such food has increased fourfold since 1999. Areas for organic farming in the EU have doubled. Every year, 500,000 ha are transformed into organic farming (Domagalska and Buczkowska, 2015).

The number of organic European agricultural producers was growing from year to year. In 2012 there were 319,789, while in 2017 this number increased to 389,813 (Fig. 1). This is an increase of 21.9%.

The most producers are in Turkey. In 2017 there were 75,067. A lot of organic agricultural producers are also in Italy (66,788), Spain (37,712), France (36,691) and Germany (29,764). The countries with the least number of producers are Malta (13), Iceland (30), Luxembourg (103), Serbia (286) and Montenegro (308). In Poland in 2017 were register 20 257 such producers. This number is steadily growing. It gives our country a 8th place.

The Polish market for organic food is developing dynamically, but we still have to chase countries such as the Germany, France, the United Kingdom, the Netherlands and Austria. According to trade forecasts, the upward trend on the Polish market is expected to continue at least until 2030.

The result of an increasing number of organic agricultural producers is more and more organic crop area in Europe. The number of organic crop area in Europe is growing from year to year. In 2012 there were 10,224,170 ha, while in 2017 this value increased to 13,351,911 (Fig. 2). This is an increase of 30.6%.

The countries with the largest agricultural area in Europe are Spain with 2,082,173 ha, Italy (1,908,570), France (1,744,420) and Germany (1,138,272). In turn, the countries with the smallest agricultural area in Europe are Malta (41), Montenegro (2,797), North Macedonia (3,193), Luxembourg (5,444) and Cyprus (5,616). Poland is in 10th place with 494,978 ha. It is worth noting that Liechtenstein is the country with the highest percentage of ecological areas in Europe (31.0%).

However, the Danish market is considered the best developed market for organic food in EU countries. The Danes allocate the largest amount of money for organic products per capita in comparison to other EU countries.

In 2017 were produced in Europe 12,602,383 t of organic crops. These were mainly plants harvested green from arable land (4,309,885 t), cereals for the production of grain (including seed)
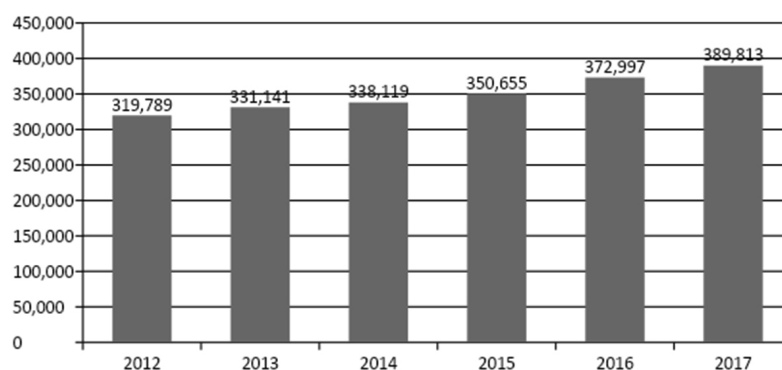


**Figure 1.** Number of organic European agricultural producers

Source: the author's own compilation on the basis of Eurostat database, www.ec.europa.eu [Access 28.04.2019].
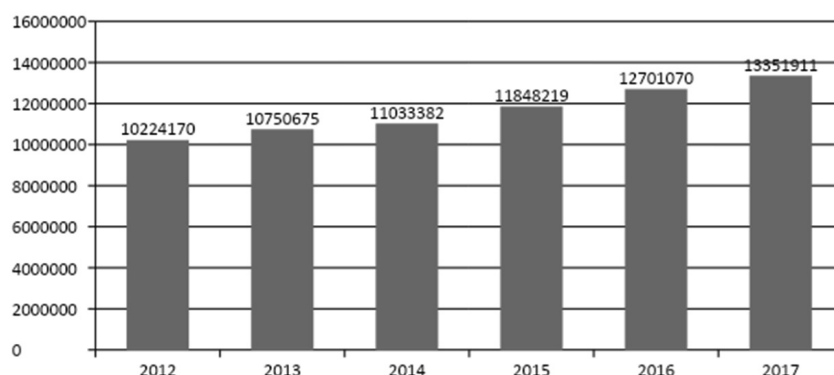
**Figure 2.** Organic crop area in Europe (ha)

Source: the author's own compilation on the basis of Eurostat database, www.ec.europa.eu [Access 28.04.2019].

(1,848,667 t), cereals (excluding rice) for the production of grain (including seed) (1,825,896 t), fresh vegetables (including melons) (1,109,409 t), wheat and spelt (617,166 t), oats and spring cereal mixtures (mixed grain other than maslin) (508,677 t), grapes (392,227 t), olives (356,524 t), barley (303,436 t), root crops (281,196 t), industrial crops (225,863 t), rye and winter cereal mixtures (maslin) (108,422 t).

Animals are also a very important part of European organic production and an organic farm. The number of animals in an organic animal farm should depend on the possibility of fodder and fertilizer balance on the farm. It is recommended that animals kept on an organic farm come from other organic farms. In 2017 were produced in Europe 107,200,832 organic livestock of animals. It was less than in the previous year, but almost 60% more than in 2012 (Fig. 3).

The largest producers of horses in 2017 in Europe were Austria (17,273), Switzerland (9,614), the Czech Republic (8,741) and Spain (6,187). In Poland in 2017 were bred 604 horses. It gives our country a 11th place. The largest bovine animals producers in 2017 in Europe were Germany (1,577,122), France (1,299,712), Austria (844,016) and Sweden (614,240). Poland is in 23rd place with 55,802 bovine animals from organic breeding. In the pig production process by organic methods, the largest producers in 2017 in Europe were Denmark (749,926), France (564,572), Germany (193,338) and Netherlands (175,084). In Poland in the same period were bred 7,786 organic pigs. It gives our country a 15th place.

The European organic production of animal products (excluding eggs) is growing from year to year. In 2012 it was 3,977,399 t product weight, while in 2017
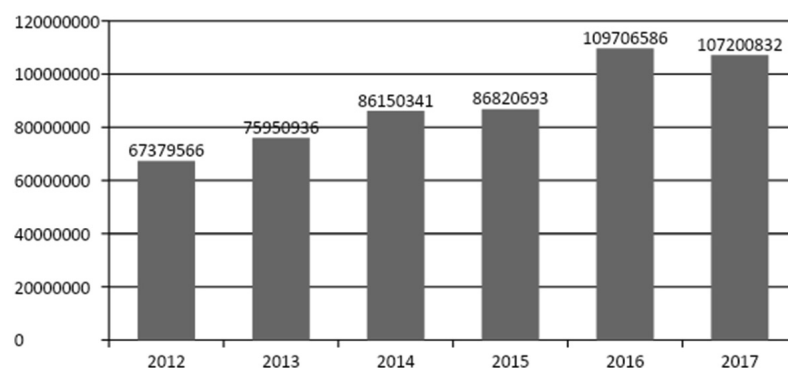


**Figure 3.** Number of organic production of livestock of animals

Source: the author's own compilation on the basis of Eurostat database, www.ec.europa.eu [Access 28.04.2019].

this number increased to 6,749,507 (Fig. 4). This is an increase almost of 70%. The largest producers of organic production of animal products (excluding eggs) in 2017 in Europe were Germany with 1,355,977 t product weight, France (1,150,074), the United Kingdom (825,200) and Austria (792,803). In Poland in 2017 were produce 26,734 t product weight. It gives our country a 18th place.

Research indicates significant differences between meat from organic and conventional production. Organic meat products have a higher content of nutrients. The largest producers of meat of livestock in 2017 in Europe were France with 55,694 t product weight, the United Kingdom (53,000), Sweden (26,877) and Spain (26,417). Poland is almost at the end of this classification with only 2 t product weight. In Poland, there was no organic production of bovine meat, pig meat, poultry meat, goat meat, and sheep meat.

The largest number of organic dairy products is produced by Germany (1,355,977), France (1,094,380), Austria (792,803) and the United Kingdom (772,200). Poland in 2017 was produce 26,734 t of organic dairy products. It gives our country a 17th place.

The United Kingdom is one of the countries that imports most of the products on its organic food market from other countries. This percentage is high and amounts to almost 70%. This is due to the inadequate structure of supply. The most important sales channel for eco-food in the United Kingdom are large-format stores.

In organic eggs production first in 2017 in Europe was France with 1,383,000,000 eggs. Next were Germany (1,293,806,000), the Netherlands (882,995,575) and Sweden (380,119,347). In Poland were produce 20,264,110 eggs (14th place).

In an unusual situation among the EU countries is the Netherlands, which despite the small area of organic farming is in Europe also an influential exporter of such eco-products as: vegetables, fruits, cheese, cereals, spices, herbs. The Netherlands as one of the few countries doing research supply and demand on the market of organic food. The persistently implemented policy of support for organic farming means that the demand for eco-food is constantly growing in the Netherlands (Tyburski and Żakowska-Biemans, 2007).

A smaller part of organic agricultural production is organic production of aquaculture products. The largest producers of aquatic organisms in 2017 were Ireland with 42,711 t, following by Norway (13,611), Italy (8,782) and Spain (4,393). Organic production of aquaculture products in Poland was at the level of 17 t.

Importing of organic products is a popular practice. There are 4,610 importers in the EU, where a significant part of them concerns EU founding countries, highly developed countries and those with large, well-stocked hypermarkets. Among them we distinguish: Germany (1,687), France (418), Italy (411), the Netherlands (385), Spain (263). Poland has 161 importers of eco-products.
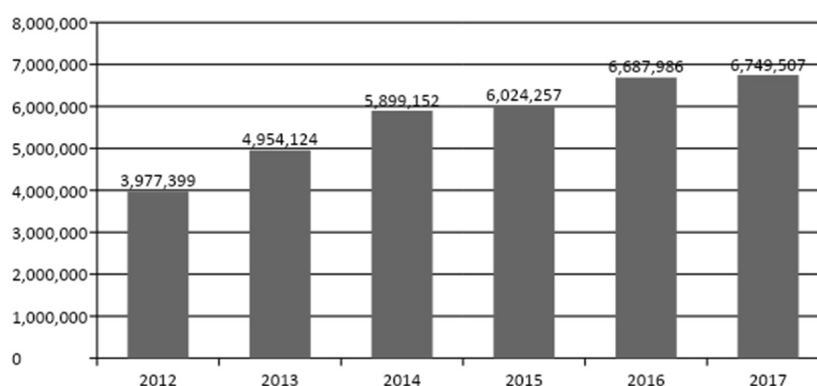


**Figure 4.** Organic production of animal products excluding eggs (t product weight )

Source: the author's own compilation on the basis of Eurostat database, www.ec.europa.eu [Access 28.04.2019].

## CONCLUSIONS

Over the last 10 years the market for organic food was characterized by buoyant growth. The number of organic European agricultural producers was growing from year to year. The most producers are in Turkey. A lot of organic agricultural producers are also in Italy, Spain, France and Germany. Poland is in 8th place.

The result of an increasing number of organic agricultural producers is more and more organic crop area in Europe. The number of organic crop area in Europe is also growing from year to year. In 2012 there were 10,224,170 ha, while in 2017 this value increased to 13,351,911. This is an increase of 30.6%. The countries with the largest agricultural area in Europe are Spain, Italy, France and Germany. Poland is in 10th place. The European organic production of organic crops, livestock of animals and animal products is getting bigger.

A smaller part of organic agricultural production is organic production of aquaculture products. The largest producers of aquatic organisms in 2017 were Ireland, following by Norway, Italy and Spain.

The Polish market for organic food is developing dynamically, but we still have to chase countries such as the Germany, France, the United Kingdom, the Netherlands and Austria.

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# CHANGES IN PRODUCTION AND VOLATILES OF FOREIGN TRADE INDUSTRY FRUIT IN POLAND OVER THE YEARS 2010–2017

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## ABSTRACT

The purpose of the work was to determine changes in production in Polish foreign trade and the level of fruit that are being consumed by Polish consumers from 2010 to 2017. The article analyses quantitative and valuable changes in export, import and the balance of Polish fruit turnover. The article presents the share of fruit harvest in Poland in the context of global and European production, the importance of Polish fruit export and import, as well as the results of statistical analysis of the impact of fruit supply on the consumption of these products in Polish households from 2010 to 2017. The research shows that the supply of fruit on the Polish market did not have a significant impact on the amount of their consumption in households.

