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**DEVELOPMENT OF THE CONCEPT A CROSS-BORDER CLUSTER FOR THE  
PROCESSING OF SECONDARY RAW MATERIALS OF WINEMAKING  
IN UKRAINE AND MOLDOVA**

**OSYPOV Vladimir,**

Doctor of economics, professor,  
Institute of Market Problems and Economic and Environmental Research  
of the National Academy of Sciences, Ukraine  
e-mail: [osipovugkonver@gmail.com](mailto:osipovugkonver@gmail.com)

**OSYPOVA Larisa,**

Doctor of Technical Sciences, professor,  
Odessa National Academy of Food Technologies, Ukraine  
e-mail: [lora.osipova@yandex.ua](mailto:lora.osipova@yandex.ua)

**GAINA Boris,**

Doctor of Technical Sciences, professor,  
Academician of the Academy of Sciences of Moldova  
e-mail: [borisgaina17@gmail.com](mailto:borisgaina17@gmail.com)

**Abstract:** *The analysis of technology of processing of grapes on wine materials in Ukraine and Moldova is carried out. The following is the list of the most promising products obtained from secondary raw materials of winemaking. The concept of creating a cross-border cluster for the processing of winemaking by-products is based on the principles of the green economy.*

*A systematic approach to the complex processing of grapes based on cluster ideology is proposed. The proposed architecture of the cluster as managerial innovation in the subregional, regional, national and cross-border context allows us to form the poles of economic growth by consolidating and converting different types of capital: human, social, productive, natural, financial and intellectual and to obtain additional economic benefits. The developed concept shows that sustained efficiency is achieved, primarily, when enterprises are able to combine efforts and capital.*

**Key Words:** *Grapes, secondary raw materials of winemaking, winemaking by-products. enotannin, grape seed oil, tartaric acid, biologically active compounds, cluster, green economy.*

**JEL Classification:** F15, Q16, R14

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**Introduction**

When grapes are processed for wine materials, secondary raw materials are formed, the most significant of which for weight and value are crests, pomace, seeds, and skin, the share of which is 15...20 %. The anatomical features of the grape berry, as well as modern sparing technologies for processing grapes into wine materials, cause that the secondary raw materials of winemaking in terms of the content of biologically active substances are superior to grapes and wine, which makes it possible to use it for the production of a wide range of products of high value for various industries: food, pharmaceutical, perfume and cosmetic, chemical, etc. However, currently there are no specialized enterprises for the integrated processing of secondary raw materials of winemaking in Ukraine and in Moldova. In the vast majority of cases, in particular, crests and pomace are uncontrolledly exported to agricultural lands without special treatment, which leads to acid soil erosion and environmental pollution by metabolites of micromycetes.

At the present stage of technological development there is a wide range of (innovations) in the field of recycling of secondary bio-materials, in particular grape waste, in order to obtain biologically valuable components. The main task in this direction is to create an organizational and economic mechanism that will unite the interests of winemaking enterprises (owners of secondary raw materials), processing enterprises (producers of winemaking by-products), representatives of local

authorities and potential consumers of innovative products. A cluster ideology may be an effective tool for consolidating the interests of stakeholders in this direction.

Development of the concept, formation and functioning of the cross-border cluster on the processing of secondary raw materials of winemaking, the core of which is the innovation and investment center, which provides cooperation of science, business and administrative resources, allows to provide non-waste technologies and use innovative solutions. In the process of recycling of secondary raw materials of winemaking in Ukraine and Moldova (about 100 thousand tons) is the possibility of obtaining more than 50 winemaking by-products, for which there is high demand in various sectors of the economy.

### Analysis of recent researches and publications

Domestic and foreign scientists, such as Ageeva N.M., Zaiko G.M., Donchenko L.V., Kasyanov D.G., Kvasenkov O.I., Gaponenko Yu. V., Butova S.M., Ismailov T.A., Shcheglov N.R., Isrigova T.O., Ogay Yu. O., Chernousova V.V., Ptitsin A.V., Mukhtarov E.I., Musaeva N.M., Vlaschik L.R., Sidorenko O.V., Perevertkina V.V., Islamov M.N., Bondakova M.V., Arpentin G.M., Gaina B.S., Kobirman G., Osypova L.A., Lozovskaya S. T., Brenner-Weiss G., Franzreb M., Nusser M., Metivier R.P., Tataridis P., Apostolopoulos K. dedicate their researches to the development of the latest processing technologies, mainly grape waste processing, for maximum extraction of biologically active substances and production of new products. A large number of technologies are aimed at obtaining an extract or powder from the waste of red grape varieties for their further use in confectionery production or as biologically active additives for therapeutic and prophylactic nutrition. However, there are no strategies for non-waste processing of bioresources, in particular, grapes, in Ukraine and Moldova. There is also an insufficient level of interaction between scientific, educational institutions, production, business, legislative and executive power, which does not allow to ensure sustainable development and to achieve high profitability of production of innovative products from winemaking by-products.

In the field of scientific ideology of clustering, attention should be paid to the researches of domestic and foreign scientists, such as Sokolenko S.I., Voynarenko M.P., Dubnitsky V.I., Zakharchenko V.I., Osypov V.M., Yermakova O.A., Kara S.V., Kuraksina S., Porter M., Marshall A., Boudry K., Breschi S., in which there is no solution to the problem of processing of winemaking by-products.

**The main objective** is ensuring sustainable development and the principles of the "green economy" in the development of viticulture and winemaking in Ukraine and Moldova; creation of high value-added biologically valuable products; obtaining social and synergistic effect in the process of forming a cluster.

### Research results

In 2018, 274,1 thousand tons and 356,0 thousand tons of grapes were processed into wine materials respectively in Ukraine and Moldova. The list and volumes of the main and secondary raw materials of winemaking are given in table 1.

Table 1: Grape Products Processed for Wine Materials in Ukraine and Moldova in 2018

Name of raw materials	Ukraine	Moldova
<i>Main raw materials</i>		
Grapes for winemaking, thousand tons	274,1	356,0
Wine materials, thousand decalitre	18912,9	24564,0
<i>Secondary raw materials</i>		
Grape crests, thousand tons	10,9	14,2
Grape pomace, thousand tons	36,8	47,9
Grape seeds, thousand tons	9,6	11,9
Grape skin, thousand tons	28,8	35,9
Yeast sediments, thousand decalitre	472,8	614,1

Source: developed by the authors.

In the case of the rational processing of the secondary raw materials of winemaking, it is possible to obtain products that are of considerable value for a number of the economy sectors (food, pharmaceutical, perfume and cosmetic, chemical, etc.). Examples of winemaking by-products are given in the Table 2.

Table 2: The Winemaking By-products

Secondary raw materials	The winemaking by-products
Grape crests	Enotanine (1,27...3,2 %), tartaric acid, beverages, fertilizers
Grape pomace	Ethyl alcohol, tartaric acid, carbohydrates, polyphenolic concentrates, beverages, melanin
Grape seeds	Grapeoil (10,0...24,0 %), vitamin D, animal feed, food powder, abrasive materials, enotanine (2,0...8,9 %), melanin, protein (8,2 %)
Grape skin	Polyphenolic concentrates, enotanine (0,15...4,2 %), grape skin extract, melanin, animal feed, fertilizers
Yeast sediments	Ethanol, group B vitamins, protein biopreparation, dry yeast, peptides, amino acids, enanthic ether
Grapevine	Activated carbon, pellets

Source: [1].

The basic scheme of complex processing of fermented grape pomace is shown in fig. 1 [1]. Despite the undeniable value, in the vast majority of cases, in particular, pomace and crests in Ukraine are exported to agricultural lands, what leads to acidic soil erosion and, due to the development of microorganisms, to environmental pollution, exacerbating one of the global problems of humanity.

To date, there are no enterprises to process secondary raw materials of winemaking, and the known ways of processing them are not efficient from a technological, economic and environmental point of view, which indicates the irrational use of resources and the loss of material resources.

There are no systematic studies on the physico-chemical, microbiological, toxicological composition of the secondary raw materials of winemaking in order to determine the optimal direction of their use. Also a deterrent is the lack of comparative analysis of existing technologies and equipment for the processing of winemaking by-products.

Large reserves are hidden in the introduction of innovative technologies for the processing of the secondary raw materials of winemaking, the data on which is not systematized; there is also no consolidation of scientists dealing with this important problem of today.

There are associations for growing grapes, their processing into wine materials, obtaining wines and distillates of various types, recycling of secondary winemaking raw materials in the Republic of Moldova. Currently, biogas, bioethanol, grape seed oil, organic fertilizers, pellets etc. are produced on an industrial scale. However complex recycling of secondary products is in the initial stage of development, requires the study of foreign experience, requires state subsidies and finding markets, feels the imperfection of taxation and the legislative framework.

In order to effectively solve the existing problems related to the complex processing of the secondary raw materials of winemaking, it is necessary to unite the winemaking enterprises in specialized clusters, including enterprises of different profile of activity (grape cultivation, its industrial processing, production of wines and distillates, processing of valuable secondary raw materials: seeds, pomace, yeast sediments, skins, wine-acid salts, etc.).

Clusters are a promising organizational management system with a unique mix of resources. Effectively managed clusters contribute to the development of regional and national industries, which is due to:

- obtaining direct positive effects of logical interconnection within the cluster, which leads to activation of innovative activity, as well as to the emergence of new methods of competition;

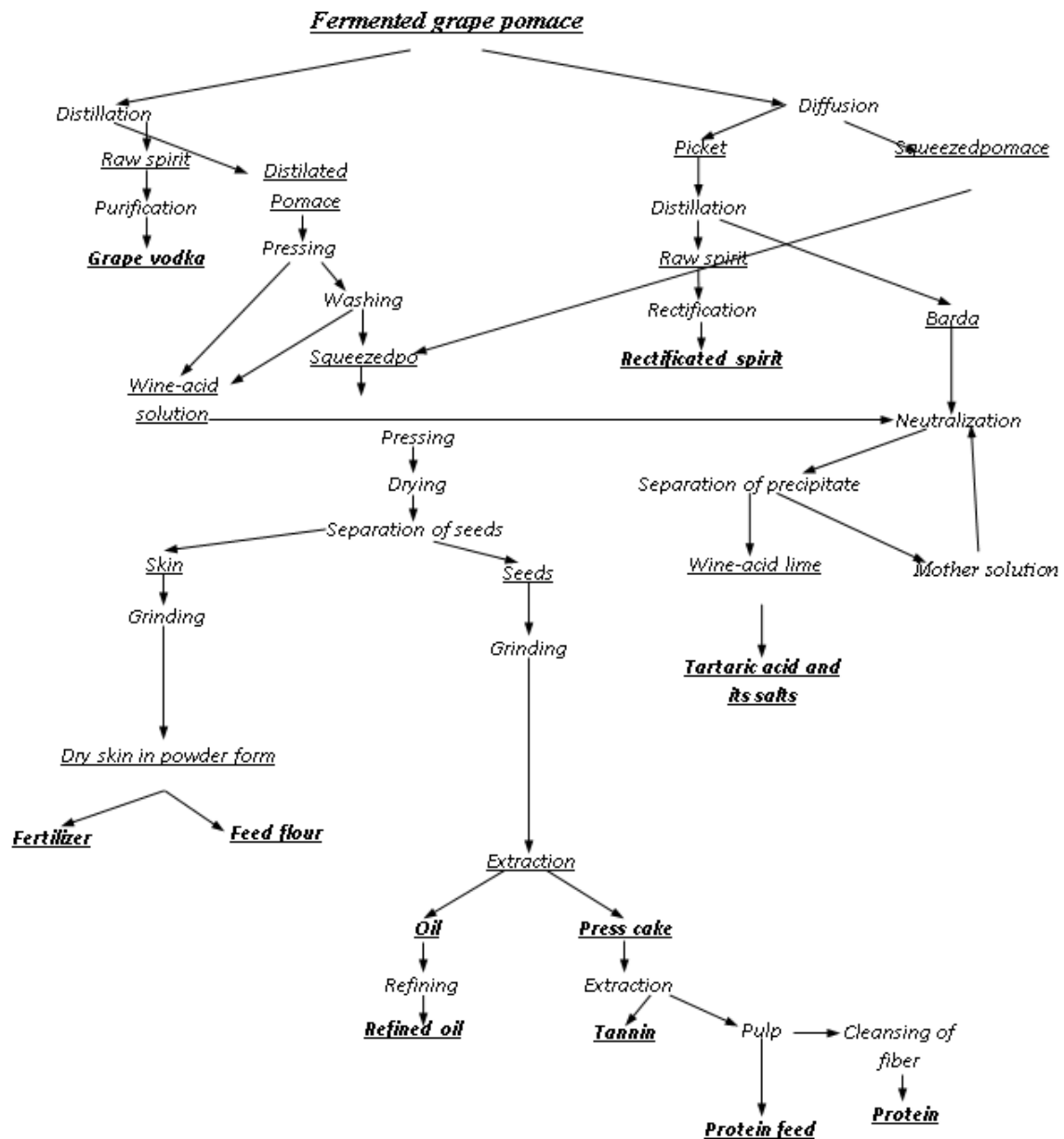


Figure 1: Scheme of complex processing of fermented grape pomace

Source: [1].