**Key words:** share of fruit, export, import, supply, fruit consumption
**JEL codes:** L66, D12, F14

## INTRODUCTION

The transition from a centrally controlled economy to a market economy and Poland's accession to the European Union had a major impact on changes in Polish fruit-growing. Fruit farming as an important plant production department follows the economic and social changes occurring in the global European and Polish economy. In order to keep up with all changes, Polish fruit-growing is gradually adapting to the changing conditions of farming, and Poland's accession to the structures of the EU has influenced the growth of production and commercial potential on the domestic and foreign market. The level of development of fruit production and its spatial and organizational structure are determined by natural conditions and various socio-economic factors. Further development of the sector is currently seen in the growth of exports, due to the growing demand for Polish fruit. This is the result of many promotional and informational activities, which are particularly intensified in the situation of the embargo imposed on fruit producers by Russia. For many years, Poland has been the world's largest producer of apples, blackcurrants, raspberries and blueberries, highbush blueberries as well as a significant producer of strawberries. The growth of fruit production is favoured by adequate land resources, a large group of producers, an increase in fruit consumption and the possibility of exporting to new markets (North Africa, Middle East, India, China). Fruit production is an important direction of agricultural production in Poland. An essential element of the planning and organization

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of horticultural production is to learn the trends and changes in fruit consumption.

## FACTORS OF PRODUCTION AND ECONOMIC GROWTH IN THE THEORY OF ECONOMICS

The subject matter of economic factors of the fruit economy is a part of the achievements of the classical and contemporary economic ideas. Production, regardless of the level of socio-economic development, always takes place under conditions of objective limitations (resources of production factors and time).

Theories of economic growth belong to more contemporary phenomena, but the very concept and interest in it, however, dates back to the beginnings of economic thought. In the theory of economic growth among the achievements of the classics of economy one can distinguish, between others, the concept of A. Smith's wealth source, the two-sector model and the theory of comparative costs of D. Ricardo and the theory of economic development of K. Marx. The authors of the first economic doctrines tried to find the answer to the question – what determines the growth of national wealth (currently economic growth) and what kind of factors influence it. The theory of economic growth of the English classical school (Smith, Ricardo, Mill) indicated the greatest importance to two factors of production: labour and capital. Capital was considered the most important (Zadroga, 2016). The classics tried to point to various factors determining the increase in the wealth of nations, and the main emphasis was placed on the size of production. They also claimed that trade is conducive to increasing production and wealth, because by expanding the market it facilitates large-scale specialization and development, and the same time it promotes the introduction of innovation and technical progress in production (Klimiuk, 2016).

Neoclassical theories of economic growth include: Harrod-Domar's growth model, R. Solow's exogenous growth model (Zadroga, 2016), views of the Anglo-American neoclassical school (including A. Marshall), some representatives of the mathematics school and K. Menger from the German historical school (Strzeszewski, 1976). The basic paradigm in the neoclassical theory was one known in the literature of the subject as Harrod-Domar model. On its basis, one can formulate two conclusions, that economic growth is greater and the efficiency of capital is getting greater when the greater part of the national income is spent on investments. Economists, the representatives of the neoclassical, mathematical and classical schools understood the problem of foreign trade, with a starting point of the international specialization problem and the division of global economic resources between different countries (Klimiuk, 2016). A. Marshall introduced the fourth factor of production: organization. In the first half of the twentieth century, this view was strengthened by J.A. Schumpeter, who called it an entrepreneurship. According to him, it had a huge impact not only on the maximization of profit in the enterprise, but also on the functioning of the entire socio-economic system (Glapiński, 2004).

## MATERIALS AND METHODS

The purpose of the work was to determine changes in Polish production, foreign trade and the level of fruit consumption from 2010 to 2017. The work determines the position of Polish production of fresh fruit on the world and EU markets, and its share in global agricultural production. The work also examines the global crop production in Poland. Moreover, the analysis includes export, import, trade balance in foreign trade in fruit and their consumption, as well as the impact of fruit supply volume on the domestic market – the consumption in households calculated using the correlation coefficient. Correlation coefficients were determined using the Person's correlation analysis, which was verified by the Student's – T statistic and Fisher-Snedecor test.

During the work on the production, export, import and fruit consumption issues in Poland, the resources that were used were mainly of secondary nature, such as the Central Statistical Office (Polish acronym GUS) database, analyses and expertise provided by the Institute of Agricultural and Food Economics – National Research Institute (Polish acronym IERiGŻ--PIB), as well as other sources. There were also used mathematical and statistical methods in the work.

## THE SHARE OF POLISH FRUIT PRODUCTION IN THE WORLD AND EUROPEAN PRODUCTION FROM 2010 TO 2017

Fruit farming plays an important role in the food economy complex. Its economic and social importance is determined by the share of horticultural production, trade and agri-food processing in the effects of agriculture as a whole, and especially in the plant production department (Rysz and Szymańska, 2017). The share of fruit in the value of global crop production in 2017 was 11% and between 2010 and 2017 there was an increase of 2.1 p.p. (8.9% in 2010), and trade plant production accounted for almost 15% (2017). According to Eurostat data, in 2017 two-thirds of the fruit tree plantation area in the EU was concentrated in Spain, Italy and Poland, and our country had the largest area of apple orchards (Eurostat online database: Agricultural production – orchards).

The importance of fruit growing in Poland is indicated by the size of domestic fruit production against the world and the EU (Table 1).

The data shows that between 2010 and 2017 there was an upward trend in fruit production in the world and in Poland. In the EU, it remained quite stable with slight fluctuations in particular years, which may have resulted primarily from climatic conditions during the growing season. Poland's share in global

fruit harvests was quite stable and ranged from 0.4 to 0.6%, and in the EU accounted for 9.9% on average. The largest share of Poland in the global fruit harvest (0.6%) was in 2012–2014 and in 2016. In the EU, in 2012–2015 it remained above 10%, and in 2016 reached the level of 12%.

There is a small number of species of fruit trees, shrubs and perennials in Polish orchards. The fruits of great importance are: apples, plums, cherries, pears, cherries. In the structure of berry fruit production in the country, the most important are strawberries, raspberries, currants (both black and coloured), chokeberry, gooseberry and from 2012 highbush blueberry. In 2010–2017, there was an upward trend in fruit harvest. In 2010, the collections amounted to only 2,733.5 thousand t, and in 2017 were higher by 14.8%. Fruit production in Poland has exceeded 4 million t since 2013, except for 2017, when due to unfavourable weather conditions harvests amounted to only 3.2 million t, which constituted about 8.8% of the production volume in the EU. Harvested by 32.1% less fruit than the record harvest in 2016. Smaller than last year were apple harvests (32.3%), pears (32.4%), plums (46.7%), cherries (63.2%), raspberries (19.1%), strawberries (9.7%), currants (22.5) and gooseberries (24%). The decline in the production of most fruit in the country was caused by unfavourable weather conditions for horticultural

**Table 1.**   Worldwide, European and Polish fruit production, Poland's share in world and EU production between 2010 and 2017

| Year | Fruit production (million t) | | | Polish share in the world (%) | Polish share in the UE (%) |
|---|---|---|---|---|---|
| | world | EU | Poland | | |
| 2010 | 613.9 | 36.8 | 2.7 | 0.4 | 7.5 |
| 2011 | 637.6 | 38.8 | 3.4 | 0.5 | 8.8 |
| 2012 | 636.5 | 36.5 | 3.8 | 0.6 | 10.5 |
| 2013 | 676.7 | 38.0 | 4.1 | 0.6 | 10.9 |
| 2014 | 689.9 | 39.3 | 4.2 | 0.6 | 10.7 |
| 2015 | 854.0 | 39.0 | 4.0 | 0.5 | 10.4 |
| 2016 | 717.7 | 38.8 | 4.6 | 0.6 | 11.8 |
| 2017 | 865.6 | 37.0 | 3.2 | 0.4 | 8.8 |

Source: own calculations based on: the GUS "Statistical Yearbooks of Agriculture" for the period of 2011–2018 – information about world and Poland; the IERiGŻ-PIB journal "Fruit and vegetable market – status and prospects. Market analysis" No 49/2016 for the period of 2010–2012 and No 53/2018 for the period of 2012–2017 – information about the EU.

crops during their flowering period, the trees and fruit shrubs suffered the most as a result of strong frosts in early May, which significantly limited or even prevented yielding. Some fruit also suffered as a result of summer hail. The increase in fruit production between 2010 and 2017 could be affected both by relatively high land resources and a large group of enterprising producers with a high level of professional and marketing knowledge and the possibility of using national and EU subsidies. The well-developed base of the domestic processing industry is very important in the development of the production of berries. According to the latest orchard survey in Poland, carried out in 2017, fruit growing is still developing. More and more expenditure is spent to fruit production and storage. From year to year there is an increasing concentration and specialization of fruit production, the production potential of orchards also increases, especially apple orchards (GUS, 2018).

## EXPORT, IMPORT AND BALANCE OF TURNOVER OF FRESH FRUIT BETWEEN YEARS 2010 AND 2017

An important factor that stimulates the development of domestic fruit production is their export. Although the share of fruit in total Polish exports is not high, due to the number of farms involved in this type of production and the significant position of Poland in the global export of some fruit groups (e.g. apples),

it is worth analysing how Polish exports, imports and the fruit turnover balance were changing. The changes (quantitative and value fluctuations) of Polish exports, imports and the balance of fruit turnover between 2010 and 2017 are presented in Table 2.

In 2010, Poland sold 921.6 thousand t of fruit worth almost 365.1 million EUR, and in 2017 the country exported almost 1.5 times more (1,291.4 thousand t) with a total value of 624.5 million EUR (an increase of 41.5% on a quantitative basis and 71% in terms of value). The analysis of Polish export of fresh fruit shows that there was a positive trend regarding its quantity and value. In the analysed period there was also a quantitative increase in fruit imports to Poland from 1,117.1 thousand to 1,741.9 thousand t (46.7%) and valuable from 842.6 million to 1,539.6 million EUR (82.7%). Despite the increase in exports in the majority of analysed years, the negative balance of foreign trade in fruit was maintained and amounted to –450.5 thousand t (–915.1 million) in 2017. In quantitative terms, it was 64.1%, and its value was 91.6% higher than in 2010.

In four of the analysed years (2011, 2014, 2015 and 2017) there was a quantitative decline in fruit exports. In 2011 and 2017, this was due to lower fruit harvest in Poland caused by bad weather conditions during the growing season. On the other hand, the years from 2014 to 2017 are the period of the Russian embargo on plant products (including fresh fruits) originating from the EU, which significantly affected

**Table 2.** Export, import, balance of turnover of fresh fruit in Poland in 2010–2017

| Year | Export | Import | Balance | Export | Import | Balance |
|---|---|---|---|---|---|---|
| | thousand t | | | million EUR | | |
| 2010 | 912.6 | 1 187.1 | –274.5 | 365.1 | 842.6 | –477.5 |
| 2011 | 776.4 | 1 252.8 | –476.4 | 396.4 | 870.2 | –473.8 |
| 2012 | 1 263.9 | 1 242.2 | 21.7 | 621.9 | 900.4 | –278.5 |
| 2013 | 1 515.3 | 1 344.7 | 170.6 | 727.9 | 1 032.9 | –305.0 |
| 2014 | 1 370.3 | 1 400.0 | –29.7 | 612.8 | 1 110.7 | –497.9 |
| 2015 | 1 175.5 | 1 458.8 | –283.3 | 567.4 | 1 217.3 | –649.9 |
| 2016 | 1 366.3 | 1 503.5 | –137.2 | 592.3 | 1 282.5 | –690.2 |
| 2017 | 1 291.4 | 1 741.9 | –450.5 | 624.5 | 1 539.6 | –915.1 |

Source: own study based on data from the IERiGŻ-PIB journal "Fruit and vegetable market – status and prospects. Market analysis" Nos 39/2011, 43/2013, 47/2015, 51/2017 and 53/2018.

the size and directions of exports from Poland, especially apples. In 2014 and 2015, there was a significant quantitative decline in their exports when compared to the previous year, respectively by 9.6% and 14.2%. The increase in volume and value of the balance in foreign trade in fruit in 2016 compared to the previous year was primarily the result of increased exports of apples, especially to the countries of the Eurasian Economic Union (a double increase in the value of apple exports to Belarus when compared to 2015 – GUS, 2017), the Middle East and China.