- favorable conditions for the formation of regional, inter-regional, cross-border innovation systems;
- the ability to mobilize the internal potential of territorial entities;
- the role of clusters as "poles of economic growth". The formation of a cluster accelerates the process of creating the conditions for competitive technologies through innovation, information dissemination, infrastructure improvement;
- creating demand for specialized logistical resources and services. Intra-cluster interconnections ensure the development of outsourcing as small and medium-sized enterprises produce products, jobs and services for key cluster entities, thereby facilitating the development of small and medium-sized businesses in the region;
- competition between producers in the cluster, which leads to a deepening of specialization, search for new niches and its expansion, resulting in the formation of new business entities, increases

the profitability of regional production, solves the problems of employment and increases the integration potential of the region;

- institutional forms of providing cross-border cooperation in trade, agriculture, tourism, transport, infrastructure, which contributes to the economic development of border areas.

Based on the above, we can conclude that the cluster is a managerial innovation of construction within a specific territorial (subregional, interregional, cross-border, etc.) structure, which consolidates at the expense of social capital and uses human, industrial, natural and financial capital on the basis of highly efficient technologies, as a result of which added value is generated and a synergistic effect is ensured.

The basic principles of creating cluster formations include:

- voluntary association;
- equality of partners in the merger structure;
- freedom to choose organizational forms of association;
- independence of participants.

However, the ultimate goal of each cluster is to provide expanded reproduction and added-value creation.

With the help of the cluster mechanism it is possible to increase the level of capitalization of the regional economy in several directions. There are the following among them:

- 1) commercialization of entrepreneurial initiative;
- 2) extension of the added-value creation chain;
- 3) wide commercialization of innovations;
- 4) complex processing of winemaking by-products and other types of production on the basis of providing a closed cycle of production.

Cluster capitalization processes can be performed on the basis of one of these mechanisms, or on the basis of an integrated variant combining several varieties of effective cluster structures and mechanisms. With regard to the processing of secondary raw materials of the wine industry, it is possible to use the whole complex of capitalization mechanisms, while the leading direction should be to ensure the economics of the closed cycle of production for non-waste technologies.

An important advantage of the cluster is the synergistic effect of moving innovation, which is achieved during development and implementation in the production of new inventions and developments.

Innovative synergism is a consequence of the common use of production facilities, research and development costs, and high-tech equipment. The introduction of innovative technologies and the dissemination of information at the cluster enterprises causes accelerated innovation development, realization of its innovative and scientific potential and, importantly, enhancement of the practical importance of research and education. The developments of scientific and educational institutions that will be included in the cluster are being put into practice at the cluster enterprises. This is made possible by the co-financing of cluster research. The transition of the cluster enterprises to an innovative base will increase the share of exports of high-tech products produced in the region and in the country as a whole, which is especially relevant for Ukraine and Moldova, considering the availability of sufficient raw material base and the possibility of production on its basis of a wide range of competitive products that create basis, the orientation of export flows, which, in turn, will serve as a vector of entry into world markets.

The revitalization of the entrepreneurial initiative causes the creation of new jobs in the region, attracting foreign investment, increasing the tax base, development of modern infrastructure. Traditional industrial policy, which is to end the subsidization of non-competitive industries, will change. At the same time, priority development should be given to small and medium-sized businesses as a basis for economic, innovation and cluster development.

An important advantage of a cluster form of production organization is the accumulation of social capital, which is a resource of interpersonal relationships, based on trust and cooperation between the cluster members. The development of effective communications within the cluster is made possible by the emergence of informal contacts and the establishment of relationships that are built on trust between the employees of enterprises working in this sector of the economy. Social

capital creates an intellectual microclimate for the movement of information, knowledge and innovation, which is a necessary component of the innovation process. Through social capital networks, knowledge is transformed into economic opportunity.

The effect of using the outsourcing cluster allows to reduce the wage costs of workers involved in related fields, not related to the main activity of the enterprise. The effects of risk sharing among cluster members, common use of infrastructure, reducing transaction costs cause a decrease in the cost of production, increasing its competitiveness, and strengthening the financial capacity of enterprises in the cluster.

At the same time, regardless of the peculiarities of the capitalization process in the framework of the proposed economic formation, cluster interaction provides a number of benefits to participating companies that can be combined into the following groups: productivity enhancement, innovation implementation, activation of entrepreneurial initiative, development of effective communications and information dissemination.

The prerequisites for the formation of the cluster for processing of the secondary raw materials of winemaking in the cross-border region Ukraine-Moldova are as follows:

- significant volumes of secondary raw materials of winemaking;
- small scale of domestic production for its processing;
- the possibility of import substitution of cocoa beans into the confectionery industry with powder from press cake of grape seeds;
- high economic efficiency of production.

The constraints are:

- limited state regulation instruments of development;
- imperfection of the insurance system;
- insufficient utilization of production capacities of wineries;
- insufficient involvement of innovations in production;
- low level of trust between potential cluster members.

The peculiarity of cross-border clusters is that their participants are located in different tax, customs, legislative spheres of Ukraine and Moldova, however, they may have joint ventures and organizations, use common infrastructure, and may be present primarily on cross-border markets.

Cluster participants interaction is done on the basis of long-term contracts. The auxiliary cluster members (transport, marketing, scientific and other enterprises) receive profit from their main activity, their interest from the interaction in the cluster - the expansion of consumers of their services. Profit distribution mechanisms between cluster core founders vary depending on the cluster organization schemes. Based on the above, it leads us to the following definition. The cluster is a voluntary association of existing winemaking enterprises and newly formed specialized enterprises and units related to common goals for the preparation and processing of the secondary raw materials of winemaking in the cross-border region Ukraine-Moldova with the introduction of innovative technologies and consolidation of social capital for further production and realization of manufactured products in the domestic and foreign markets, with added value, with transparent distribution of profits between all founders and participants depending on the contribution made: raw materials, equipment, innovations, technologies, finances, training programs, transport, financial, marketing and other outsourcing services.

The main founders of the cluster should be wineries of Ukraine and Moldova, which create a production platform, as well as regional and foreign investors focused on financing innovative technologies for processing of winemaking by-products.

The cluster's economic core and catalyst for economic growth will be the Innovation and Investment Center (IIC), which will include researchers and representatives of:

- Scientific Center "Ukrainian Institute of Wine" (SC "UIW");
- Institute of Market Problems and Economic and Environmental Research of the National Academy of Sciences of Ukraine (IMPEER NASU);
- National Science Center "Institute of viticulture and winemaking of V.E. Tairov" (NSC IVW);
- Technical University of Moldova (TUM);

- Odessa National Academy of Food Technologies (ONAFI);
- production platform.

The organizational structure of the cluster is presented in Fig. 2.

At the initial stage of cluster formation, the IIC structure will be represented by three self-supporting departments, which will solve the following tasks.

1. Department of Strategic Development and Financing:

- develops a long-term strategy for sustainable cluster development; monitors the implementation of the development stages and actualization of strategic and tactical priorities;
- participates in international grants, national programs and competitions to obtain financial support for the implementation of innovative projects for both cluster infrastructure programs and local projects of specific wineries;
- helps to create favorable investment climate in the cross-border region for attracting investments through establishing stable contacts with investors; a free market niche for the sale of winemaking by-products;
- provides information, analytical and marketing support and access to statistical data base, analytical surveys, as well as marketing research on the situation in the innovation market, analyzing consumer behavior and preferences;
- defines key indicators of cluster development;
- carries out short-, medium- and long-term planning of cluster innovation development, development of functioning programs of its main sectors.

2. Department of technological improvement:

- provides technology transfer and commercialization of scientific and technical activities, creating small high-tech structures;
- provides technical support, monitors compliance with the developed standards and rules, as well as organizes repair work;
- provides services for the use of unique equipment and instrument base;
- conducts innovative and technological audit of cluster enterprises.

3. Department of education, through multichannel funding, develops the concept of a continuing education program in the cluster and subregion, retraining and upgrading the skills of the cluster employees.

In the process of formation and functioning of the innovation and investment center can also manage the innovation activity of the subregion by creating innovative infrastructure (technoparks, industrial parks, business incubators, market innovation, etc.) and its further management.

IIC's activity is a fundamentally new tool for the economy and public administration, which makes it possible to use inter-municipal cooperation and public-private partnership to enhance cluster competitiveness in the Ukraine-Moldova cross-border region.

New enterprises in the wineries will be specialized enterprises (workshops) for the preparation of secondary raw materials of winemaking (eg. drying and packing of casks, seeds and skins) for further processing, which will be located in the subregion center (with a radius of 50-70 km), where large wineries and points of primary winemaking with a production capacity of up to 500 tons of grapes per day are located. Part of the prepared products (large batches) will be sent to the Odessa plant of seed and vegetable oils (OPSVO) for processing, the rest of the prepared raw materials will be processed during the year at newly established specialized enterprises in Moldova and in Ukraine (Figure 2).

It is also possible to process the secondary raw materials of winemaking comprehensively, what is based on the combination of specialized workshops with large wineries.

The construction of one specialized enterprise (workshop) instead of several workshops for processing of raw materials at each winery is much more economical, requires less investment and transport costs. Subregional enterprises significantly reduce labor costs, increase their productivity and interest in obtaining the maximum output at its lowest cost, create a higher level of technology, the opportunity to produce a number of new products.

The basic enterprises for the processing of grape seeds should be the Odessa plant of seed and vegetable oils in Ukraine and the Chadir-Lung plant "Azamet" in Moldova.

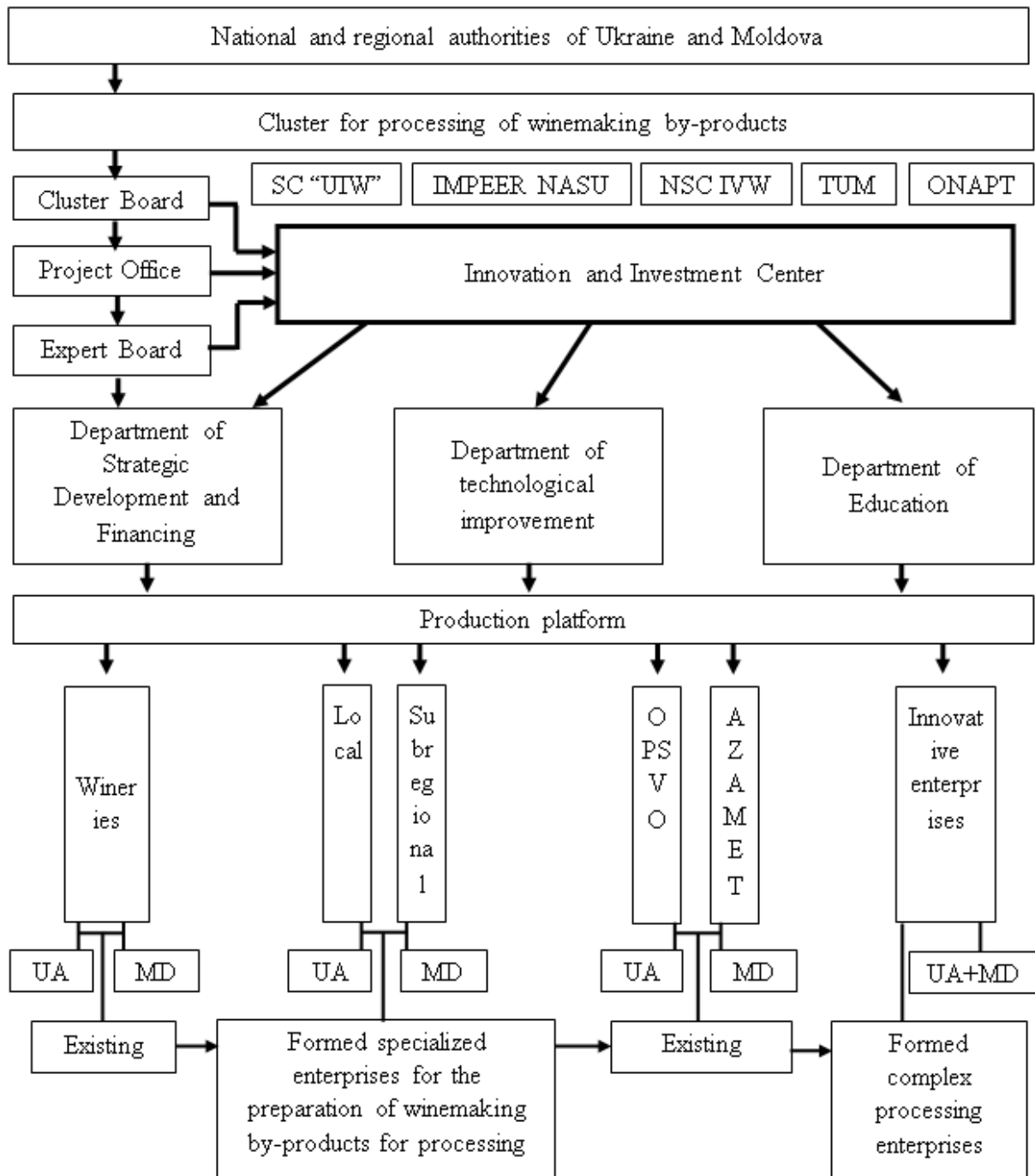


Figure 2: Organizational structure of the cluster

Source: developed by the authors.

Odessa plant of seed and vegetable oils was established in 1893 and was the only one in the Soviet Union which produced oil in a press manner from the seeds of grapes and other berries, fruit seeds, as well as obtained technical oils from seeds of flax, rapeseed, mustard, soybean, peanuts, sesame seeds, tomatoes for the production of drying oil, paints, special equipment.

Grape oil is the most in demand for the preparation of injectable solutions and medicines in the pharmaceutical industry, as well as for the production of perfume, cosmetics, confectionery and other industries.



It should be emphasized that the raw materials for the plant are the seeds of fruits and berries, including tomato seeds, which is a secondary raw material of the canning industry.

Thus, the plant not only produces valuable and, to some extent, unique products, but also provides integrated use of agricultural raw materials, secondary raw materials of food industry enterprises. So it solves the tasks related to environmental protection, which is especially important for the conditions of the Odessa region, which is a recreation center and at the same time is characterized by a developed canning and wine industry.

Unfortunately, at present, the production capacity of the enterprise is loaded only 35% of the production capacity of the enterprise is used, because after the break of inter-economic ties created in the USSR, the plant is experiencing great difficulties in restoring them, with the procurement and delivery of raw materials from different regions, finding new markets and reliable long-term partners, both in Ukraine and abroad.

Despite the difficulties, a team of professionals has been retained at the plant, which needs technical re-equipment, and there is equipment in working condition that will allow to produce new types of products from the secondary raw materials of winemaking. And this is a substitute for cocoa beans from the grape seed cake for the confectionery industry, and high-protein feeds for livestock and pond based on grape, soybean, flax, rapeseed and other pods.

With the integrated use of the secondary raw materials on a more advanced consolidated technical base will increase production, the laboriousness will be reduced 2-3 times, consequently increasing profits and profitability of production and accelerating cost recovery. Therefore, the proper organization of processing of winemaking by-products is one of the most important tasks for the wine industry of Ukraine and Moldova.

The centuries-old wine-making traditions, unique combinations of natural factors, infrastructure and consumer tastes formed for a long time dominated the Old World - European wine producers on the world market. In recent years, there have been positive changes in the development of viticulture, winemaking and processing of the secondary raw materials of winemaking in Ukraine and Moldova, which testifies to the systematic implementation in the European and world trading area.

The idea of forming a cross-border cluster for the processing of secondary raw materials of winemaking was supported by the European Union, allocating in 2018 funds for the implementation of EU grant project No. 83263440 "Development of the Ukrainian-Moldovan cross-border production, scientific and educational cluster for processing of winemaking by-products".

World experience shows that sustainable competitiveness is achieved above all by companies that are able to cooperate. Therefore, creating a cluster is the right way to ensure success in this important industry of Ukraine and Moldova.

### **Conclusions**

1. Wineries of Ukraine and Moldova have considerable potential of secondary raw materials for its complex processing into new types of products.

2. The most competitive by-products are ethyl alcohol, grape skin extract, grape seed oil and press cake, tartaric acid and its derivatives, polyphenolic concentrates, vitamin D, animal protein feed, abrasives, fertilizers, etc.

3. For the enterprises with small volume of grapes for processing (up to 1000 tons per season), transfer of pomace and seeds to large producers (1000... 10000 tons per season) for their complex processing within the cluster is advisable.

4. It is possible to implement the concept of a "green economy", which allows the introduction of a complex of innovative and waste-free technologies for the processing of winemaking by-products only after creating a cluster. Synergetics of interaction of cluster members on the basis of social capital consolidation will provide effect of scale and to enter into competitive markets.

5. The leading core and catalyst for economic growth should be the leading scientific and educational institutions of Ukraine and Moldova, which are part of the innovation and investment center of the cluster and its institutions.

6. The production platform of the cluster will consist of Ukraine and Moldovawineries, as well as newly created specialized workshops for the preparation of secondary raw materials for winemaking for further processing at existing or new enterprises.

7. In order to be successful in the domestic market, as well as to export innovative products made from processed winemaking by-products, it is necessary to be guided by the current rules and requirements of the European Union countries, as the most advanced and effective - the production of finished products should be traced throughout the technological cycle (from preparation of raw materials to its release) through the introduction of HACCP control systems and ISO certification systems.

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## **THE FEATURES OF FORMATION OF THE CONCEPT OF MARKETING IN THE NON-INDUSTRIAL SPHERE**

**ZAKHARCHENKO Vitaliy I.,**

Doctor of Economics, Professor.

Odessa National Polytechnic University, Ukraine

E-mail: [kafedra@mzeid.in](mailto:kafedra@mzeid.in)

**METIL Tatiana K.,**

Candidate of Economic Sciences, Associate Professor

Izmail State University for the Humanities, Ukraine

E-mail: [tatanametil@gmail.com](mailto:tatanametil@gmail.com)

**Annotation.** *The article discusses the features of the formation of the concept of marketing in the non-industrial sphere. The functions of the non-industrial sphere, the main directions of development of marketing in the state, the models of resource allocation, which play an important role in improving the quality of life of the population are determined.*

**Key words:** *marketing, management, regulation, social, region, state, population, structure.*

**JEL classification:** M31

**UDC:** 339.138(477)

### **Introduction**

Non-industrial sphere lags behind the industrial in the practical use of marketing. Therefore, the construction of a marketing concept in this area and the development of a methodology for its practical application in the region require sufficient scientific justification, which is emphasized by the relevance of the research topic.

Non-industrial sphere allows satisfying non-productive needs for housing, education and health services, professional recognition and political partialities. The satisfaction of these needs is influenced by state government bodies and management, as well as political institutions. At the same time, the desire to studying, forecast and satisfaction of the above needs from government structures, as analysis shows, avoids management crises and extreme social situations in the region. The concept of marketing, which arose during the mass production of consumer goods and services, is only beginning to become widespread in the non-industrial sphere; recently, marketing ideas have also been tried to be used in government bodies of management [1, p. 124]. This is primarily due to profound changes in understanding the essence of the modern state and its functions.

The traditional approach to the state as an instrument of coercion and administrative management is replaced by a new paradigm that sees in the activities of power institutions a system of organization focused on satisfying the current and potential needs of consumers, as well as the transfer of many powers to local self-government.

### **Statement of the task**

In these conditions, it is necessary to concentrate the efforts of the state (region; oblast, city, district) on the selection of several most feasible, priority areas that require relatively small investments, but which have a significant effect for economic recovery. Such priority areas, in the opinion of the author, can be personnel and political marketing, marketing in the housing market, marketing in the education and healthcare services markets.

### **Analysis of publications**

A number of scientists, both foreign and domestic, considered issues of the features of the formation of marketing concepts, among which it should be noted: F. Kotler [1], V.Yu. Svyatnenko [2], V.I. Zakharchenko [3], G.A. Morozov [4] and others. However, very little attention was paid to the formation of the concept of marketing in the non-industrial sphere, and today these are the main

directions of activity of both state bodies and business structures in the formation of the concept of marketing.

### **The purpose of the article**

Consider the features of the formation of the concept of marketing in the non-industrial sphere.

### **Results**

The need for the use of marketing in the non-industrial sphere, which is regulated by state and local bodies and management, is associated with the following reasons:

- increased dissatisfaction of citizens with the quality of work of state institutions, incapable of fulfilling their direct responsibilities to serve the needs of the population;
- decrease in financing of state programs and services due to a constant budget deficit;
- differentiation of demand in the market of services and goods;
- changes in the social structure of society and the emergence of new social groups and strata having their own specific interests and needs;
- traditional bureaucracy of the power apparatus, which often sets its corporate goals above the interests of society and individual citizens [2, p. 28].

The use of marketing in state and local government, firstly, improves the efficiency of state programs and services, secondly, creates a scientific basis for determining management strategies and tactics in accordance with the needs of the population, thirdly, optimizes the entire management cycle from determining goals and objectives of political leaders, before evaluating the implementation of their election programs, from the point of view of consumer-citizens of the society, fourthly, provides massive support to power structures, increased confidence in their policy and the active participation of the population in government programs, fifthly, public servants are forming a stereotype of thinking that focuses on the needs of citizens.

A necessary condition for the successful development of the state is the high efficiency of its management system. Since complex problems can arise in various fields of management at the same time, their solution is possible only by managers of a new type who have systematic thinking, the ability to multi-aspect, multi-level and targeted analysis of emerging problems. This is especially true in the context of the formation of a new state management system in Ukraine and local self-government of territorial communities [3, p. 112]. Based on the experience of the civil service of civilized countries, the experience of government structures in Ukraine, the forecast of practitioners. Specialists performing the functions of state (regional) management should solve the following tasks:

1. Development of a state strategy and tactics for the application of political, economic and socio-psychological methods of managing macroeconomics and microeconomics at the regional and local levels.
2. The implementation of the financial and economic analysis of the functioning of the region, region and society.
3. Forecasting the financial, economic and socio-political development of the region and society.
4. Development of a program of effective tax policy, methods of formation and use of budgets.
5. Development of a regional management program.
6. Organization and conduct of sociological research in the region, identification of the conditions for the psychological adaptation of the population to the specific results of political and economic reforms in the region.
7. Diagnostics of the regional economic system.
8. The study of the influence of market infrastructure elements on the development of the region, its management system.
9. Analysis and improvement of information support for the system of management of the region and society.
10. Regulation of socio-economic proportions of development of various industries in the region.
11. Identification of key environmental problems and the formation of approaches to the development of organizational, technical, administrative, legal and economic solutions.
12. Legal support of state and local government.