The rich use of EU and national support funds for the horticultural sector has contributed to the growth of Polish fruit exports in terms of quantity and value. The funds were mainly directed to the building of modern cold stores, which allowed to increase the flexibility in adapting supply to the structure and seasonality of the demand of sales markets. This factor, in connection with the increased concentration of fruit supply, made it possible for Poland to use the main advantage of domestic products in relation to other major exporters in the world, i.e. relatively low prices in the export offer (Nosecka, 2014).

## THE IMPACT OF FRUIT SUPPLY ON THE DOMESTIC MARKET BETWEEN 2010 AND 2017 FOR THEIR CONSUMPTION

The economic growth of the country, and thus also the increase in the income of the population, contributes to the change in the structure of consumption of fruit by consumers. In the civilized countries, the level of fruit consumption is considered as an exponent of the living standard of society. The measure of the consumption level is no longer the quantity, the assortment structure, the distribution of intake during the day and the quality of the consumed fruit become more important (Olewnicki, 2010). Public awareness of the impact of fruits on human health in the 21$^{st}$ century is one of the main factors that determines their intake in humans. This is confirmed by research, among others Jasiulewicz (2011), Włodarczyk and Adamowicz (2011), Stolarska (2014) and Strojewska (2017). In recent years, there has been a worldwide increase in the consumption of fresh fruit, which may, first of all, result from the concern of consumers for a well-balanced diet, appreciation of the dietary values of these products and increased consumption of salads, juices and fruit drinks.

Based on the analysis, it was found that between 2010 and 2017 fruit production was growing (Table 1). A similar situation occurred in the case of fruit consumption (Table 3).

According to data from 2010 to 2017, there was an increase in fruit consumption by 20.5%. In 2011, 2013 and 2017, a slight decrease in their consumption was observed in relation to the previous year, which could have resulted from lower harvests in those years, and thus higher fruit prices on the market. In the analysed period in foreign trade, both exports and imports showed an upward trend (Table 2). On the

**Table 3.** Fruit consumption and supply on the domestic market in 2010–2017

| Year | Fruit consumption (kg per person) | Fruit supply (thousand t) |
|---|---|---|
| 2010 | 44 | 3 018.0 |
| 2011 | 42 | 3 891.0 |
| 2012 | 46 | 3 821.5 |
| 2013 | 46 | 3 957.7 |
| 2014 | 47 | 4 218.0 |
| 2015 | 53 | 4 332.2 |
| 2016 | 54 | 4 780.9 |
| 2017 | 53 | 3 601.5 |

Source: own study based on the GUS and the IERiGŻ-PIB data.

basis of the analyses carried out at work, it was assumed that the annual level of fruit consumption in households depends on the harvest and import of fruit in a given year, reduced by the volume of exports, i.e. from the so-called fruit supply on the domestic market.

The article attempts to determine whether between 2010 and 2017 there was a linear relationship between the supply of fruit on the domestic market and the amount of consumption per year per one person in the household. In the analysed period, the factor that could have influenced the level of fruit consumption was the price. Due to the access to collective data regarding the general supply of fruit on the market and consumption, the role of the price in the development of the indicated dependence was not taken into account.

The Pearson correlation coefficient for variables referring to the supply of fruit on the domestic market and annual fruit consumption per one person in a household amounted $r = 0.55$. On this basis, a moderate positive correlation was found between the supply of fruit on the domestic market and its consumption between 2010 and 2017.

Based on the additional verification of the significance of the correlation coefficient, it can be concluded that the supply of fruit on the domestic market had no impact on the consumption of fruit in households between 2010 and 2017. It can be assumed that the increase or decrease in the supply of fruit products in a given year did not have a significant impact on the volume of their consumption in Poland. Changes in fruit consumption in the analysed period may have been conditioned by other factors, such as the price or change in eating habits, recommendations of global health organizations and numerous campaigns promoting fruit consumption in Poland.

## SUMMARY

For many years, Poland has been among the world's and European leaders in fruit production. Fruit production in the world, the EU and Poland between 2010 and 2017 has increased. The structure of fresh fruit production is dominated by apples, cherries, strawberries and currants. In 2015, a decline in crops was recorded due to weather conditions and the Russian embargo, and in 2017 a significant decrease in harvest was due to the very low yield of individual fruit species as a result of spring frosts and hail during the summer. In foreign trade, both exports and fruit imports showed an upward trend. Between 2012 and 2017, export and import of fruit from and to Poland exceeded 1 million t. The value of exports increased over 600 million EUR (except for 2015), and import by 900 million EUR. In most of the analysed period, in terms of quantity, imports of fresh fruit exceeded their exports. Based on the increase in fruit consumption between 2010 and 2017, it can be concluded that Polish consumers appreciate the nutritional value of fruit, the opinions of doctors and dieticians about their beneficial effects on health and physical condition. However, there is no link between their supply on the market.

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# THE DEVELOPMENT OF ENTREPRENEURSHIP IN RURAL AREAS IN PODKARPACKIE PROVINCE

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## ABSTRACT

The study is devoted to the diagnosis of entrepreneurship development in rural areas. The aim of the work is to analyse and evaluate the dynamics and directions of entrepreneurship development in rural areas of the Podkarpackie province as well as to identify changes and trends as well to present the strengths and weaknesses of rural areas in the studied area. On the basis of the conducted research, it can be concluded that the number of business entities in rural areas is systematically growing, and forecasts indicate further development. Assessment of directions and dynamics of entrepreneurship development based on the number of entities by selected NACE sections in 2009–2017 showed no significant variation in trends in all counties the trends are similar. The largest growth dynamics relate to communication and information services on, the real estate market as well as rental services for buildings, machines or devices, job market mediation, tourist services, detective or security services, maintenance of cleanliness and order, development of green areas, and office administration. In turn, industries such as agriculture, forestry, hunting and fishing, wholesale and retail trade, vehicle repairs, financial and insurance activities were characterized by a reverse tendency – a systematic decline in the number of business entities occurred. The remaining sections of PKD (Polish classification of activities) maintained a stable, unchanging level.

**Key words:** entrepreneurship, rural areas, enterprise, Podkarpackie province, development
**JEL code:** L26

## INTRODUCTION

Entrepreneurship in rural areas is an important factor and indicator of the economic development level (Kamińska, 2011). Individual economic activity is the driving force of the economy in rural areas (Kłodziński, 2010). It is also an important factor counteracting the unfavourable socio-economic processes, such as unemployment, exclusion and marginalization. Economic activity of rural residents is also a prerequisite for economic success (Bański, 2008).

The rural economy has undergone significant changes over the past few decades. The share of agriculture in the production of gross value added is constantly decreasing, while the share of the services sector in the level of production is increasing. This

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trend is observed in all EU Member States, especially in south European countries. However, demographic forecasts for the future of the European village are unfavourable.

Interest in the future and condition of rural areas in Poland is also dictated by the fact that, according to the methodology of their separation by the GUS (Statistics Poland), based on administrative division, they occupy over 93% of the country and are inhabited by approximately 38.8% of the total population (state on 2017). In the Podkarpackie province, in recent years, a strong emphasis has been placed on the development of rural areas, with a special attention paid to the development of entrepreneurship.

## MATERIALS AND METHODS

The aim of this paper is to analyse and evaluate the dynamics and directions of entrepreneurship development in rural areas of the Podkarpackie province as well as to identify changes and trends and to present the strengths and weaknesses of rural areas in the studied area. The study covered rural communes and a part of urban-rural communes. The analysis was based on GUS (Statistics Poland) data contained in the Bank Danych Lokalnych (Local Data Bank). The method of comparative analysis based on secondary and primary data was used. In turn, inference for deduction based on the analysis of the subject literature and source documents was used to determine the expected future changes. The paper is a contribution to further research on the development of economic activity in this area.

## RESULTS AND DISCUSSION

### Concept of multifunctional rural development
One of the basic multi-functionality assumptions, and thus economic activation of a village, is the creation of jobs outside the agricultural sector and integration of agriculture with other branches of the rural economy, in which entrepreneurship is the most important. The above paradigm of rural development assumes the cooperation of their market, social and environmental functions.

Most economists and scientists confirm the view that entrepreneurship is becoming a key factor in the well-being of societies. However, the multifaceted nature of the term "entrepreneurship" implies that, despite the broad bibliography on the phenomenon of entrepreneurship, there is no single, universal definition of the concept. This is due to the fact that this process goes beyond the scope of economics, because it is located on the borderline of many other children of science, such as psychology, sociology, economic geography, etc. (Raczyk, 2009). As early as 1934, Schumpeter (1934) pointed out that "an entrepreneur is an innovator, who introduces an entrepreneurial change within markets, where entrepreneurial change has five symptoms: (1) introduction of a new/ /improved good; (2) introduction of a new production method; (3) opening of a new market; (4) use of a new source of supply; and (5) introducing a new organization in every industry".

An entrepreneur is therefore a person with a high need for achievement. This need is directly related to the entrepreneurship process. At the same time, the entrepreneur is a moderate risk taker, who accepts the possibility of failure. However, the owner of an economic entity recognizes and uses market opportunities (McClelland, 1976). Such a person is characterized above all by innovative behaviour and the ability to use strategic methods of business management (Shapero, 1975). Therefore, entrepreneurship is an attempt to create value by recognizing business opportunities (Kao and Stevenson, 1985). It is a way of thinking, reasoning and acting, taking advantage of opportunities, but with a holistic approach and balanced leadership (Timmons and Spinelli, 1999). The basis for the functioning of the modern concept of entrepreneurship is innovation (Kukoc and Regan, 2008).

A village is to become a place of production development and trade activities as well as provision of various services. The main factor for the development of multi-functionality is entrepreneurship and financing of infrastructure investments that improve the quality of life in rural areas, but also increase the investment attractiveness of the area. The concept of multifunctional rural development is to be a response to the problems of managing the rural space in regions that are particularly backward, critical and hard to reach.

According to Bryden and Hart, entrepreneurship is the most important factor in the professional and social revitalization of rural areas. It makes it possible to avoid traps connected with mono-production, improves the quality of life of rural communities and increases the level of their integration. By improving the availability of services, negative phenomena associated with depopulation can be stopped and they can even attract potential new residents to these areas (Bryden and Hart, 2005)

An important task of rural policy is the selection of such instruments that will encourage rural residents to undertake economic activity. According to the research carried out by OECD, the level of entrepreneurship depends on the possibility of obtaining financing for business operations. According to the report, rural enterprises have very limited financing possibilities, and funds for the development of rural companies come mainly from own resources or loans granted by the entrepreneur's family or friends (Tudor and Voicilas, 2010).

The concept of multifunctional rural development, in addition to stimulating the local entrepreneurship, also assumes investments in infrastructure in rural areas. Its condition affects the conditions of running a business, the result of which depends on road connections with urban areas and the availability of information and communication technologies for rural enterprises. However, taking into account the demographic trends concerning the European village, the decrease in the number of inhabitants, and thus also the income of local self-governments, causes restrictions in the implementation of investment projects.

Multifunctional rural development is to be a process that takes place simultaneously on many levels. It includes spatial, social and economic changes that enable residents to obtain income from professional activity and improve the quality of life (Stanny, 2012).

**Development trends in the Podkarpackie province**

Development trends have been observed in the Podkarpackie province located in the south-eastern part of the country. Neighbouring regions are: Lviv in Ukraine and Košice in Slovakia along with the following Polish provinces: Lublin from the north-east,

Świętokrzyskie from the north-west and Małopolska from the west. It covers an area of 17 846 km2, which is 5.7% of the country's area. Rural areas occupy about 94% of its territory.

The Podkarpackie province is characterized by specific features that include: low level of economic development with significant internal differentiation of its features, very high rural population (58.6%) in the total population of the province and problems of rural development, economically poor agriculture with a high percentage of people living off work in agriculture and a small propensity to change this sector of the economy, border location (eastern and southern border of Poland) and resulting peripherality of the province, high share of legally protected areas in the overall area of the province, but poor use of natural resources for the development of prospective sectors of the economy (tourist and health services) (Czudec, 2007).

At the time of Poland's accession to the European Union, these areas proved to be the least developed in the country. Based on the Eurostat research from 2002, they were considered the regions with the lowest GDP per capita in the European Union (OP DEP 2007–2013). It was a determinant for development for those provinces with a similar level of GDP (Eastern Poland), a special supra-regional program supporting social and economic development – Operational Program Development of Eastern Poland 2007–2013 (OP DEP) and in the following years – Operational Program Eastern Poland 2014–2020 (POPW).

In 2015, according to the GUS (Statistics Poland), there were 4,184,409 business entities in Poland, of which 1,130,658 registered in rural areas, which constituted over 27% of all entities. On the other hand, in the analysed area of economic enterprises in rural areas, 70 683 were recorded in the Podkarpackie province and it was the largest percentage in the region of south-eastern Poland.

In the Podkarpackie province in 2018, there were 174.8 thousand business entities registered in the REGON (National Official Register of National Economy Entities) this is an increase of 3.8 thousand (2.2% compared to 2017). Entities from the Podkarpackie province accounted for 4.0% of all entities registered in the national official register of the national economy entities REGON.

The vast majority of entities (167.7 thousand), i.e. 95.9%, belonged to the private sector, while public sector entities (5.3 thousand) accounted for 3.1%. In comparison with 2017, private sector entities were by 2.1% more, and public by 0.3% less. The largest number of public sector entities carried out activities related to education – 47.1% in 2018, then with real estate services – 16.1%, public administration and national defence; compulsory social security – 11.7% as well as health care and social assistance – 9.1%. Among the private sector entities, 77.4% (129.9 thousand) were natural persons conducting business activity, mainly in the field of trade and repair of motor vehicles – 25.7%, construction – 16.7%, industrial processing – 10.2% and professional, scientific and technical activity – 10.1%. Among the natural persons conducting business activity, 99.1% were micro-enterprises, i.e. entities employing up to 9 persons. Among natural persons running business activity, there were 41.0 thousand women, which accounted for 32.7% of the total. In comparison with 2017, there was an increase in the number of entities operated by women (by 631), i.e. by 1.6%.

Most entities of the national economy were active in the sections (Fig. 1): trade; repair of motor vehicles – 41.6 thousand (23.8% of the total); then construction – 24.1 thousand (13.8%), industrial processing –

16.7 thousand (9.5%) and professional, scientific and technical activity – 15.6 thousand (8.9%). Among the registered entities, there were definitely predominant ones that declared predicted employment no more than 9 people; they constituted 95.7% of all registered units. The share of small entities (with the expected number of employees from 10 to 49 people) was 3.5%, medium-sized entities (from 50 to 249 employees) – 0.7%, and large (250 employees and more) – 0.1% (Statistics Poland, 2019).

Entities of the national economy in terms of population and area in 2017 in the Podkarpackie province per 1,000 population accounted for 80 entities of the national economy (79 before), while 112 in the country of (110 before that year). The largest number of entities per 1,000 population was registered in cities with county rights: Rzeszów (146), Krosno (122), Przemyśl (105) and Tarnobrzeg (103) and in the Lesko county (113), and the least in the counties: Przemyśl (58), Brzozów and Lubaczów (after 59) and Przeworsk (60) – Figure 2.

In 2002, the number of companies in the Podkarpackie province amounted to over 56 thousand, in 2015 there were around 71 thousand of them. When analysing the dynamics of changes in the number of business entities in the rural areas of Poland in the analysed province, an increasing trend can be observed.
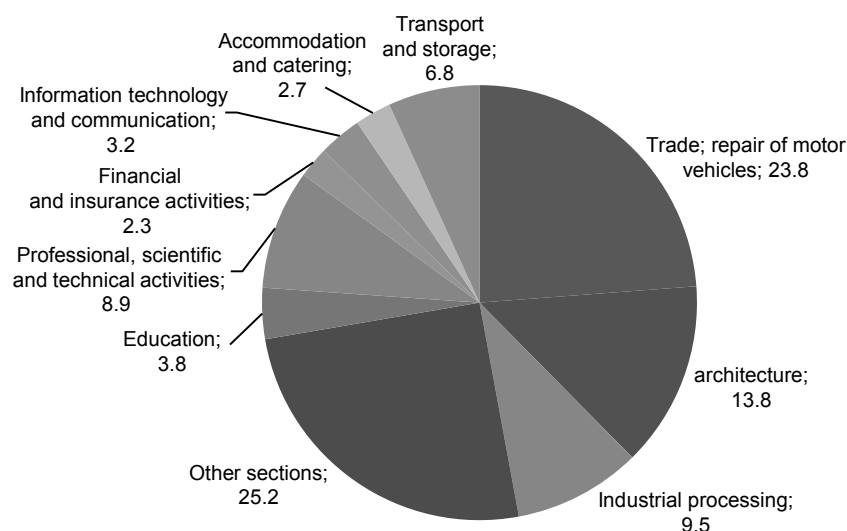


**Figure 1.** Structure by type of activity and expected number of employees

Source: own study based on data from Local Data Bank (Statistics Poland, 2018).
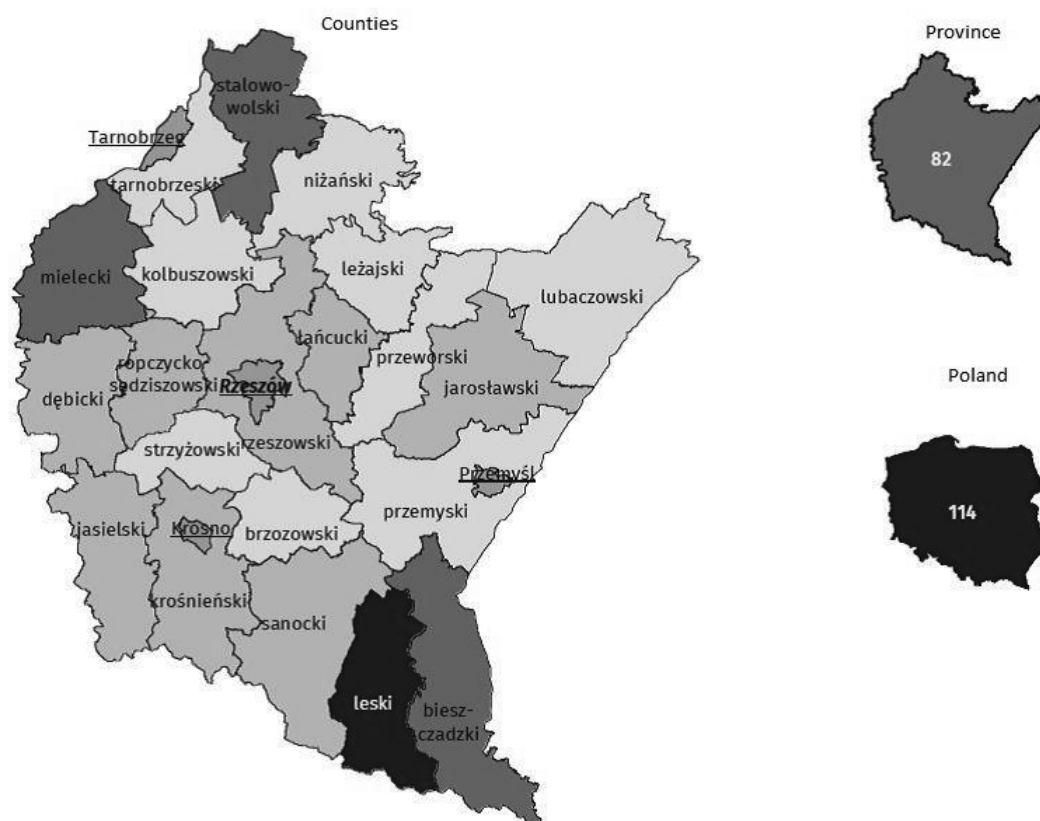
**Figure 2.** Entities of the national economy per 1,000 population by poviats in 2018

Source: Entities of the national economy in the REGON in the Podkarpackie province, Voivodship Labour Office in Rzeszów (2019).

The development of non-agricultural functions of rural areas should be correlated with the nature of resources and endogenous potential of a given rural area. Therefore, the implementation of the rural development policy should be bottom-up, as decentralized as possible, and the programs and priorities of measures must be compatible with the resources available to the regions. The territorial approach, taking into account the specificity of a given rural area, and the diagnosis of development problems can help solve these problems. Possible variants of rural development depend on the following factors (Kłodziński and Rosne, 1995):

− natural (geographic location, terrain, climate, natural resources);
− demographic (age and social structure of rural population, migration balance, rate of natural increase);
− economic (structure of the rural economy, ownership relations, employment structure, state of human capital);
− infrastructure (state of technical, social and institutional infrastructure);
− socio-cultural (identity, values, norms, level of entrepreneurship).

From a broader perspective, entrepreneurship refers to the individual's ethos, based on standards, values and motivations, which results in undertaking the activity (Michalewska-Pawlak, 2012). Entrepreneurship is therefore equated with initiative, resourcefulness as features of the human personality, which contribute not only to his personal success, but also to broadly understood local development. Entrepreneurship is therefore not only about individuals running their own businesses and is not limited to the business sector, but also includes the attitudes and behaviours

of all residents of rural areas in matters that directly affect them. The level of activity refers to the owners of companies, farmers, local authorities, and leaders of social organizations responsible for the economic and social processes taking place in these areas.

The implementation of regional policy is implemented by two structural funds: the European Regional Development Fund (ERDF) and the European Social Fund (ESF). According to the program assumptions concerning regions, they are convergent with the assumptions of national programs, and their priorities include tasks in the areas of: innovation, scientific research, information and communication technologies, enterprises' competitiveness, low-emission economy, infrastructure development, rail and road connections, and also investments in environmental protection and energy.

The Podkarpackie province is characterized by the lowest saturation with economic entities from the REGON for 10,000 inhabitants, although comparable with rates from other provinces from the eastern part of the country – Lublin and Podlasie. In addition, small family enterprises with low sales and low competitiveness and innovation prevail in the structure of business entities. Small and medium-sized enterprises have still not fully used development potential. The share of the SME sector in sales revenues is smaller than its share in the total number of employees, which indicates lower productivity of this sector. The unemployment rate in the Podkarpackie province in 2016 was 11.6% and it was one of the highest rates in the country. The highest unemployment rate was recorded in the following counties: Nisko, Lesko, Bieszczady, Strzyżów, Przemyśl and Brzozów. These are the areas constituting the inner regional development peripheries (Strzyżów, Brzozów) or outer peripheries located near the border with Ukraine (the belt of counties in the eastern part).

It is believed that the support for entrepreneurship and competitiveness of enterprises in the non-agricultural sector will be crucial in the future financial perspective. Road and technical investments as well as increasing the accessibility of these areas to capital investments should become a priority in the subsequent period. Owners of enterprises in rural areas very often face difficulties that are rare in urban agglomerations. Additional obstacles for rural entrepreneurs is the small size of local markets, as well as limited access to necessary services such as financial services, information and advice. Other issues include the lack of facilities designed to run business, less developed transport and telecommunication infrastructure, as well as limited networking and cooperation opportunities. In order to assess the directions and dynamics of entrepreneurship development, the number of entities according to selected PKD (Polish classification of activities) sections in 2009–2017. In all provinces of Eastern Poland, trends were similar. Almost in every sector of the national economy, an upward trend can be observed in the studied region. The most dynamic growth characterized Section I – communication and information, Section L – activities related to real estate market services; Section N – activities in the field of administration services and business support activities such as rental and lease services for buildings, buildings, machinery or equip-

**Table 1.** Strengths and weaknesses of the rural areas of the Podkarpackie province

| Strengths | Weaknesses |
|---|---|
| One of the highest rates of natural increase | Low level of basic infrastructure |
| A large number of potential employees live a short distance from the main development centres of the region | Low entrepreneurship |
| The highest social activity index in the country | High unemployment rate |
| | Low level of remuneration |
| | A small share of employees in services |
| | Agrarian fragmentation and low commodity of agriculture |

Source: own study.

ment, job market mediation, tourist services, detective or security services, maintenance of cleanliness and order, development of green areas, administration office, etc. In turn, in such departments as Section A – agriculture, forestry, hunting and fishing; Section G – wholesale and retail trade; repair of motor vehicles, including motorcycles; Section K – financial and insurance, the activity can be seen as subjected to the opposite tendency – a systematic decrease in the number of business entities.

The intelligentsia specializing in rural areas of the province should concentrate on their tourist functions. It should be expected that the development of organic farming in the Podkarpackie province will result not only in the absorption of excess labour in agriculture, but also the emergence of small enterprises processing organic raw materials and tourist facilities offering local, traditional and low-processed food.