13. The study and assessment of the socio-demographic situation in the region.
14. A study of the problems of social tension in the region.
15. 15. Analysis of the conformity of management structures to management objects.
16. Identification of housing, education and health care needs.
17. Development of recommendations on the structure and forms of activity of local authorities, optimization of horizontal and vertical relations on the interaction of legislative (representative) and executive structures.
18. Building a management model and choosing adequate management methods in accordance with real conditions and dependencies.
19. Development of management methods in extreme and crisis situations.
20. Marketing in the activities of government.
21. Development of a forecast for the release of employees of enterprises and organizations as a result of structural changes in the economy of the region.
22. Analysis of the structure of workers released and required by enterprises and organizations, taking into account new production opportunities.
23. Scientific analysis of human resources at enterprises and organizations, development of recommendations for training, retraining, advanced training.
24. The determination of the cost of training, retraining, advanced training of workers and specialists registered in the employment center.
25. Consulting leaders of different ranks of the regional and local government system.
26. Organization and technology of foreign economic operations [4, p. 36].

In most cases, state and local structures are employed specialists who are poorly knowledgeable in the field of state administration and law, political science, sociology, marketing and management, psychology and computer science.

In the context of the formation of new state and local government structures, the creation of market infrastructure, there is a need for specialists of a new type who are able to competently perform tasks related to ensuring the functioning of state institutions, and the implementation of control and regulatory functions of the state.

In foreign countries, they have achieved tremendous socio-economic progress thanks exclusively to management, because it is management that is able to use the ever-deepening division of labor, to unite workers of different specialties "to bring them to achieve common goals."

Currently, there is an increased interest in the results of the work of management specialists, which led to an unprecedented increase in their number and share in the total workforce.

At present, the necessary prerequisites and favorable opportunities for introducing the concept of marketing into the public administration system are emerging. This means the formation of a new direction in theory and practice - state marketing. Its scope includes the field of non-production needs, where, on the one hand, there are national and regional government bodies, committees and departments, local authorities, and on the other hand, consumers of these services - citizens, trade unions, political and public organizations, financial, industrial associations business structures.

Since marketing are arose to serve the production sector and business structures, therefore, when using marketing in the state regional administration, it is necessary to take into account the features of this sphere, which primarily affects personnel policies, political institutions and processes, and the satisfaction of housing needs, education and health services in region [5, p. 48].

Consider the data related to the non-production sector in Ukraine for 2018. Consumer Price Index (CPI) in December 2018 compared to November, it was 100.8%, for 2018 overall - 109.8% [6].

In the consumer market, food and non-alcohol prices rose by 1.8% in December. Vegetables increased the most (by 16.5%). Prices for milk and dairy products, pasta, butter, bread increased by 3.2-1.6%. At the same time, rice, eggs, sugar, fruit, pork went down by 1.4-0.5%.

Prices for alcoholic drinks and tobacco are increased by 1.0%, which is associated with a 1.7% rise in prices of tobacco products.

The prices (tariffs) for housing, water, electricity, gas and other types of fuel increased by 0.7%, mainly due to the increase of liquefied gas prices by 3.2%, tariffs for hot water, heating – by 2.1%, sewage – by 0.8%, water supply, maintenance of houses and residential areas – by 0.6%.

The decrease in transport prices by 1.6% was mainly caused by a decrease in fuel and lubricants by 6.0%. At the same time, the price of road passenger transport increased by 2.5%.

Food and non-alcoholic drinks went up by 7.8%. The prices of vegetables and bread increased the most (by 27.8% and 21.5%). Pasta, dairy, fish and fish products, butter, meat and meat products became more expensive by 14.7-9.2%; 5.6-2.4% – non-alcoholic drinks, lard, rice, sunflower oil. At the same time, buckwheat fell by 24.7%; by 17.0–9.3% – fruits, eggs, sugar.

Alcoholic drinks and tobacco increased by 17.9%, incl. tobacco products - by 24.5%, alcoholic drinks – 10.1%.

Prices (tariffs) for housing, water, electricity, gas and other fuels increased by 10.6%, which is due to the increase of tariffs for the maintenance of houses and residential areas – by 23.7%, natural gas -by 22.9%, sewage by 21.2%, water supply by 19.9%.

Health care prices increased by 8.9% at the expense of hospital services prices by 18.5% and outpatient clinics by 13.1%.

Prices in the transport sector are increased by 12.9%, mainly due to the rise in prices of transport services by 28.9%, as well as fuel and lubricants – by 9.1%.

The 15.1% increase in telecom prices is due to a 1.8 times increase in postal services, 22.7% and 21.7% respectively to mobile and local telephony. Consider now the Consumer Price Indices in 2018, which are shown in Table 1.

Table 1. Consumer price indices in 2018

(percent)

	Until the previous month				December 2018 to December 2017
	September	October	November	December	
Consumer Price Index	101,9	101,7	101,4	100,8	109,8
Food and non-alcoholic drinks	101,6	101,4	101,3	101,8	107,8
Food	101,7	101,5	101,4	101,9	108,1
Bread and bread products	102,5	102,0	102,1	101,2	114,1
Bread	103,3	102,7	103,3	101,6	121,5
Pasta	102,4	101,7	101,4	102,0	114,7
Meat and meat products	102,8	100,8	100,1	100,2	109,4
Fish and fish products	100,8	101,1	101,3	100,3	111,2
Milk, cheese and eggs	103,8	102,6	102,5	101,8	105,8
Milk	102,7	103,6	104,5	103,2	109,2
Eggs	114,1	102,7	99,5	98,9	90,5
Oil and fats	101,3	101,8	101,8	101,0	105,5
Butter	101,4	101,4	102,7	101,9	110,0
Sunflower oil	100,3	100,6	100,3	100,1	102,4
Fruits	97,1	95,4	95,5	99,4	83,0
Vegetables	98,5	108,8	109,1	116,5	127,8
Sugar	99,8	97,7	98,3	99,0	90,7
Non-alcoholic drinks	100,5	100,5	100,5	100,4	105,6
Alcoholic drinks, tobacco	100,8	102,3	101,1	101,0	117,9
Clothes and shoes	108,6	102,6	99,4	97,5	102,0
Housing, water, electricity, gas and other fuels	100,2	100,6	106,1	100,7	110,6
Maintenance and repair of housing	101,2	101,1	100,7	100,2	110,7
Water supply	101,1	104,8	102,1	100,6	119,9
Sewerage	100,9	105,2	102,5	100,8	121,2
Maintenance of houses and adjoining areas	100,0	101,4	101,0	100,6	123,7
Electricity	100,0	100,0	100,0	100,0	100,0
Natural gas	100,0	100,0	122,9	100,0	122,9
Hotwater heating	100,1	100,3	102,3	102,1	105,2

Household appliances, appliances and current housing maintenance	100,6	100,7	100,6	100,0	106,8
Healthcare	101,3	100,9	100,9	100,8	108,9
Pharmaceuticals, medical supplies and equipment	101,0	100,9	100,7	100,7	107,4
Outpatient services	101,4	101,2	101,4	100,7	113,1
Transport	102,8	103,1	100,5	98,4	112,9
Fuel and lubricants	105,4	106,0	98,7	94,0	109,1
Transport services	100,9	102,4	103,1	102,3	128,9
Rail passenger transport	96,3	101,9	100,0	100,1	115,9
Road passenger transport	101,2	102,5	103,5	102,5	130,3
Communication	102,1	103,3	101,7	101,1	115,1
Rest and culture	100,6	100,8	100,3	99,8	104,4
Education	110,0	100,1	100,1	100,1	113,4
Preschool and elementary education	98,9	100,1	100,2	100,2	115,0
Secondary education	116,0	100,2	100,0	100,3	117,9
Higher Education	112,6	100,0	100,0	100,0	112,8
Restaurants and hotels	100,5	102,3	101,0	101,2	113,0
Various goods and services	101,3	100,8	103,4	103,0	111,0

Source: [6]

The definition, forecasting and satisfaction of these non-productions needs have its own characteristics. First of all, marketing in the non-industrial sphere is not directly focused on making a profit, although in particular cases this orientation of marketing can be preserved.

State and local government bodies are constantly dealing with the needs of the population, for the satisfaction of which they have resources, but their resources are limited. In the practice of state institutions, there are three models of resource allocation [3, p. 245].

1. Equal distribution model, which allows to obtain equal resources (services) depending on the chosen distribution unit (family, household, district), although some consumers do not need these services, and the initial living conditions for people are different.

2. Compensation model in distribution. When used, individual social groups or areas receive additional resources, which lead to a leveling of living conditions. And this gives rise to dependency and sometimes causes a negative reaction in those layers that are better off.

3. The model of market distribution. The liberal model focuses on distribution according to income earned or taxes paid. In this case, consumers essentially buy services. However, this model increases social inequality, which leads to increased instability in society.

When using models, priority should be given to the principle of social justice. Prices for public services often add up only under the influence of the free market and competition, as in the private sector, and as a result of elements of state regulation. State programs are subsidized by the state, which makes them accessible to the poor, the population. Public services are characterized by a weak susceptibility to innovation in governance and the presence of many bureaucratic rules that make regulation more conservative and subject to political corporate interests. The content and volume of public services and programs are influenced by legislative bodies, political parties, and public organizations.

State organizations are created to achieve not only economic but also political goals, to maintain political power. This policy moment affects the entire existence of the organization. The nature of the goods and services in the non-industrial sphere has differences: it requires more personal participation, attention, contacts and obtaining information from consumers than is necessary when selling industrial goods. In most cases, the quality of services can only be expressed descriptively and the consumer will be able to evaluate it only after the service is purchased. With regard to services requiring highly qualified personnel – educational, medical, auditing, real estate and other services, consumers are more selective when choosing, try to reach well-known specialists, receive recommendations from clients, and consult with those who are trusted.

The individuality of the buyer, his uniqueness is required the individualization of services. In principle, the variability of consumer behavior in relation to a product, service of a non-industrial sphere can be associated with inappropriate personal and professional qualities of personnel, which



should be revealed through HR marketing, the significance of which in the non-industrial sphere is even greater than in the industrial one.

To ensure the provision of goods and the provision of non-industrial services of high quality, standards must be developed. In the opinion of the author, this is a set of mandatory elements, rules and conditions of service, the provision of goods and services. The service standard establishes the achieved level of formal criteria by which the activities of the organization and any employee are evaluated.

Service standards can be internal, industry, international. Consider the essence of the standards for the services studied in the work. In the middle of the XX century the UN and UNESCO have developed the first international standard for minimum living conditions that are required to ensure the livelihoods of people. This standard determined, in particular, that for every resident there should be at least 20 square meters of total area and that each household (family and one resident) needs to have its own separate traditional type of housing. Along with this international standard, it was also stipulated that each member of the household needs one individual room, and at least one room is intended for a joint stay. In subsequent years, this standard was clarified, in terms of increasing the size of the total area per inhabitant to 30 square meters and the number of rooms for a common stay for large households up to two. In most industrialized countries, the minimum level of housing provision is 40-50 square meters of total area per inhabitant, in their housing stock the number of apartments or individual houses exceeds the number of households.

The standard defines the basic elements, rules and conditions of educational activity, the level of professional or corresponding additional education, the form of training (full-time, part-time, part-time, correspondence), the initial level of education accepted for the 1st year, the term of study in years, degree or qualification, assigned at the end of training, the curriculum of training, retraining and advanced training in the specialty with a clear division on the status of disciplines and training cycles, the criteria for ensuring the educational process educational and methodical literature, equipment, classrooms, staff sanitary and hygienic norms.