The analysis shows that the Podkarpackie province is developing unevenly, and this development is very diverse in individual municipalities. The largest social development takes place in the central and north-western region of the Podkarpackie province. It consists of many factors, but the most important ones are those that have a well-developed communication network: the A-4 motorway, the Jasionka airport, the migration balance and the influx of new companies in these regions are of great importance here.

**SUMMARY**

The Podkarpackie province is growing. However, this development is slow, especially when compared to other regions. The reason for the low level of the region's economic development can be seen as its low investment attractiveness. The province has poorly developed transport and communication infrastructure. A significant part of the region is rural areas with an economy based on agriculture, which, despite of having to invest using the EU funds, still needs modernization. Entrepreneurship is characterized by great fragmentation, and investing in improving innovation and competitiveness of companies requires large financial capital, which small companies do not have and which are difficult to obtain.

Based on the above analysis, it can already be stated that the specificity of the region, its level of development and unfavourable processes occurring within it (increasing the distance to other regions) indicate that this region should be considered difficult, requiring continuous development, inflow of capital and growth of entrepreneurship. The problem of economic activity in rural areas of the Podkarpackie province is similar in all provinces of eastern Poland and does not significantly polarize. In less developed communes, entrepreneurship can be a very important factor in activating the population and improving the living standards. This phenomenon has the effect of reducing the disproportion in the income level of individual social strata and at the same time, it contributes to the mitigation of unemployment-related phenomena. The increase in demand is also an increase in interest in rural areas in order to invest and locate business ventures. On the basis of the conducted research, it can be concluded that the number of business entities in rural areas of the Podkarpackie province is systematically growing, and the forecasts indicate further development of entrepreneurship. The purpose of implementing measures in this area is to increase the level of entrepreneurship and improve the region's competitiveness. Thus, the funds are mainly addressed to business entities implementing projects in the field of research and development and introducing the innovative solutions. The expected result of this type of activities will be to strengthen the cooperation between the R&D sphere and to achieve the objectives set within the framework of ongoing aid programs.

On the other hand, the assessment of directions and dynamics of entrepreneurship development on the basis of the number of entities by selected NACE sections in 2009–2017 showed no significant variation in trends within the study area. The greatest dynamics of growth characterizes services related to communication and information, real estate market service and rental and lease services of buildings, buildings, machines or devices, job market mediation, tourist services, detective and security services, maintenance of cleanliness and order, development of green areas, administration office. In turn, industries such as agriculture, forestry, hunting and

fishing, wholesale and retail trade, vehicle repairs, financial and insurance activities were characterized by a reverse tendency – a systematic decrease in the number of business entities. The remaining sections of PKD maintained a stable, unchanging level. The financial perspective covering the years 2014–2020 is currently being implemented, therefore it is extremely important for the region to use the financial resources that can be obtained under EU development policy rationally. It is anticipated that it will be the last period of Poland's use of such significant external funds, decisive for the dynamics of socio-economic development of both the country and the Podkarpackie province. However, the financial situation of entities, especially local government units, may be an obstacle in their acquisition.

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# INTERDISCIPLINARY TAKE ON FOOD CONSUMPTION

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### ABSTRACT

The main aim of this paper is to present economic and social aspects of food consumption studies. At the beginning, consumption is located among other sciences. Then, the methods used to study food consumption is presented, with particular attention paid to the method of econometric analysis and panel analysis. The last part of the paper presents the current state of studies in this area.

**Key words:** food consumption, methodology of consumption studies, panel models
**JEL codes:** D1, D4, C23

## INTRODUCTION

The interdisciplinary nature of approach to studies in consumption economics results from the multitude of areas it deals with, lying on the border of economics, social sciences, biological sciences and life sciences. The contribution of other scientific disciplines and branches is used in the formulation of theories and examination of processes occurring in various areas of consumption. What enjoys a special place and has special importance in the theory and application of consumption studies are "consumer behaviours", their determinants and the resulting decision-making process. The multifaceted nature of approaches to the description of causative agents of consumer behaviours determines the typology of consumer on the basis of social-and-psychological conditions. As a result of studies conducted in this area, "lifestyles" of consumers can be determined. What is significant for consumption studies is the assessment of the degree to which purchasing needs are met. Regarding consumption economics as a sub-discipline of economics results from the essence of the notion and the function the former serves in the economic system. The range of consumption covers both the direct act of fulfilment of a single need and human behaviours in the process of production, exchange and consumption of goods and services. From the macroeconomic point of view, consumption is treated as a phase in social reproduction responsible for the finalisation of the entire reproduction process. This multifaceted nature of approach to consumption determination indicates that it has a special place among economic sciences. At the same time, it should be noted that in the previous period (i.e. the period of the so-called classical economics – at the turn of the 18th and 19th centuries – and of pre-classical currents, such as mercantilism and physiocracy and Marxian economics) the consumption was placed in the margin of economic theories (Bywalec and Rudnicki, 1999). What

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had a strong impression on shaping the view of the role of consumption in centrally planned economy were the views of Lange, who stated that consumption was to be covered by out-of-economics sciences (Lange, 1978). The position of consumption in economic sciences started to be built in the 1960s, first and foremost thanks to such outstanding scientists as Krzyżewski, Lipiński, Hodoly, Piasny and Pohorille. Consumption established its position among economic sciences in the 1970s. Special credit in this area is to be given to Hodoly, Szczepański and Pałaszewska-Reindl, Kusińska, Kos, Zielińska and others.

## PLACE OF CONSUMPTION AMONG OTHER SCIENCES

At the beginning, consumption is defined in subjective and objective terms. The objective approach includes consumption of tangible goods and consumption of services. Consumption of tangible goods includes consumption of foodstuffs and consumption of manufactured articles. On the other hand, the consumption of services is divided into the consumption of tangible and intangible services. The subjective criterion of consumption refers to the individual (personal) approach or the collective approach (a household, a social group or the entire society).

Consumption is an interdisciplinary science which includes the achievements of many other disciplines: economics, sociology, psychology, anthropology, philosophy and management. In practice, the interdisciplinary nature of consumption can be seen in various approaches to its analysis. This is particularly well expressed in the analysis based on the economic and sociological approach, which is expressed by regarding consumption as a socioeconomic category (Bylok, 2013). The reasons for including consumption in the economic field are first and foremost needs and how and in what order they are satisfied (Maslow, 1990). From the point of view of the pondered economic context, what is important is how consumer needs are met.

Referring to the mechanism of market economy, the process of meeting needs unfolds, without doubt, through goods and services acquired during market exchange. This is expressed in the approach proposed by Bywalec and Rudnicki (2002), who pointed out that "consumption" is the act of fulfilling human needs by consuming tangible goods and services. It might be claimed that the process of consumption has strong cultural and social connotations. A wide reference to such a take on consumption can be found in Szczepański (1981), who draws attention to "taking consumption as a process of social reproduction and a sphere of social cooperation, which include […] social life conditions – working conditions, level of life of people, consumption fund". On the other hand, the sociological approach to consumption pays attention to the social nature of human needs. This is about higher level needs, which appear as the society develops. What has a special impact on the emergence and development of these needs is the social surroundings and the used methods and forms of communication.

Referring the above to the role played by food in shaping interpersonal relations, attention needs to be drawn to strong social, economic, mental and cultural connotations of food. The cultural context is significant here, which is entails explaining relations between food systems and human behaviours. This is a subject covered by the anthropology of food, being a sub-discipline of cultural anthropology (Belasco, 2008). The sub-discipline attempts to locate food in the context of politics, ritual, production and distribution, sex and other spheres of social life. Food has been the main point of interest of anthropology, starting from the classification of dishes eaten by the studied communities (as part of the evolutionary paradigm) in order to determine the level of their development. That scientific discipline blossomed in the 1960s, which was related to the widening of the examination field with the analysis of structures connected with the preparation of meals and the manner of their consumption. The anthropology of food reached its culminating point towards the end of the 20th century as a result of the intensification of various consumption trends, especially activities accompanying the process of consumption covering gastronomy and entertainment services, TV and radio programmes and online blogs. The interdisciplinary approach to the anthropology of food is expressed by statements of social science researchers, including sociologists,

anthropologists, philosophers and economists about the role and meaning of food in culture (Anthropology of food, n.d.).

As seen by sociology, consumption refers to consumerism resulting from secondary processing of prosaic, unchanging human needs and desires into the main drive of the society (Bauman, 2009). In the extended meaning, consumption society means a society that not only consumes, but also founds its existence on consumption (Baudrillard, 2006). Baudrillard pays special attention to the social dimension of consumption, which is expressed by communicating one's social status to others. The demonstrations of the attained social position is characteristic of late capitalist society. A feature of the functioning of the consumption society is its activity in shopping malls. This take clearly refers to the behaviours of societies of the 19th-century Paris, described as a large shopping mall with separated luxurious arcades (Benjamin, 2006). What is also pronounced in this take on consumption is regarding consumption through the prism of marketing, advertising in particular. The function of advertising to lead consumers to their own desires and needs and to indicate possibilities of satisfying them. The presented interpretation of consumers' needs and desires is also linked with the psychological approach here. The issue of the harmful effect of consumption on the human psyche is also tackled by philosophers, who point to the alienation and incapacitation of the consumer in the world of objects (Marks and Engels, 1966; Baudrillard, 2006). As pointed out by philosophers, fetish has a detrimental effect on the human psyche – taking the reins of the consumer's behaviour leads to the addiction of the individual to an object. The literature widely covers the subject of the consumer's identity in the late capitalist world, drawing attention to the imperfections of a consumption-based political system (Foucault, 1998). The contemporary incapacitation of the consumer is reinforced by the dictate of international corporations that run active advertising campaigns, which lead to a strong attachment of consumer to international brands (boiling down to the cult of these brands) (Klein, 2004).

The contemporary reference to the culture of consumption is a point of interest of cultural studies, inspired by currents of postmodernist philosophy.

## METHODOLOGY OF FOOD CONSUMPTION STUDIES

Food consumption studies are interdisciplinary. Their range covers the economic and social as well as behavioural and marketing dimension. The paper focuses on the socioeconomic aspects, which are the fundamental area of studying the consumption sphere overall, including food. The most widespread direction of studies is the analysis of relations between the socioeconomic development of the country and changes occurring in the consumption sphere from the point of view of its volume and the consumption structure. In this area, quantitative studies have been carried out in Poland for years, aiming to determine the scope and direction of changes in food consumption as a result of increase in society's earnings (Zielińska, 1978; Szwacka-Salmonowicz, 2003; Kwasek, 2008, 2015; Szwacka-Mokrzycka, 2018).

## METHODOLOGY OF ECONOMETRIC STUDIES

What is most frequently used in investigating the pace at which food consumption develops and at which its structure changes are the methods of econometric analysis (Welfe, 1977). They are quantitative and enable carrying out analyses in a wide scope, based on assessment measures. The measures are parameters estimated on the basis of various demand models as well as income elasticity coefficients, determining the strength of reaction of demand to changes in the level of consumers' earnings. It should be noted that econometric studies on transformation of the structure of food consumption have been carried out by many authors for years. To a large extent, this results from the specific nature of food, including the fact that it satisfies relatively homogenous needs of consumers, and from relative stability (predictability) of factors conditioning shopping processes. The specific, basic nature of food goods is also significant for forecasting the level of their saturation. From this point of view, many-year work targeting substantive analysis of processes concerning food consumption development were mostly related to the assessment of the adequacy of various econometric models for the description of empirical processes of food consumption development in Poland. What is the most adequate

for the description of food consumption processes are functions of demand and asymptote determining the empirical level of saturation of consumption, assuming that consumers' income is growing without limitation (Zielińska, 1978).

As regards the food market, the patterns formulated by Keynes and Engel have been confirmed many a time, which concern the patterns visible in income spending, ones consisting in a change in general relations in consumption expenses and savings and in a change in the structure of expenses.

Studies verifying Engel's law are a point of interest to a lot of scientists and were reflected in numerous Polish and foreign papers (Zielińska, 1978; Deaton, 1998; Szwacka-Salmonowicz, 2003; Janoś-Kresło and Mróz, 2006; Kwasek, 2008, 2015; Szwacka-Mokrzycka, 2018). A specific expansion of Engel's law are Tornquist functions, presenting relations between consumers' expenses and income. They are the basis for approximation of Engel curves, assuming various forms depending on the type of the goods and services for which they are estimated.