Market participants in education are not only educational institutions and specific customers of educational services, but also the state – not only as a guarantor of the quality of standards and quality of education, but also as an interested party – the customer and the consumer. It is important that the training of specialists financed from the state budget is, in principle, the same exchange act as the provision of paid educational services. Therefore, the field of marketing in education is not only paid for specific consumers, but the entire education as a whole.

Education – this is a fundamentally new, search, promising area of marketing.

The target result of marketing activities: the most optimal satisfaction of needs: personality – in education; educational institution – in the development and welfare of its employees; customer organizations – in the growth of human resources, society – in the expanded reproduction of the aggregate personal and intellectual potential.

The medical and economic standard is central to the system regulatory and technological, economic and legal relations between medical institutions, a consumer of medical services and an intermediary service. First, a medical standard is developed for those forms of diseases that are the greatest social and economic importance for the region. The standards also indicate the place of medical care: an outpatient clinic, a general diagnostic hospital, a specialized and highly specialized hospital, rehabilitation, a sanatorium and an outpatient clinic after a hospital. Clear criteria for laboratory and clinical indications are developed for each of these steps. Based on medical standards, economic standards are calculated, which, in terms of value, make it possible to evaluate each element of the medical standard and the total cost of treating a disease.

Currently, each region develops medical and economic standards on its own, which costs a lot of money, and qualified medical personnel are distracted from their main work. All of the above indicates that medical and economic standards need to be developed centrally, accumulating all the achievements and experience of medical institutions in the regions.

Medical and economic standards should become economically feasible guidelines for price control, taking into account inflation in the market of medical services that satisfy the primary priority need – health, followed by professional success, business success and recognition.

### **Conclusions**

As a result of the study, we came to the following results:

1. The relevance of building the concept of marketing in the non-industrial sphere is connected with the fact that the non-industrial sphere lags behind the industrial sphere in the development of the concept, methodology, and approaches to using marketing as the most important direction for the effective reform of the regional economy that is adequate to world development trends. Especially relevant in market conditions is the use of marketing in state and local government bodies. It should be noted that, abroad, research on this issue is also still in an initial state.

2. State and local government bodies constantly have deal with the needs of the population, for which they have the resources, but their resources are limited, so the use of marketing priorities and strategies becomes especially relevant, as it allows, firstly, to increase the effectiveness of government programs and services, and secondly, creates a scientific basis for determining management strategies and tactics in accordance with the needs of the population, thirdly, optimizes the entire management cycle from determining the goals and objectives of the poly political leaders before evaluating their electoral programs from a consumer perspective; fourthly, it provides massive support to power structures, increased confidence in their policies and the active participation of the population in government programs, fifthly, public servants form a stereotype of thinking that focuses on the needs of citizens.

3. Since marketing has arisen to serve the manufacturing sector and business entities, therefore, when using marketing in the non-industrial sphere, including government and administration, it is necessary to take into account the features of this sphere, which is primarily related to meeting the needs for housing, education and health services, professional recognition and political preferences.

4. To ensure the goods provided and the provision of non-industrial services of high quality, standards must be developed. In the author's opinion, this is a set of mandatory elements, rules and conditions for servicing and providing goods and services. The service standard establishes the achieved level of formal criteria by which a consumer evaluates a product or service.

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## SUBSTANTIATION OF PREREQUISITES FOR THE INTENSIFICATION OF INNOVATIVE AND INVESTMENT ACTIVITY IN THE FOOD INDUSTRY

**KOVALENKO Olga,**

doctor of economic sciences,

senior research worker,

Institute of Food Resources of NAAS of Ukraine

(Kyiv, Ukraine),

e-mail: [okovalenko0960@gmail.com](mailto:okovalenko0960@gmail.com)

ORCID (<https://orcid.org/0000-0001-8364-3316>)

**YASHCHENKO Lyudmila,**

candidate of economic sciences,

senior research worker,

Institute of Food Resources of NAAS of Ukraine

(Kyiv, Ukraine)

e-mail: [lud\\_ya@ukr.net](mailto:lud_ya@ukr.net)

ORCID (<https://orcid.org/0000-0002-4893-8191>)

**VERBYTSKYI Sergii,**

candidate of technical sciences,

Institute of Food Resources of NAAS of Ukraine

(Kyiv, Ukraine),

e-mail: [chaink@ukr.net](mailto:chaink@ukr.net)

ORCID (<https://orcid.org/0000-0002-4211-3789>)

**Abstract.** *The article substantiates the need and prerequisites for intensifying innovation and investment in the food industry using economic and statistical analysis. The stimulants and destimulants of the intensification of innovation and investment activity of the food industry are identified. The stimulants for intensifying innovative activities include increasing profitability, stabilizing the USD exchange rate and increasing demand for food, and destimulants – reducing net profit or increasing losses, increasing the USD exchange rate due to the outflow of foreign investment and reducing the period of supply of orders for food production. A real possible level of additional net profit, a range of fluctuations in the USD exchange rate and changes in the period of supply with orders for food production, contributing to the intensification of innovation and investment in the food industry, were established.*

**Keywords:** *innovation and investment activity, stimulants, destimulants, prerequisites of intensification, production facilities, capital investment, foreign investment, Student's t-criterion.*

**JEL Classification:** C12, E22, L66, O31

**UDC:** 338.439.2:311.214:336.581(477)

### 1. Introduction

The amplitude of fluctuations and trends of the main indicators of innovation and investment activity in the food industry indicate its unstable slow growth. The most negative impact on this is provided by the low share of innovation costs in the structure of capital investments and their instability. Under these conditions, funds are usually invested in the purchase of finished equipment, machines and software, which are no longer a novelty to the market, and are not directed to research, development or implementation of new production technologies. Therefore, an extremely urgent problem of today is the creation of prerequisites for the intensification of innovation and investment activities of food industry enterprises.

### 2. Recent research and publications analysis

Innovation and investment activity of enterprises was studied in their works by the scientists: Geyets V.M. [1], Sabluk P.T. [2], Sychevskiy M.P. [3], Lupenko Yu.A. [4], Bruijn, M. R. N., Stassen, E. N., Gremmen, H. G. J. [5], Blok, V., Lemmens. P. [6] etc. At the same time, the scientific substantiation of the current prerequisites for the intensification of innovation and investment in the

food industry of Ukraine requires further research. To expand the boundaries of these studies, in our opinion, is possible with the help of economic and statistical analysis, in particular, Student's t-tests.

Student's criterion – is the general name for a class of methods for statistical testing of hypotheses (statistical criteria) based on Student's distribution. Most often, the cases of applying the t-criterion are associated with checking the equality of average values in two samples. Using this criterion, the effectiveness of the proposed activities can be evaluated and management decisions can be substantiated.

This criterion was developed by William Gosset to assess the quality of beer at Guinness. In connection with the obligations to the company for non-disclosure of trade secrets, an article by Gosset was published in 1908 in *Biometrika* journal under the pseudonym "Student" [7].

### 3. Purpose of the article

The purpose of the article is the justification of the conditions for the intensification of innovation and investment in the food industry of Ukraine based on Student's t-student criterion and analysis of stimulants and destimulants.

### 4. Results and discussion

Until recently, the problem of significant equipment depreciation was relevant for the food industry (the value of the wear coefficient is above 50%). Now this problem has found its solution through active investment injections to replace worn-out machinery and equipment (Fig. 1). Due to the additional capital investment of UAH 11285.2 million in 2018 compared to 2017, the depreciation rate decreased to 48.2%. For 2019, such problems as insufficient capacity utilization and insufficient emphasis on the innovative component of the production process remained relevant. The share of innovation costs in the investment structure in 2018 decreased by 3% compared to 2017 and amounted to 4.4%, and production facilities were loaded by 70% – on average by the food industry [8]. In order to load production facilities up to 80% (that is, to the optimum working capacity), additional capital and foreign investments are necessary.

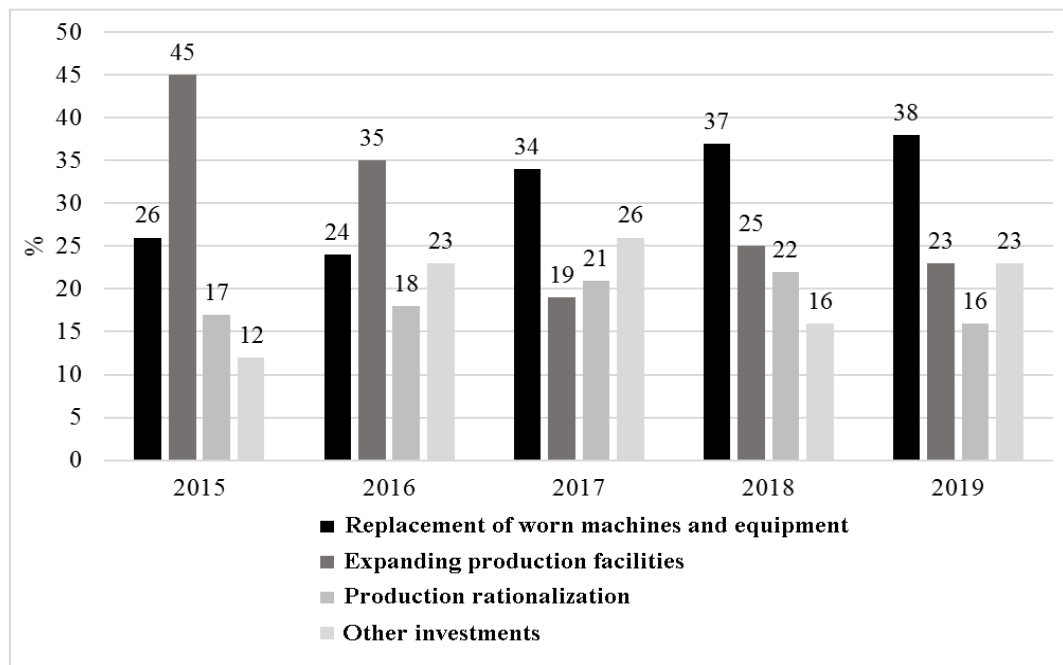


Figure 1 Principal directions of investments in food industry of Ukraine

Source: developed according to data of State Statistic Service of Ukraine

In order to determine the size of the necessary investments, to find out the prerequisites for the intensification of innovation and investment activity and evaluate their effectiveness, we proposed to use Student's t-criterion.

Student's criterion is used to determine the statistical significance of differences in average values, it can be used both in cases of comparing independent samples, and when comparing related populations.

To apply Student's t-criterion, it is necessary that the initial data have a normal distribution. In the case of applying the two-sample criterion, for independent samples it is also necessary to observe the conditions for the equality of variances (homoskedasticity). If the observance of these conditions is impossible, similar methods of nonparametric statistics should be used when comparing the sample means, the most well-known of the said methods being the Mann - Whitney U-test (as a two-sample criterion for independent samples), as well as the sign criterion and Wilcoxon criterion (used in cases of dependent samples).

To compare the average values, Student's t-test is calculated according to the formula [9]:

$$t = \frac{M_1 - M_2}{\sqrt{m_1^2 - m_2^2}} \quad (1)$$

Where:

$M_1$  - is the arithmetic mean of the first population (group);

$M_2$  - arithmetic mean of the second population (group);

$m_1$  - is the average error of the first arithmetic mean;

$m_2$  - is the average error of the second arithmetic mean.

The obtained value of Student's t-criterion must be correctly interpreted. To do this, one needs to know the number of objects in each group ( $n_1$  and  $n_2$ ). The number of degrees of freedom  $f$  is found by the formula [9]:

$$f = (n_1 - n_2) - 2 \quad (2)$$

After that, the critical value of Student's t-test is determined for the required level of significance (for example,  $p = 0.05$ ) for a given number of degrees of freedom  $f$ .