## USE OF PANEL REGRESSION IN CONSUMPTION MODELLING

At present, what is more and more often applied to study consumption are panel regression models, based on panel data obtained from Statistics Poland's statistics (Household Budget Survey).

Panel studies have a lot of advantages. They allow to carry out analysis in terms of both micro- and macro-consumption. Micro-panels are run in the context of households and macro-panels can include a given economy sector in their range. Panel studies enable increasing data sets, and so – expanding the analysis. They allow identifying causes for the studied phenomena and tracing their dynamics as well as controlling non-observable individual effects in regression models.

The notion "panel data" defines data sets containing information about the same objects (cross-sectional information) in several periods (over time) (Maddala, 2001). Some authors (Dańska-Borsiak, 2009) regard panel data as a special type of time cross-section data. In this case the number of periods

$T$ is markedly lower than the number of objects $n$. Literature studies (Baltagi, 2005) confirm the edge of analyses carried out on panel data over the analyses of sets of cross-sectional data or several sets of cross-sectional data containing objects that do not repeat. The edge is the observation of entities over consecutive periods. Data analysis carried out this way allows reducing measurement errors and problems resulting from the omission of non-observable variables or variables correlated with the explanatory variable (Osińska, 2007). Carrying out such analyses allows to identify causes of some phenomena.

## STATE OF KNOWLEDGE ON FOOD CONSUMPTION STUDIES

As already stated, what is most frequently used in investigating the pace at which food consumption develops and at which its structure changes are the methods of econometric analysis. The source of information for carrying out these studies were household budget data of Statistics Poland. At the first stage of studies, analysis covered years 2001–2009, which allowed grasping the dynamics of changes occurring in the structure of food needs of Polish households. Food needs in 2009 were compared and contrasted with food needs in 2001. The next stage of the studies involved assessing the level at which the food needs of Polish households were satisfied in years 2003–2015. The aim of the studies was to determine the direction and scale of changes occurring in consumption patterns of Poles in the first and second decades of the 21st century.

On the basis of many-year results of econometric studies, Engel-Keynes pattern was verified. Changes occurring in patterns of food consumption were assessed from the point of view of both quantitative satisfaction of food needs and qualitative transformations. The latter are mostly the effect of changes in the consumer's awareness, which leads to the verification of the eating habits present so far and change in the structure of preferences. This is expressed by structural changes and increase in rationalisation of food consumption over the investigated years.

The carried out analysis of food needs of Polish households leads to the classification of three main directions of change. It is connected with the degree

to which needs are satisfied, qualitative transformations and substitution processes within the analysed food groups (Szwacka-Salmonowicz, 2003; Szwacka--Mokrzycka 2018).

Panel models were used to model the consumption of selected foodstuffs in econometric terms. Years 2003, 2009 and 2015 were investigated. During the studies, data from a household budget survey were used (Szwacka-Mokrzycka, 2018). The analysed data form a balanced panel. An attempt was made to build all presented models for panel data, but during the studies it turned out that the correct models are the ones with constant unit effects. The following panels were separated in the analysed data set: for households of employees, pensioners and disability pensioners and for households in general in years 2003–2015. On the basis of the analysis of panel data for each of the three household groups, three categories of models were built: a model estimated with the classic least square method, a fixed effects model (FEM model) and random effects model (REM model). In total, 42 models were built for each household group. The next stage of panel studies was statistical verification, which allowed making the final decision as to what model to select.

Some of the selected product categories show individual effects. This can indicate a changing tendency in their consumption. Analysing the built models, one can observe significant differences in the consumption of the studied products between quintile groups; the disproportion is usually the most pronounced for two extreme groups. This means that consumption behaviours of Poles are significantly differentiated by the income level. In relative low income households, demand for food is relatively high. On the other hand, in relatively high income households, there is a low sensitivity of consumption to increase in income. The pattern that the level of food need satisfaction grows as income goes up was confirmed. There is also high differentiation in the shaping of the consumption of food products depending on product categories. In relation to absolutely essential products, buyers showed a relatively weak reaction to change in income, which was expressed by increase in consumption. On the other hand, the demand for products with higher processing degree is still relatively high.

## CONCLUSIONS

Most frequently, methods of econometric analysis are employed to investigate the pace at which food consumption develops and at which its structure changes. The application of the logarithmic and hyperbolic model to the hierarchisation and assessment of the direction of changes in food needs in years 1996–2015 proved to be adequate. At the same, it was confirmed that the coefficients of income elasticity of demand are the basic measurements for assessment of the level at which food needs are satisfied, the scope of qualitative changes and the degree of substitution in individual product categories. Those studies were the continuation of the work carried out by the author in years 1996–2001.

At present, what is more and more often applied to study food consumption are panel regression models, based on panel data obtained from Statistics Poland's statistics. They are a new solution in consumption modelling developed by the author for the first time for the purposes of the food market. Panel models were used to model the consumption of selected foodstuffs in econometric terms.

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# OVERINVESTMENT IN POLISH AGRICULTURE

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**ABSTRACT**

The purpose of this paper was to assess the level of overinvestment in Polish farms grouped by economic size. As the volume of investments clearly continues to grow, the authors noticed the need to address that problem. Using FADN data, they developed their own method for measuring overinvestment, and identified its size and extent. Indeed, overinvestment proves to be widespread in Polish agriculture. The reasons probably include inadequate subsidies allocated under European Union aid schemes, and improper farm management practices. In the future, this could give rise to dysfunctions, ultimately resulting in farm bankruptcies.

**Key words:** overinvestment, Polish agriculture, FADN
**JEL codes:** B21, B41, D29, Q19

## INTRODUCTION

The literature defines investments as the allocation of a certain amount of money (expenditure) to increase the existing value of fixed assets (Czubak, Sadowski and Wigier, 2014). Some authors take labour inputs into account in addition to financial expenditure. Also, investments are made to earn a return in the future; this means income which will compensate the investor for: the time his/her money was invested; the inflation rate; and the investment risk (Reilly and Brown, 2001). Investments involve growth in the investor's assets (Nowak, Pelichaty and Poszwa, 1999; Różański, 2006). Also, investments mean the flow of expenditure allocated to specific projects which, when implemented, do not provide immediate return and, hence, do not result in immediate consumption (Kataria, Curtiss and Balmann, 2012). As time went by, it was found that investments could be unviable which, in the long run, means the economic operator experiences a loss. This process can also be noticed in the agriculture sector, and affects specific groups of farms to a various degree. This results in the emergence of what is referred to as overinvestment which can be defined as a condition where long-term investments are excessively high compared to the production potential (mainly land resources) and ultimately become economically unviable. Though rarely addressed in studies, this phenomenon seems to be important from both a scientific and an utilitarian perspective. Therefore, the authors carried out research in this field, using their own methodology and economic and financial performance data for farms covered by the FADN.

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## THE PROBLEM OF OVERINVESTMENT IN AGRICULTURE

Overinvestment in agriculture has not yet been finally defined. Bezat-Jarzębowska and Rembisz (2015) defined optimum investments as a situation where the assets-to-labour ratio of a farm grows at the same pace as labour productivity. Their conclusion was that overinvestment takes place when the assets-to-labour ratio grows while labour productivity declines. So far, the international literature has explored the problem of overinvestment in large companies in the context of state interventionism (Shen, Firth and Poon, 2016). In Poland, too, large enterprises are more concerned about overinvestment (Orłowski et al., 2010). According to other authors (Guangming and Zigi, 2013) overinvestment also affects politically-connected companies. However this were private companies with totally different specifics than agriculture. In their case, overinvestment is defined as ineffective investments which are made when companies invest in projects/solutions with a negative net value (Lei et al., 2014).

In agriculture, underinvestment and overinvestment at farm level is one of the factors which affect variability in production and therefore also have an effect on price fluctuations (Demeke and Balie, 2016). This, in turn, is caused by a deficiency or improper use of funds. In agriculture, overinvestment can be presented in a broader context of human development. Changes which have affected the global economy since the industrial revolution (mainly including the emergence of the industrial and service sectors) have resulted in a relative decrease of economic importance of agriculture measured with its contribution to GDP, for instance (Białowąs, 2016). At the same time, there was demand for labour in the new sectors which contributed to the substitution of labour with capital. This was a two-dimensional process: on the one hand, there was an outflow of labour from the agricultural sector; on the other, there was an increase in capital resources, mainly due to investments. Another consequence was the agrarian transformation, i.e. concentration of land held by an increasingly smaller number of increasingly larger farms. In this context, note that these processes took place because labour productivity was usually higher outside agriculture, and the concentration of agricultural production, together with an increase in the farms' assets-to-labour ratio, provided an opportunity for narrowing that gap. Regardless of the above, highly developed countries progressively implemented public support instruments for agriculture, including the co-financing of development investments which, in the long run, were supposed to accelerate the agrarian transformation, including the substitution of labour with capital. While this enabled the modernization of agriculture, it also contributed to overinvestment. In some cases, the allocation of public funds may (at least potentially) relax the rigidity of the microeconomic assessment of investment efficiency, resulting in excessively costly and economically unviable projects. This is especially true for the relationship between land and capital inputs. If the extent of investments in machinery or buildings is not accompanied by an increase in farm area (which, in the sectoral context, means the agrarian transformation), there is a strong risk that the increase in capital resources will not entail a simultaneous improvement in labour productivity, and thus overinvestment will take place.

Note that the above is especially true for highly developed countries. Conversely, many countries around the world struggle with the lack of capital to implement agricultural investments. Examples include Pakistan where the entire economy is based on agriculture and the considerable restrictions in access to credit have an adverse effect on agricultural development (Channa et al., 2019). All around the globe, a need has been recognized to eradicate poverty through measures which include financing for the agricultural sector, especially in countries where low incomes coexist with extensive natural resources, e.g. in Sub-Saharan Africa (FAO, 2017). Nevertheless, in some countries, increased agricultural investments continue to be ineffective.

In the group of highly developed countries, overinvestment is particularly present in the European Union. After the 1992 MacSharry reform, the level of financing for farms has been gradually decoupled from production efficiency. As a consequence, the system gave preference to farms with an appropriate area of agricultural land rather than to those at highest levels

of production efficiency (Czyżewski, 2015). This is why Poland experiences accelerated modernization of farms (Poczta, Siemiński and Sierszchulski, 2012). Although this results in labour being substituted with capital, that process should be accompanied by improvements in labour productivity. In agriculture, this can be done either through an increase in unit productivity (mainly including increased yields) or through an extension of farm area. Subsidies for agricultural investments are important as they contribute to technical, biological, organizational and economic progress which results in enhancing the productivity and production capacity of agriculture (Czubak, 2012). As demonstrated in previous research, modernization investments are mostly implemented by large farms with great areas of agricultural land (Sadowski and Girzycka, 2011). Furthermore, the efficiency of farm investments is below the level recorded in other sectors for reasons which include the seasonality of production (Czubak, Sadowski and Wigier, 2014).

Inefficient investments often result in overinvestment, something which has not yet been defined in the context of farming. That problem will probably become apparent within a few (or ten to twenty) years. At that time, fixed assets will be fully depreciated but some credits taken out to finance the investment will remain outstanding. While overinvestment can be reasonably expected to be related to EU subsidies towards agricultural production, it is possible that it only supplements the credit. Worryingly enough, overinvestment and underinvestment in agricultural production may result in production and price fluctuations (Garrido et al., 2016).

**MATERIALS AND METHODS**

This paper assumes that increasing the value of farm assets through investments is a reasonable thing to do if it results in a proportional growth in labour productivity. Therefore, overinvestment is defined as a situation where:
- The increase in the value of assets results in a decline in labour productivity, which may be due to high maintenance costs of particular assets (e.g. depreciation, insurance, repairs). The above is defined as absolute overinvestment.

- Labour productivity grows at a lower rate than the value of assets. This is referred to as relative overinvestment.

The increase in the value of assets was measured using the following metric: total asset value (SE 435), including fixed assets (SE 441) and current assets (SE 465), less land value (SE 446) which, in the FADN, includes agricultural land, land improvement machinery, permanent crops, quotas and other rights attached (including purchasing costs) and forest land. Production quotas (and other rights attached) received free of charge are not appraised in the balance sheet (only the sales thereof is recorded). The rationale behind the above approach is that overinvestment is a problem which ultimately boils down to a mismatch between the farm area and the extent of investments in machinery and buildings.

Labour productivity was defined as net value added less operating and investment subsidies per FTE. Net value added was used (rather than family farm income) because of the need to eliminate the costs of external inputs (paid labour, rents, interest charged on credits) from the calculation in order to unify the economic performance figures of farms which rely on both their own and external productive inputs. The subsidies were removed from the calculation because public aid cannot be regarded as a metric of labour productivity in the economic sense. This can be assumed even if access to certain subsidies involves (at least formally) the need to perform specific actions, such as meeting the cross compliance or greening requirements in the case of payments. However, these actions refer to the production of public goods, and therefore do not have a direct impact on economic performance recorded in the market.

Investments, including overinvestment, need to be considered in the long term. Nevertheless, this paper relies on direct indices calculated independently for each subsequent year covered by the analysis. The purpose of this approach was to indicate the growth rates of both essential metrics, i.e. labour productivity and assets-to-labour ratio in each year of the study period. This allowed to indicate whether the farms grouped in different classes responded in real time to changes in both indicators and adjusted to prevailing conditions. In this context, it needs to be assumed

that the growth rate of labour productivity largely resulted from exogenous factors (e.g. changes in prices or weather patterns). Therefore, investment decisions should depend on the estimated potential for growth in labour productivity.

This paper uses data retrieved from the European Union's Farm Accounting Data Network (FADN), a European system for accounting data collection from 28 member countries of the EU. Data is collected from commercial farms in accordance with a unified methodology. The system covers operators who make up over 90% of standard output (SO) in the country concerned. Hence, they form a representative sample of farms operating in the EU (Nowak, 2018, after Floriańczyk et al., 2016).

The problem addressed in this study was analysed based on FADN data for Polish farms grouped into six classes of economic size. Each class was assessed in terms of economic viability of investments. The following data was needed to compare that indicator: assets other than land (which is part of farm capital – C); the metric of labour inputs, defined as the annual work unit (AWU) (L); net value added (NVA) per FTE less operating and investment subsidies.

The study period was 2004–2017, with 2004 set as the base year. Overinvestment in Polish agriculture was identified in five steps:

Defining the fixed-assets-to-labour ratio ($FAL_{ratio}$):

$$FAL_{ratio} = \frac{C}{L}$$

Defining labour productivity ($LP$):

$$LP = \frac{NVA}{L}$$

Defining the increments with direct indices (2004 as the base year) for two variables: assets-to-labour ratio ($FAL_{ratio}$) and labour productivity ($LP$):

$$\Delta FAL_{ratio} = \frac{FAL_{ratio} \text{ in the year considered}}{FAL_{ratio} \text{ in the base year}} \cdot 100\%$$

$$\Delta LP = \frac{LP \text{ in the year considered}}{LP \text{ in the base year}} \cdot 100\%$$

Identifying the difference between growth in labour productivity ($LP$) and growth in the assets-to-labour ratio ($FAL_{ratio}$), defined as the overinvestment index ($OI$) calculated with direct indices:

$$OI = \Delta LP - \Delta FAL_{ratio}$$

Concluding whether the typological classes are affected by absolute or relative overinvestment or are not affected by overinvestment at all:
- absolute overinvestement: $LP < 100$ and $OI < 0$;
- absolute overinvestment and a negative economic results: $LP < 0$, $FAL_{ratio} > 0$ and $OI < 0$;
- relative overinvestment: $LP > 100$ and $OI < 0$;
- optimum: $OI \approx 0$;
- underinvestment: $LP < 0$ and $FAL_{ratio} < 0$.

## RESULTS AND DISCUSSION

With data retrieved from the FADN database, it was possible to estimate the overinvestment index ($WP$). It was noticed that the assumptions used in this study, as detailed in the methodology, allow to identify differences between particular classes of farms. These findings provide a basis for further research on overinvestment. Each of the classes covered by this study features a different economic potential which somehow determines the production methods but does in no event protect the operators against the phenomenon described. During the work, it was observed that each class experienced an increase in the assets-to-labour ratio over the study period (except for 2005). Hence, none of the classes were affected by underinvestment (Table 1). Other results could be observed when analysing labour productivity which tended to decrease against the base year (Table 2).

As shown by this analysis, the increase in the assets-to-labour ratio was usually higher than the increase (if any) in labour productivity. Overinvestment was noticeable already in the short run. In the long run, this can drive various dysfunctions in the agricultural market system. Overinvestment in a group of farms may lead to an increase in production costs or even to bankruptcy. This is because of the particularities of agriculture which largely depends on climate and weather conditions which have a considerable impact on prices. The next step consisted in calculating the

**Table 1.**   Direct indices for the assets-to-labour ratio in the period 2005–2017 (2004 as the base year) (%)

| Class | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | 111.3 | 116.5 | 125.1 | 139.2 | 113.6 | 126.7 | 121.8 | 105.4 | 132.7 | 136.7 | 137.2 | 137.8 | 153.2 |
| 2 | 80.0 | 113.4 | 126.0 | 142.2 | 108.2 | 120.1 | 125.1 | 120.4 | 131.7 | 131.7 | 133.6 | 133.4 | 145.1 |
| 3 | 66.4 | 114.7 | 127.0 | 147.9 | 116.2 | 127.1 | 133.3 | 122.6 | 128.9 | 129.0 | 129.7 | 126.9 | 138.1 |
| 4 | 104.7 | 113.7 | 120.4 | 145.0 | 124.8 | 138.6 | 141.5 | 136.8 | 144.5 | 142.5 | 143.2 | 139.4 | 147.1 |
| 5 | 107.4 | 111.4 | 123.6 | 136.2 | 118.9 | 125.5 | 129.1 | 145.8 | 153.9 | 152.9 | 156.7 | 149.6 | 156.5 |
| 6 | 85.5 | 100.5 | 121.4 | 166.0 | 134.1 | 143.8 | 136.8 | 139.0 | 159.6 | 178.5 | 164.6 | 170.7 | 194.6 |

Source: own compilation based on the FADN database.

**Table 2.**   Direct indices for labour productivity in the period 2005–2017 (2004 as the base year) (%)

| Class | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | 80.2 | 95.4 | 153.4 | 57.0 | −57.6 | 48.8 | 92.4 | 79.9 | 0.7 | −33.7 | −19.4 | −4.7 | −21.3 |
| 2 | 94.0 | 111.8 | 153.0 | 82.0 | 19.7 | 84.4 | 97.1 | 87.4 | 66.5 | 34.5 | 50.8 | 28.0 | 54.8 |
| 3 | 93.6 | 103.5 | 136.0 | 90.6 | 45.3 | 98.6 | 111.9 | 96.0 | 79.5 | 61.0 | 53.9 | 48.3 | 88.0 |
| 4 | 92.0 | 102.3 | 128.2 | 96.3 | 61.5 | 110.3 | 118.6 | 110.2 | 95.3 | 86.0 | 72.6 | 67.8 | 113.6 |
| 5 | 92.3 | 84.6 | 131.4 | 89.8 | 86.3 | 117.9 | 121.8 | 137.0 | 127.9 | 130.1 | 113.9 | 107.3 | 134.8 |
| 6 | 70.7 | 68.0 | 82.0 | 72.4 | 64.7 | 82.5 | 84.7 | 93.9 | 86.4 | 86.5 | 91.1 | 85.3 | 107.1 |

Source: own compilation based on the FADN database.

overinvestment index (*WP*), defined as the difference between growth in labour efficiency (against 2004, the base year) and growth in the assets-to-labour ratio (Table 3).

The analysis found that the results deviated from the trend only in 2005 and 2007, when the difference went above 0. In other cases, the result was negative which is explained by the aforementioned trend followed by the growth in the assets-to-labour ratio and in labour productivity.

The distribution of overinvestment in time in different size classes was presented in Table 4. The authors used four groups of investment ranks, as described in the methodology.

**Table 3.**   Difference between direct indices of labour productivity and direct indices of the assets-to-labour ratio in the period 2005–2017 (%)

| Class | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | −31.2 | −21.2 | 28.3 | −82.2 | −171.1 | −77.9 | −29.4 | −25.5 | −132.0 | −170.4 | −156.6 | −142.5 | −174.5 |
| 2 | 14.0 | −1.6 | 27.1 | −60.2 | −88.5 | −35.7 | −28.0 | −33.0 | −65.2 | −97.3 | −82.8 | −105.4 | −90.3 |
| 3 | 27.2 | −11.2 | 9.0 | −57.2 | −70.9 | −28.5 | −21.4 | −26.7 | −49.4 | −68.0 | −75.8 | −78.6 | −50.0 |
| 4 | −12.7 | −11.4 | 7.8 | −48.7 | −63.3 | −28.3 | −22.9 | −26.6 | −49.2 | −56.5 | −70.6 | −71.6 | −33.5 |
| 5 | −15.1 | −26.8 | 7.8 | −46.3 | −32.6 | −7.6 | −7.3 | −8.8 | −26.0 | −22.8 | −42.7 | −42.3 | −21.8 |
| 6 | −14.8 | −32.5 | −39.4 | −93.7 | −69.5 | −61.3 | −52.2 | −45.0 | −73.2 | −92.0 | −73.5 | −85.4 | −87.5 |

Source: own compilation based on the FADN database.

**Table 4.** Viability of farm investments by economic size class

| Year | Class 1 from 2 000 to < 8 000 | Class 2 from 8 000 to < 25 000 | Class 3 from 25 000 to < 50 000 | Class 4 from 50 000 to < 10 0000 | Class 5 from 10 0000 to < 500 000 | Class 6 ≥ 50 0000 |
|---|---|---|---|---|---|---|
| 2005 | absolute | none | none | absolute | absolute | absolute |
| 2006 | absolute | relative | relative | relative | absolute | absolute |
| 2007 | none | none | none | none | none | absolute |
| 2008 | absolute | absolute | absolute | absolute | absolute | absolute |
| 2009 | absolute + negative NVA | absolute | absolute | absolute | absolute | absolute |
| 2010 | absolute | absolute | absolute | relative | relative | absolute |
| 2011 | absolute | absolute | relative | relative | relative | absolute |
| 2012 | absolute | absolute | absolute | relative | relative | absolute |
| 2013 | absolute | absolute | absolute | absolute | relative | absolute |
| 2014 | absolute + negative NVA | absolute | absolute | absolute | relative | absolute |
| 2015 | absolute + negative NVA | absolute | absolute | absolute | relative | absolute |
| 2016 | absolute + negative NVA | absolute | absolute | absolute | relative | absolute |
| 2017 | absolute + negative NVA | absolute | absolute | relative | relative | relative |

Source: own compilation based on calculations using data from the FADN database.

It turns out that overinvestment did not occur only in two out of thirteen years covered by this study: in 2005 in the 2nd and 3rd class of economic size; and in 2007 in the 1st, 2nd, 3rd, 4th and 5th class of economic size. The 6th class of economic size was affected by overinvestment throughout the study period. It was relative overinvestment only in 2017, with absolute overinvestment found in other years. This means that in this period, the largest Polish farms reported lower levels of labour productivity than in the base year, whereas the assets-to-labour ratio was always higher than in the base year (except for 2005). Relative over-investment, i.e. a situation where labour productivity grows against the baseline but at a slower rate than the assets-to-labour ratio, was found in economic size classes from 2nd to 6th, with the strongest intensity being recorded in the 5th class. In turn, the 4th class was mostly affected by absolute overinvestment, although

relative overinvestment was found in five years of the study period. The 3rd class of economic size mostly exhibits absolute overinvestment. The same is true for the efficiency of investments made in 2nd class. The worst situation affects the smallest farms (1st class) which mostly exhibit absolute overinvestment. Furthermore, in five out of thirteen years covered by this study, this was accompanied by a negative economic result because the economic productivity of labour, in addition to falling below the baseline level, fell below the threshold level (below 0), too.

## CONCLUSIONS

The analysis of this data found that 1st class is the least viable and the most affected by overinvestment. Over-investment accompanied by a positive economic result was mostly found in 2nd, 3rd and 6th class. Although 4th

and 5th class look better than other ones, they too are affected by overinvestment (which, however, does not involve a considerable decline in labour productivity). The index of overinvestment reflects the inefficiencies in the system and in farm management practices. These findings provide a basis for further research and economic analyses of the index of overinvestment at farm level, and for an investigation into its reasons and consequences. Although this is not a direct conclusion from this study, high levels of absolute and relative overinvestment can be related to the allocation of considerable public funds to the development of the agriculture sector. This includes not only direct support for investments under the 2nd pillar of the CAP (main measure: "Investments" or "Young farmers") but also the use of investment funds granted as direct payments. The use of external funds for investment financing blurs the microeconomic self-assessment of different projects in terms of viability. In some cases, this leads to actions which are not fully reasonable from the economic point of view.