The critical and calculated value of the criterion are compared:

- if the calculated value of Student's t-criterion is equal to or greater than the critical value found in the table, the conclusion is drawn that the differences between comparable values are statistically significant.
- if the value of the calculated Student's t-test is less than the tabular one, then the differences of the compared values are not statistically significant.

The methodology for substantiating the prerequisites for intensifying innovation and investment in the food industry of Ukraine is as follows:

1. It is found out how changes in capital and foreign investments effect the increase in production capacities. It is also determined how much capital investment is needed to increase the capacity utilization up to 80% (optimal workload).
2. It is determined how changes in income affect the activation of investment activity and what a level of changes in net profit can attract domestic and foreign investors?
3. It is revealed how the stabilization of the exchange rate affects changes in capital investment. It is determined what should the average annual changes in the USD exchange rate to activate innovation.
4. The effect of foreign investment upon USD is evaluated and the need of its stabilization is determined.
5. It is found out how changes in the period of supply with food production orders (demand for food products) affect the activation of investment activity. It is also determined what should be the average quarterly changes in the number of months for which production must be additionally secured by orders to be attractive for capital and foreign investments.
6. Stimulants and destimulants of intensification of innovative activity of food industry enterprises are indentified. It should be noted that the same indicator can be both a stimulant and a destimulant, depending on the direction of change.

The analysis is based on quarterly (for I quarter of 2015 – II quarter of 2019) and annual (for 2010 – 2018) data on production capacities, capital and foreign investments, net profit, dollar exchange rate, number of months of orders.

In the Table 1 the results of testing the significance of the Student's criterion to justify the effectiveness of the proposed activities are summarized.

Table 1 The results of checking the significance of indicators to substantiate the effectiveness of measures aimed at enhancing innovation and investment in the food industry

Relationship of parameters	t	Significance (two-tailed)
The effect of changes in capital investment on changes in capacity utilization	4.442	0.021
The effect of changes in foreign investment on changes in capacity utilization	6.503	0.007
The effect of changes in net income on changes in capital investment	2.983	0.042
The effect of changes in net income on changes in foreign investment	4.266	0.025
The effect of changes in USD exchange rate on changes in capital investment	2.254	0.041
The effect of changes in foreign investment on changes in USD exchange rate	3.907	0.035
The effect of changes in the number of months of orders on changes in capital investments	3.720	0.035
The effect of changes in the period of provision with orders on changes in foreign investment	3.905	0.032

Source: the authors' own development

The calculations confirmed the impact of the proposed measures on the activation of innovation and investment activity, since the significance value is less than 0.05 (Table 1). As a result, stimulants and destimulants of intensification of innovation and investment activity of the food industry were identified. The stimulants are: increased profitability; stabilization of USD exchange rate; increased demand for food; and to destimulants – a decrease in net profit or an increase in losses; USD appreciation due to outflow of foreign investment; reduction of the period of supply with food production orders.

In the Table 2 the average values of the main indicators of intensification of innovation and investment activity in the food industry as a whole with the distribution of stimulants and destimulants dependent on them are shown.

It was found that the intensification of innovation and investment activity has a positive effect on increasing the utilization of production facilities as each additional infusion of capital investment in the amount of UAH 1285802 thousand or foreign investment in the amount of USD 41167 thousand provides an additional load upon production facilities of 1.03% (entry 1 of Table 2) and 1.07% (entry 2 of Table 2).

In Table. 2, the influence of stimulants and destimulants on the activation of innovation and investment in the food industry is determined. For example, the growth of net profit attracts domestic and foreign investors, has a positive effect on the intensification of innovation and investment activity (capital investment per year on average can grow by UAH 3797.3 million, and foreign investment – by USD 189.2 thousand, entry 3 and 4 in Table 2).

Conversely, a decrease in net profit or an increase in losses discourages investors from investing in the development of the food industry (on average, capital investments come to UAH 107.8 million per year, and foreign investments – by USD 167.1 thousand, entries 11 and 12). The domestic investor is also attracted by the stabilization of USD (annual fluctuations up to UAH 0.9, entry 6), which can be achieved by additional attraction of foreign investment. At the same time,

capital investments grow on average over the year by UAH 3904.96 million (entry 5). At the same time, the average annual growth of the USD exchange rate by UAH 6.9 (entry 14), which occurs due to the outflow of foreign investment, also repels domestic investors (capital investments come in an average of UAH 430.7 million per year, entry 13).

Table 2 Distribution of the main indicators of activation of innovation and investment activity in the food industry depending on the influence of stimulants and destimulants

N	The rate of innovation and investment activity depending on the influence of a stimulant	Value	N	The rate of innovation and investment activity depending on the influence of a destimulant	Value
1	Average quarterly changes in production facilities utilization with additional infusion of capital investments, %	1.03	9	Average quarterly changes in production facilities utilization with a decrease in capital investment infusion, %	0.4
2	Average quarterly changes in production facilities utilization with additional infusion of foreign investment, %	1.07	10	Average quarterly changes in production facilities utilization with a decrease in the infusion of foreign investment, %	0.65
3	Average annual changes in capital investments with an increase in net profit, thousand UAH	3797328	11	Average annual changes in capital investments with a decrease in net profit or increase in losses, thousand UAH	-107824
4	Average annual changes in foreign investment with additional profit, thousand USD	189.2	12	Average annual changes in foreign investment with a decrease in net profit or an increase in losses, thousand USD	-167.1
5	Average annual changes in capital investments while stabilizing USD, thousand UAH	3904961	13	Average annual changes in capital investments with increasing USD exchange rate, thousand UAH	-430724
6	Average annual changes in USD exchange rate with the additional attraction of foreign investment, UAH	0.9	14	Average annual changes in USD exchange rate with the leakage of foreign investment, UAH	6.9
7	Average quarterly changes in capital investment with an increase in the period of supply with orders, thousand UAH	789553	15	Average quarterly changes in capital investments with a decrease in the period of supply with orders, thousand UAH	408952
8	Average quarterly changes in foreign investment with an increase in the period of supply with orders, thousand USD	36.8	16	Average quarterly changes in foreign investment with a decrease in the period of supply with orders, thousand USD	-22.5

Source: the authors' own development

## 5. Conclusions

The intensification of innovation and investment in the food industry helps to increase the production facilities utilization to the optimal working level (80%). For this, an additional infusion of capital investments in the amount of UAH 12483.5 million or foreign investments in the amount of USD 384.7 million is necessary.

Thus, on the basis of the study, the most attractive investment conditions (foreign and domestic) in the food industry were identified to enhance its innovation and investment activity and achieve the target level of production facilities utilization:

- provided that the industry receives additional net profit in the amount of UAH 6231.4 million on average per year, capital investments can be effectuated in the amount of UAH 3797.3 million, and foreign investments can be raised in the amount of USD 189.2 thousand per year;

- provided that USD exchange rate fluctuations do not exceed UAH 0.9 during the year, it is possible to additionally absorb UAH 3904.96 million of capital investment and attract foreign investment – USD 268.35 thousand annually;
- provided that the increase in the period of supply with production orders in the food industry is 0.2 months on a quarterly basis, it will be possible to additionally effectuate UAH 789,553 thousand of capital investments and USD 36.8 thousand of foreign investments.

In further studies, it is advisable to justify the prerequisites for the intensification of innovation and investment in certain sectors of the food industry of Ukraine.

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## **OBJECTIVES AND INSTRUMENTS OF FISCAL POLICY TO STIMULATE ECONOMIC GROWTH IN DEVELOPING COUNTRIES**

**PETROIA Andrei,**

PhD in economics, associate professor,  
The Academy of Economic Studies of Moldova,  
Chisinau, Moldova  
e-mail: [petroia5@hotmail.com](mailto:petroia5@hotmail.com)

**Abstract.** *In this paper, there is analyzed the influence of fiscal policy in the developing countries. I start with brief explanation the general meaning or an overview image of a developing country. Then, there are shown general objectives and role of the fiscal policy for developing countries in comparison with those for developed countries. At the end, there are presented fiscal policy instruments, which are used in the framework of fiscal policy in developing countries.*

**Key words:** *developing country, fiscal policy, economic growth.*

**JEL classification:** H30, O1.

**UDC:** 332.14:336.22

### **Introduction**

According to a well-known definition, a developing country is also called a less developed country or underdeveloped country; it's a nation with a less developed industrial base and a low Human Development Index (HDI) relative to other countries. Or, according to Kofi Annan, former Secretary General of the United Nations, a developed country is defined as "one that allows all its citizens to enjoy a free and healthy life in a safe environment [3].

The achievement of sustainable development objectives is impossible without the application of a system of economic mechanism and instruments, thanks to which the market subjects can be adjusted. Fiscal policy is one of the main tools to reach the economic objectives because it enables direct intervention into the problem, which should be solved [5].

Fiscal policy is explained as a process of adjusting government taxation and expenditure to attain the wanted economic and social goals. The objectives of fiscal policy can vary from country to country. Fiscal policy is considered an essential method for achieving the objectives of development both in developed and underdeveloped countries of the world [8]. Fiscal policy is a powerful instrument in the hands of the government to intervene into the economy. It relates to a variety of measures, which are broadly classified, as: (a) taxation, (b) public expenditure and (c) public borrowing.

The most important instrument of government operation in the economy today is that of fiscal or budgetary policy. Fiscal policy refers to the taxation, expenditure and borrowing by the Government. The economists now hold the government intervention through fiscal policy; it's essential in the matter of overcoming recession and inflation as well as of promoting and accelerating economic growth. There is no doubt that the Government budgetary or fiscal policy must be transparent, keeping in mind the needs and demands of a developing economy.

Fiscal policy has been defined in a number of ways. According to Samuelson, "under fiscal policy we mean the process of shaping taxation and public expenditure in order to (a) help dampen the swings of the business cycle and (b) to contribute to the maintenance of a growing high employment economy".

In the words of Arthur Smithies, "fiscal policy under which the government uses its expenditure and revenue programs to produce desirable effects and to avoid undesirable effects on the national income, production and employment" [8].

### **General objectives and role of fiscal policy**

The main goal of fiscal policy is to raise the rate of production and employment without inflation. So, in all the countries, the fiscal policy major aim is to ensure the economic stability in the country [8].

One of the important objectives of fiscal policy is to use taxation as an instrument for dealing with inflationary or deflationary situations. In developing countries, there is a tendency of the general prices to go up due to expenditure on development projects, pressure of wages on prices, long gestation period between investment expenditure and production etc. Fiscal measures are used to counter act the inflationary pressure.

The tax structure is devised in such a manner that it purifies up a major proportion of the rise in income. The Government also tries to reduce its own spending and achieve budgetary surplus. It helps in reducing inflationary pressure in the economy.

Fiscal policy must be designed to be performed in two ways:

(1) by expanding investment in public and private enterprises and

(2) by diverting resources from socially less desirable to more desirable investment channels.

Generally speaking, the fiscal policy in under-developed countries has a different objective to that of advanced countries.

The fiscal measures, to a larger extent, promote economic stability in the face of short-run international cyclical fluctuations. These fluctuations cause variations in terms of trade, making the most favorable to the developed and unfavorable to the developing economies. So, for the purpose of bringing economic stability, fiscal methods should incorporate built-in-flexibility in the budgetary system so that income and expenditure of the Government may automatically provide compensatory effect on the rise or fall of the nation's income. Below, there are outlined the main objectives:

*1. Increase in savings:*

This policy is also applied to raise the rate of savings in the country. In the developing countries, rich class spends a lot of money on luxuries. The government can impose taxes on them, therefore assuring the basic need for life to the poor class on low rate.

*2. To stimulate investment:*

The government can promote the investment by securing different stimulant like the tax in the various sectors of the economy. The capital can be replaced from less productive areas to more productive branches of the economy. So, the resources of the country can be used at maximum rate.

*3. To obtain equal distribution of wealth:*

The fiscal policy is very helpful for the realization of equal distribution of wealth. When the wealth is equally distributed among the various classes then their acquiring power grows, which guarantee the elevated level of employment and production.

*4. To supervise inflation:*

The fiscal policy is very useful tool for inspection the rate of inflation. When the expenses on nonproductive projects decrease or the rate of taxes increase then the purchasing power of the people is minimized.

*5. To lower the regional disproportion:*

In the less developing countries, the regional disproportion is a common feature. Some areas are more developed while the others are less developed. Government delivers the infrastructure facilities in less developed territories.

*6. Stabilization of price level:*

The fiscal policy is also used to obtain wanted level of prices in the country. It means the cost and price should be at such level that production and employment may grow.

*7. Increase in agriculture and industrial productivity:*

The fiscal policy is also used that the output of various sectors of the economy must increase. The demand inside and outside the country should be satisfied.

*8. To achieve maximum prosperity of the people:*

The fiscal policy main objective is to achieve maximum welfare of the people. The quality of life must improve in the country.

*9. To reach economic stability:*

Therefore, the fiscal policy plays a leading role in maintaining economic stability in the face of internal and external forces. The instability caused by external forces is corrected by a policy, popularly known as 'tariff policy' rather than aggregative fiscal policy. In the period of boom, export and import duties should be imposed to minimize the impact of international cyclical fluctuations.

To curb the use of additional purchasing power, heavy import duty on consumer goods and luxury import restrictions are essential. During the period of recession, government should undertake public works programs through deficit financing. Fiscal policy should be viewed from a larger perspective keeping in view the balanced growth of various sectors of the economy [4].

### **Objectives of fiscal policy in developing countries**

In developing countries, the taxation, Government expenditure and borrowing play a major role in accelerating economic development. In fact, fiscal policy is a powerful instrument in the hands of the Government by means of which it can achieve the objectives of development.

There are several specific features of a developing country, which need the adoption of a special fiscal policy which ensures a rapid economic increase. There are large and various resources, human and material, which are staying without being used.

Developing countries have weak infrastructure, they are in need of adequate means of transport and communications, roads, ports, highways, irrigation and power. Their population is increasing at an explosive rate which requires rapid economic development to meet the demands of the rapidly growing population. Above all, these countries suffer from deficiency of capital. They are caught up in a vicious circle of poverty. To overcome these gaps, a suitable fiscal and taxation policy is needed [7].

The role of fiscal policy in less developed countries differs from that in developed countries. In the developed countries, the role of fiscal policy is to promote full employment without inflation through its spending and taxing powers. Whereas the position of the developing countries is very much different. The LDC's (Less Developed Countries) or backward countries are caught in a vicious circle of poverty. The vicious circle of low income, low consumption, low savings, low rate of capital formation and therefore low income has to be broken by a suitable fiscal policy.

The principal objectives of fiscal policy in a developing country economy are:

#### *1. Full Employment:*

The first and foremost objective of fiscal policy in a developing economy is to achieve and maintain full employment in an economy. In such countries, even if full employment is not achieved, the main motto is to avoid unemployment and to achieve a state of near full employment.

Therefore, to reduce unemployment and under-employment, the state should spend sufficiently on social and economic overheads. These expenditures would help to create more employment opportunities and increase the productive efficiency of the economy.

In this context, Prof. Keynes made the following recommendations to achieve full employment in an economy:

- (a) To capture the excessive purchasing power and to curb private spending;
- (b) Compensate the deficiency in private investment through public investment;
- (c) Cheap money policy or lower interest rates to attract more and more private entrepreneurs.

Below, there is a graph showing the decrease of unemployment rate worldwide, indicator according to the WB data [9].

#### *2. Price Stability:*

There is a general agreement that economic growth and stability are joint objectives for underdeveloped countries. In a developing country, economic instability is manifested in the form of inflation.

Therefore, in developing economies, inflation is a permanent phenomenon where there is a tendency to the rise in prices due to expanding trend of public expenditure. As a result of rise in income, aggregate demand exceeds aggregate supply. Capital goods and consumer goods fail to keep pace with rising income.

Thus, these result in inflationary gap. The price rise generated by demand pull reinforced by cost push inflation leads to further widening the gap. The rise in prices raises demand for more wages. This further gives rise to repeated wage-price spirals. If this situation is not effectively controlled, it may turn into hyperinflation.

In short, fiscal policy should try to remove the bottlenecks and structural rigidities which cause imbalance in various sectors of the economy. Moreover, it should strengthen physical controls of essential commodities, granting of concessions, subsidies and protection in the economy. In short,

fiscal measures as well as monetary measures go side by side to achieve the objectives of economic growth and stability.

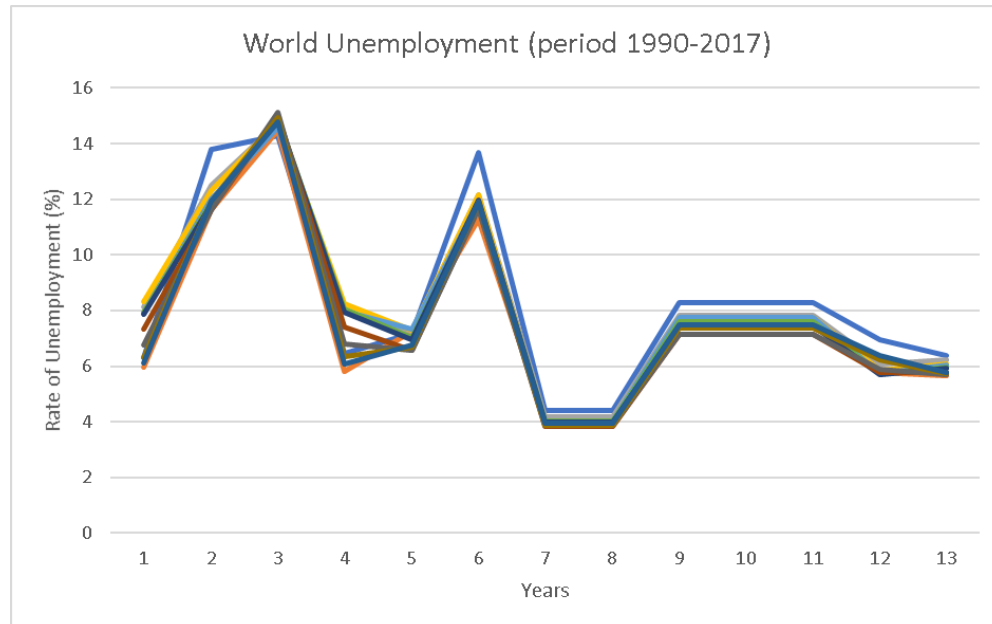


Figure 1. The world unemployment rate for period of 1990-2017

Source: World Bank Indicator for Unemployment per total (%)

### 3. To accelerate the rate of economic growth:

Primarily, fiscal policy in a developing economy, should aim at achieving an accelerated rate of economic growth. But a high rate of economic growth cannot be achieved and maintained without stability in the economy.

Therefore, fiscal measures such as taxation, public borrowing and deficit financing etc. should be used properly so that production, consumption and distribution may not adversely affect. It should promote the economy as a whole which in turn helps to raise national income and per capita income.

In this connection it is significant to understand that fiscal policy has been developed as an established economic function of a government, every country is anxious to gear its public finance in pursuit of the twin aims of stability and growth, but their relative importance is very differently regarded from one country to another... A steady rate of expansion will tend to reduce the violence of such fluctuations as may occur; a successful full employment policy will provide an atmosphere which is congenial for growth."

### 4. Optimum allocation of resources:

Fiscal measures like taxation and public expenditure programs, can greatly affect the allocation of resources in various occupations and sectors. As it is true, the national income and per capita income of underdeveloped countries is very low. In order to gear the economy, the government can push the growth of social infrastructure through fiscal measures. Public expenditure, subsidies and incentives can favorably influence the allocation of resources in the desired channels [6].

Tax exemptions and tax concessions may help a lot in attracting resources towards the favored industries. On the contrary, high taxation may draw away resources in a specific sector. Above all, direct curtailment of consumption and socially unproductive investment may be helpful in mobilization of resources and the further check of the inflationary trends in the economy.

Sometimes, the policy of protection is a useful tool for the growth of some socially desired industries in an under-developed country.

The goal of the fiscal policy is to maintain the condition of full employment, economic stability and to stabilize the rate of growth. For an under-developed economy, the main purpose of fiscal policy is to accelerate the rate of capital formation and investment.

### **Fiscal policy instruments**

In the developed nations, fiscal policy is effective in maintaining economic stability while in the developing countries it is important in achieving economic growth, development and also in solving the employment issue. The instruments of fiscal policy serve goals of stimulating economic prosperity and growth, reducing poverty and destitution and chipping away at income inequality.

To implement fiscal policy, the government has several instruments:

- *Taxation*

Taxation is an important instrument for fiscal policy. The first tool is taxation. That includes income, capital gains from investments, property, sales or just about anything else. Taxes provide the major revenue source that funds the government. The downside of taxes is that whatever or whoever is taxed has less income to spend on themselves.

That includes income, capital gains from investments, property, sales or just about anything else. Taxes provide the major revenue source that funds the government. The downside of taxes is that whatever or whoever is taxed has less income to spend on themselves [8]. It is widely used to mobilize the available resources for capital formation in the country. There are two type of taxes which are levied to transfer funds from private to public use (i) The direct taxes are levied on the income, profits and wealth of the people who have potential economic surplus. (ii) The indirect taxes such as excise duty, sales tax etc., are imposed mostly on goods which have higher income elasticity of demand. The mopping up of surplus resources through taxation is an effective means of raising resources for capital formation. A rise in tax rates causes a reduction in aggregate demand for three reasons (i) it reduces consumption (ii) It reduces investment and (iii) it reduces net exports. A fall in the tax rates has the opposite effect.

- *Government expenditure*

The second tool is government spending. That includes subsidies, transfer payments including welfare programs, public works projects and government salaries. Whoever receives the funds has more money to spend. That increases demand and economic growth. Public expenditures include normal government expenditures, capital expenditures on public works, relief expenditures, subsidies of various types, transfer payments and social security benefits.

Government expenditures are income-creating while taxes are primarily income-reducing. Management of public debt in most countries has also become an important tool of fiscal policy. It aims at influencing aggregate spending through changes in the holding of liquid assets [8]. In this way, public expenditure and public-sector investment have a special role to play in a modern state. A properly planned investment will not only expand income, output and employment but will also step up effective demand through multiplier process and the economy will march automatically towards full employment. Besides public investment, private investment can also be encouraged through tax holidays, concessions, cheap loans, subsidies etc.

In the rural areas attempts can be made to encourage domestic industries by providing them training, cheap finance, equipment and marketing facilities. Expenditure on all these measures will help in eradicating unemployment and under-employment.

- *Redistribution of income*

When the government pays out Social Security, unemployment and welfare benefits, it expects nothing such as a product or service in return. As suggested by the International Monetary Fund's staff note Income Inequality and Fiscal Policy, the government employs these and other forms of income redistribution to do more than grow the gross national product.

According to the IMF report, income transfers are tools for reducing the gap between rich and poor and removing barriers to health care and political and other resources. Social Security, which began in 1935 during the Great Depression, was created as a safety net to protect retired workers against swings -- especially downward ones -- in the economy [1].

In hard times, government will spend more on unemployment benefits and other welfare programs because the numbers of eligible recipients will rise. During expansion of the economy, the public's need for income assistance will decline and spending on this assistance will go down as well. According to the IMF, these automatic stabilizers hold more sway in larger economies [2].

In a mixed economy, private sector constitutes an important part of the economy. While framing fiscal policy, the interests of the private sector should not be ignored. The private sector should make significant contribution to the development of the economy.

A wider measure of equality in income and wealth is an integral part of economic development and social advance. The fiscal operations if carefully worked out can bring about a redistribution of income in favor of the poorer sections of the society.