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# USING CHATBOTS IN MARKETING COMMUNICATION

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### ABSTRACT

The e-commerce industry is constantly growing and becoming a strong competition for stationary outlets. More and more e-stores are deciding to use new communication solutions. Many of them use so-called bots. The article presents the possibilities of using virtual assistants, the analysis of the literature on the subject and the results of conducted surveys on the use and familiarity of chatbots among recipients and managers.
In the application of virtual assistants, managers see a chance to increase the possibility of effective communication with simultaneous reduction of the costs of carrying out this process. The benefits of this solution support the intensive and versatile use of it. At the same time, customers opt for direct contact with a consultant. That is why the perfect combination is to have both a chatbot and a real consultant.

**Key words:** marketing, chatbot, communication
**JEL code:** 031

## INTRODUCTION

All companies that want to be visible and recognizable on the market care about their marketing communication. They have a number of tools at their disposal that facilitate the organization of such a process. Marketing communication management itself is currently a targeted activity to regulate market stability through information technologies. They enable consumers to obtain information about products and services and allow to learn about consumers' needs. The development and spread of new technologies gives many opportunities, including communicational possibilities. One of the instruments filling the communication space between the producer and the consumer are chatbots. Using instruments from the new technologies category is the domain of the Y and Z generation. These are people born between 1980–1999 and after 2000 respectively. They are often referred to collectively as the Millennials, due to the fact that they entered the labour market at the turn of two centuries. Their representatives are brought up in the age of the Internet which has no secrets for them. They cope very well with technological innovations, from which they expect pragmatism and simplification in everyday life. Generation Y is the first generation that grew up in the world dominated by computers, mobile phones, multimedia devices and online social networks. In turn, the generation Z is a generation that had never existed before. This young generation born after 1995 significantly outperforms their predecessors in terms of knowledge about the use and utilization of the Internet, mobile devices. The

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reason for this is communing in a completely natural environment for them. At the same time, it is a generation that in the era of new technologies cannot function without it (Jaska and Werenowska, 2018).

The article presents the possibilities of using chatbots in marketing communication. It analyses literature on the subject and the results of the survey carried out. In the survey, the groups of respondents were: representatives of companies using chatbots for marketing purposes (IT companies), potential recipients of virtual assistants services. The method of the diagnostic survey was used. A questionnaire was used among potential service users. However, among the representatives of companies using chatbots, there is an interview questionnaire.

## THE ESSENCE OF COMPUTER COMMUNICATION

Transformations in the way of marketing communication have a very deep dimension. The so-called hypermedia computer environment "creates a new quality of marketing communication: the collection, storage, processing, presentation and transmission of information between the sender and the potential recipient of the message" (Wiktor, 2013, 249).

In literature, the term "marketing communication" refers to a dialogue of the enterprise with other entities in its market environment, constituting the foundation of marketing and the condition for market success of each institution (Wiktor, 2005). Communication via a computer is a type of communication in which communicators do not have face-to-face contact but talk using computer-assisted communication technologies (Pyżalski, 2012). The specific, yet common communication via a computer is possible thanks to the coexistence of four basic elements (Grębosz, Siuda and Szymański, 2016):
−   sender, who has access to a computer or a device from which information is transmitted and sent; recipient, who has access to a device that receives information; message in the form of a code sent to the recipient by the sender as text, image, video, sound, etc.
−   the channel through which the information sent, which is at the same time the carrier of the code. The indisputable attribute of hypermedia commu-

nication is its selectivity to a degree unattainable for traditional mass media communication. This means that the new communication environment offers sellers the opportunity to appear on the market through the presence of their offer on the web and recipients decide what, where and what time to browse. This is the ground of individual recipient's decision (Wiktor, 2002).

Nowadays, two trends are noticeable that influence the development of communication tools: the integration of communication channels and the use of modern interactive technologies. These phenomena generate the need for interactive communication which is why the Internet plays such an important role in the processes of marketing communication (Taranko, 2015). Whereas one of the increasingly popular marketing communication tools are so-called chatbots.

## THE CONCEPT AND USE OF CHATBOTS

Chatbots are still new solutions, although the first computer programs that can be called chatbots appeared around 1966 as attempts to implement the CMC (Computer Mediated Communications) project whose aim was to establish a human-computer connection. The concept itself is an abbreviation of the word "robot". Its task is to imitate human behaviour in specific cases. A chatbot accomplishes two basic goals: it satisfies the client's needs and provides automation of communication. It is used in situations when contact with recipients is based on repetitive processes, it can answer typical questions, check the available date of appointment or encourage purchase of a desired product (Nowy Marketing, 2018). To define it in the simplest way chatbots are computer programs that simulate the operation of live users. According to the report "Polish Chatbots 2018", Internet bots currently account for over 50% of all activity on the Internet – including websites browsing, content publishing, media playing or downloading files on portal https://projekty.k2.pl.

Today, many types of electronic assistants can be distinguished. One of the taxonomies is chatbots classification: notifying; process; conversational (Table 1).

Conversational chatbots have become particularly popular. Consumers and customers often ask the same questions. In order to maintain high quality of

**Table 1.** Classification of chatbots and sample tasks

| Type of chatbot | Communication method | Examples |
|---|---|---|
| Notifying | One-way communication to users, sends notifications in accordance with the established schedule, works similarly to a "newsletter". | notification of sending a package, weather forecast news from the country and from all over the world |
| Process | The process allows the user to go through a predetermined and linear process, requiring a series of decisions from a closed pool of choices. | purchase of tickets to the cinema, online shopping from the messenger, selection of a holiday offer of a travel agency, submitting an application to open a bank account |
| Conversational | Allows the user for casual conversation, following instructions answers questions asked in the language of the user. | implementation of the FAQ office |

Source: own study based on information from portal https://projekty.k2.pl/

service and customer satisfaction a possibility of answering a very wide range of questions at different times becomes almost a standard. It must be remembered that from the point of view of a brand, a satisfied customer significantly influences the company's success. Chatbots have various applications. Thanks to the possibilities they create, they are used in the implementation of many tasks (Table 2).

**Table 2.** Possible applications of chatbots

| Task | Implementation tasks | Benefits |
|---|---|---|
| Entertainment | Building of an emotional connection with clients. | Credibility and plasticity of the website; time spent on the website, more frequent return to it; attracting potential customers; an offer presented in an attractive way; openness to receiving information. |
| Guide to the website service | Information interesting for the client and familiarization with the offer. | Effective finding of the information sought; indication of information based on the answers to questions; personalization of the company's website. |
| Virtual spokesman | Creating a good company and product image. | Works 24 hours a day; ease of adaptation to changes; currentness. |
| e-marketing | Dialogue focused on acquiring information; building an emotional connection with clients; collecting knowledge about individual customer preferences. | Low research costs; readiness to talk with the customer at any time; ability to talk about general topics; obtaining information about customer preferences. |
| Customer adviser | Providing advice on purchased products. | Easy and continuous access to information. |
| Consultant | A quick, competent and friendly response. | Lack of technical limitations as to the number of customers simultaneously conversing with a chatbot; instant service for all current customers. |
| Seller | Familiarization with the range of products; answers to questions; assistance in making a choice based on an analysis of customer's needs and expectations resulting from the interview. | Increase sales with cross selling; shortening of the procedures of product purchase; reduction in the number of interrupted purchases due to lack of information. |

Source: own study based on Pawlak and Wolski (2007).

## USING CHATBOTS IN MARKETING COMMUNICATION IN THE LIGHT OF OWN RESEARCH

Contemporary, consumers often look for information about the company that interests them on the website or on Internet forums. Sometimes, however, this information is insufficient. In such situations consultants or chatbots are used. For enterprises such a solution gives the possibility to minimize the costs of customer service. Managers are very optimistic about this solution. The four interviews conducted with experts in 2018 show that in addition to reducing costs they also see in this solution acceleration of communication, e.g. by partially replacing e-mailing. According to experts, chatbot isn't yet a very effective tool and cannot change the conversation with a company employee. The key problem at a given stage of development and use of chatbots is low consumer awareness of their existence and use of the communication.

From a technical point of view, the use of chatbots by companies means, first of all, maintaining the fluency in communication, reaching a huge number of recipients and fast delivery of messages. It can be assumed that bots will be increasingly used by companies for communication with clients. In the midst of benefits for users should be included among others the following (SALESmanago, n.d.):

- recommending in real time products and services tailored to the needs and interests of consumers;
- simple implementation;
- creating multilingual conversations;
- possibility to plan a full conversation with the client;
- unlimited number of scenarios;
- support for the work of the marketing and customer service department;
- extending communication with the client with a new channel;
- reaching with the offer the wider range of users;
- standing out from the competition.

We should also mention the costs of introducing and operating chatbots. The final cost of preparing the bot and implementing it on the fanpage varies and depends on many factors. These include, among others, the desired functionalities, the number of user paths, integration with external data sources, marketing development, etc. Among the offers of companies that run the service and introduce chatbots prices start from several hundred zlotys a month. The price depends on the client's needs. The possibility of adjusting makes it an instrument more valued by managers. Consumers have a slightly different view of this specific tool. The survey was conducted in 2018 among 123 people between the ages of 20 and 24. It is worth mentioning that it is a group belonging to a generation in a special way involved in the use of new technologies in everyday life. More than half of the respondents knew the concept of chatbot (51%) but was unable to define it which indicates a little knowledge of the tool and its use. Only 9% correctly defined it. It should be concluded that despite the increasing use of chatbots by companies, clients do not know exactly what it is used for and what is this virtual assistant. Most of the respondents also did not use chatbots at all or thought that they did not use the services of a virtual assistant. Only 4% of respondents stated that they often use chatbots.

Despite the popularity of chatbots in the communication they have gained among marketers, customers – users of this program still believe that it is not very effective and cannot match up to the conversation with a company employee. They unequivocally emphasize the importance of "live" consultants in customer service and their irreplaceability in matters related to customer service, especially in more complex matters. Although a chatbot is very attractive for companies, it is still not popular among consumers. The analysis of research results leads to the conclusion that many people are still suspicious of using chatbots and the possibilities they provide. Considering that 47% of the respondents could not define the concept of "chatbot", it may be suggested that the time to full use and acceptance of this technology among users is going to be very long. On this basis, it can be concluded that consumers still do not have full confidence in chatbots and communication with them and direct communication with a "live" consultant is the most effective and reliable. Dissatisfaction and distrust in relation to chatbots also showed the results of research conducted in the United States and

the United Kingdom in 2017 among 3,000 consumers (van Lun, 2018). More than half (53%) of the surveyed consumers (including 54% in the USA and 52% in the United Kingdom) considered chatbots as "ineffective" or only "slightly effective". Consumers in the US were more strict in chatbots assessment, as 14% rated them as ineffective comparing to only 5% for British consumers. Interestingly, younger consumers thought that chatbots are more effective than older ones, as 22% of the surveyed representatives of the Z generation and 15% of Millennials rated them as "very effective". This is largely due to the positive attitude of young people to new technologies consumers (van Lun, 2018).

## SUMMARY AND CONCLUSIONS

The e-commerce industry is constantly developing, becoming a competition for stationary outlets. More and more e-stores are deciding to use their own chatbots. The benefits of this solution support the intensive and versatile use of it. That's why the perfect combination is to have both a chatbot and a real consultant.

A well-programmed chatbot allows you to remember shopping preferences of customers. This, in turn, translates into building a customer relationship – if they come back to the store, they can expect a personalized offer and appropriately selected products in terms of size, colour or style. It also speeds up shopping and makes it easier to navigate the store which is of great importance especially when using mobile devices which, as indicated by numerous studies, are increasingly used by consumers. The advantages of implementing a chatbot in an e-store, however, do not only apply to customers. It is also a convenience for the service department as well as marketers. In addition to answering standard questions, a chatbot can quickly help you analyse what information customers are looking for, which elements on the site need updating or simplifying, and whether all the formalities on the website (application form, payment options, delivery method) correspond to the buyer's preferences. The main problem at a given stage of development and use of chatbots lies in the low awareness of consumers about their existence and the way they use a given message. However, as show the results of research carried out by the Gartner (2011) until 2020, up to 85% of customer interactions will take place without human intervention.

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