The government can reduce the high bracket incomes by imposing progressive direct taxes. For raising the income of the poor above the poverty line and narrowing the gap between rich and poor, the government can take direct investment on economic and social overheads.

Summing up, the principal aim of the fiscal policy in underdeveloped countries is to provide incentives for promoting saving and investment and thereby high rate of economic growth [4].

It is needless to emphasize the significance of equitable distribution of income and wealth in a growing economy. Generally, inequality in wealth persists in such countries as in the early stages of growth, it concentrates in few hands. It is also because private ownership dominates the entire structure of the economy. Besides, extreme inequalities create political and social discontentment which further generate economic instability. For this, suitable fiscal policy of the government can be devised to bridge the gap between the incomes of the different sections of the society.

To reduce inequalities and to do distributive justice, the government should invest in those productive channels which incur benefit to low income groups and are helpful in raising their productivity and technology. Therefore, redistributive expenditure should help economic development and economic development should help redistribution.

Thus, well-planned fiscal program, public expenditure can help development of human capital which in turn possesses positive effects on income distribution. Regional disparities can also be removed by providing incentives to backward regions. A redistributive tax policy should be highly progressive and aim at imposing heavy taxation on the richer and exempting poorer sections of the community. Similarly, luxurious items, which are consumed by the higher section, may be subject to heavy taxation.

This policy will help to raise the level of aggregate savings in the economy and create capital for bringing about a qualitative improvement in it. Capital formation, however, can also be facilitated by taxation, deficit spending and foreign borrowing. In fact, fiscal measures of the government can induce the private entrepreneurs to take active participation for mobilizing resources at least in the long run.

Fiscal policy aims at the acceleration of the rate of investment in the public as well as in private sectors of the economy. Fiscal policy, in the first instance, should encourage investment in public sector which in turn effect to increase the volume of investment in private sector. In other words, fiscal policy should aim at rapid economic development and must encourage investment in those channels which are considered most desirable from the point of view of society.

It should be aimed at reducing apparent consumption and investment in unproductive channels. In the early stages of economic development, the government must try to build up economic and social overheads such like transport and communication, irrigation, flood control, power, ports, technical training, education, hospital and school facilities, so that they may provide external economies to induce investment in industrial and agricultural sectors of the economy.

### **Conclusions**

Thus, the fiscal policy encompasses two separate but related decisions; public expenditures and the level and structure of taxes. It occupies the central place for maintaining full employment without inflationary forces in the economy [6].

With its various instruments it influences the economic stability of an economy. The fiscal policy implemented by government has been very focused in several fields such as mobilization of resources for economic development, increasing rate of savings and capital formation, developing cottage and small-scale industries, reducing the incidence of poverty.

To be ready to step into the system of reform and implementation of fiscal policies it is needed to educate and cultivate experts, the investment should be done in the education sector.

Once it is invested, there with time the result will emerge itself, in form of qualified and educated people who can response for the future of the country.

Through years international financial institutions have provided considerable resources and expertise with aim to help to reduce poverty and strengthen social and gender equality. As the result, the social sector development and poverty reduction has been thoroughly covered by various international multilateral and bilateral donors.

The donor activities can be identified in form of interventions at the policy level, such as development of poverty reduction programs, contributions to capacity building and direct technical and financial assistance.

Based on all the information read from different sources of information, the conclusion outlined is that fiscal policy, being a component in economic policy has a major and vital role in evolution and development of a society from developing country.

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**PROCESSING OF THEORIES OF FINANCE AND AGRICULTURAL CAPITAL IN  
RESEARCH OF OUTSTANDING FINANCIAL SCIENTISTS**

**LEMISHKO Olena,**

PhD (Economics),

National University of Life and Environmental Sciences of Ukraine,  
Ukraine

e-mail: [elena.lemishko@gmail.com](mailto:elena.lemishko@gmail.com)

**SHEVCHENKO Anatoly,**

Academician of the NAAS of Ukraine,

Doctor of Agricultural Sciences, Professor,

State Institution of Lugansk National University named after Taras Shevchenko (Starobelsk),  
Ukraine

**SHEVCHENKO Natalie,**

PhD (Economics),

National University of Life and Environmental Sciences of Ukraine,  
Ukraine

e-mail: [200582\\_@ukr.net](mailto:200582_@ukr.net)

**Abstract:** *The article deals with the theoretical foundations of finance and the reproduction of agrarian capital from the perspective of different scientific schools of the sixteenth and nineteenth centuries. The economic nature of capital as the main element of social reproduction is substantiated; generalized theoretical principles of the process of capital accumulation, deepened the economic nature of finance; the process of capital reproduction is analyzed with the help of different views of economists and macroeconomic schools. It is indicated that classical political economy became the science, which made a significant contribution to the theory of finance and capital, based on economic laws and covered all spheres of human economic activity. It is proved that the evolution of the development of conditions and foundations of capital formation indicates a constant search for its optimality. It is substantiated that the radical changes in economic science, initiated by the scientific schools of the sixteenth and nineteenth centuries, did not become global; however, it was the eminent scholars-economists of the Macroeconomic School of Mercantilism and Classical Political Economy who changed the direction of economic theory and laid the groundwork for further research on the most complex issues of finance and capital reproduction.*

**Keywords:** *finance, capital, mercantilism; physiocracy; keynesianism, economic and financial thought.*

**JEL classification:** F65, E22, F63.

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### **Introduction**

The study of the essence of capital as an economic category is in the process of capital formation and use at both macro and microeconomic levels. A special place belongs to the multifaceted category of "capital" in the research of economists for several centuries, which laid the foundation of scientific heritage. To date, the development and tenets of economic scholars on the category of "capital" have not lost their relevance in the field of financial science. But at the current stage of transformational shifts, both in the global space and in our country, in particular, it is necessary to deepen the comprehensive study of the assets of the world economic thought, financial theory, medicine and practice on the process of capital reproduction.

### **Analysis of recent researches and publications**

The theoretical basis for understanding the problems of the theory of finance and the reproduction of capital is laid in the works of prominent economists F. Kene (1963), V. Petty (1940), J. Keynes (1936), D. Ricardo (1955), A. Smith (2001) and other researchers.

Various aspects of capital accumulation are revealed in the works of domestic scientists and contemporary foreign researchers: V. Balitskaya (2008), A. Blinder (2015), G. Menkyu (1991), J.



Akerloff (2001) and other scholars. Their research focuses mainly on finance, capital structure of enterprises in various fields of activity. Many previous developments have high efficiency and advisability, but do not adequately highlight issues relating to the evolution of finance and the process of capital reproduction and its true economic nature.

The purpose of the article is to elaborate theoretical approaches to the study of theories of finance and capital as an economic category and the process of its reproduction, analyzing the scientific heritage of economists of the sixteenth and nineteenth centuries.

### **The main body of the academic paper**

After the development of commodity-money relations was the emergence of early capitalism and the filling of the previously abstract category "capital" with real content, the formation of its proportions and types. Mercantilism is considered to be the first systematic economic school, which was associated with the era of trading capital domination, originated on the basis of generalizing the experience of the operation of initial capital and solved the practical issues of accelerating this process. The development of trade and merchant capital in Western Europe during the fifteenth and eighteenth centuries contributed to the separation of the mercantilist scientific trend (Italian "mercante" - merchant). In the early stages it was of a monetary nature, and the object of study was the sphere of circulation, in the later stages it was a manufactory, which studied the penetration of money capital into the sphere of production. Foreign trade was determined by representatives of the said economic trend as determinant of the growth of national wealth, and the tool - the policy of protectionism, state support for exports.

The mercantilists initiated the elements of economic analysis to investigate the economic problems associated with the circulation of capital, and their recommendations were of great practical importance to governments of different countries. Hetman Bohdan Khmelnytsky (1595 - 1657), who contributed to the development of internal and foreign trade of our country, which gave a significant impetus to the initial accumulation of capital and the raising of productive forces, can be considered an adherent of the views of mercantilists in the domestic territories. Developing the views of the mercantilists, William Petty (1623-1687) made a significant contribution to the formation of the theory of agrarian capital, examining the penetration of monetary capital into agriculture, and proving that the existence of rent and rent relations causes different productivity.

The development of productive capital has become the object of study of the school of physiocrats (gr. "Υσσιική - physical," κράτος - state). Its famous representative François Quesnay (1694-1774) developed the theory of the cycle of capital (the social reproduction of wealth as a constant repetition of the process of production and marketing). Exploring the substantial composition of "agricultural capital", he actually divides it into basic - "initial advances" and circulating - "annual advances". Meters of the cycle of capital determine its natural and value indicators, and the use of the latter allows you to evaluate the "capitalization" of production, distinguish the concepts of "capital" and "income." Classics of political economy Adam Smith (Adam Smith) (1723 - 1790) and David Ricardo [David Ricardo] (1772 - 1823) determined the growth of capital as a basis for increasing the national wealth of the country.

The emphasis is on two essential characteristics of capital: value - related to the profit from the use of hired labor, natural (it is the stock of fixed and current assets that provide the production process). Sources of capital growth are thrift, or abstinence from current consumption. Labor theory of value determines the "eternal" nature of capital, and the determining factor for its functioning is the process of production. Developing the views of his predecessors, scientists, James Mill (1773-1836) distinguishes labor and capital as separate factors of production that create value and profit. In his view, money and capital perform different functions, and the relationship between them is the monetary assessment of real capital, which is previously accumulated materialized product. Factors of change in the value of capital are the value of the product created and the propensity to save. Therefore, with appropriate investments, the growth of capital in industry is unlimited, in agriculture there is a natural and economic boundary of capital related to the productivity of land, living organisms and plants, the existence of rent and so on.

The pioneering work of Thomas Robert Malthus (1766 - 1834) is to substantiate the immanence of cyclical development; he was one of the first to attempt to determine the optimum ratio of savings and investment capital. Also, the scientist paid considerable attention to the problem of capital efficiency in agriculture. In the writings of Jean Baptiste Say (1767 - 1832), the theory of three factors of production (labor, capital and land) and the corresponding income (wages, profits, rent) was introduced. Emphasizing on the close relationship between the factors highlighted, the scientist takes the leading role in capital as a determinant of economic growth, which revolves around the personality of an entrepreneur with innovative abilities. Thus, representatives of the School of Classical Political Economy recognized the source of capital as a source of accumulation, production and circulation, they assigned it the role of the main factor of economic growth and laid a solid foundation for further study of the problems of capital functioning, its multivariance and diversity [1, 3].

The eminent economist-scientist John Maynard Keynes made a huge impact on the world economic science, developing a fundamentally new theory of finance. The novelty of this theory was to direct the levers and instruments of financial policy to regulate the economy under conditions of state-monopoly capitalism. Keynes defined financial capital as a balanced set of cash flows. Establishing causal relationships, dependencies and proportions between the main financial and economic indicators, JM Keynes questioned the effect of the economic mechanism on the capital market, goods, labor (according to which the process of production of goods generates income that is exactly equal to value manufactured goods) and proved the impossibility of existence in the conditions of monopolistic capitalism free movement of prices in the direction of decline [1, 2].

The undisputed scientific work of a prominent scientist, who has an exclusive role in the theory of finance, is the theory of marginal efficiency of capital. JM Keynes defined the marginal efficiency of capital as a value equal to the discount rate that would equate the present value of a number of annual returns expected from the use of capital assets during his term of service to the price of his offer; In doing so, the marginal efficiency of individual types of capital assets will be obtained, and the greatest of these marginal efficiencies can be considered as the marginal efficiency of capital as a whole [1, 5].

Forming a new system of views, establishing a strong line of economic theory and theory of finance, JM Keynes proved that the tendency to decrease marginal efficiency of capital develops as the market is saturated with capital goods. Distinguished scientist explained this by suggesting that the marginal efficiency of capital in accordance with the theory of marginal productivity and rising cost is inversely dependent on the volume of investment, and the decrease in marginal efficiency of investment is associated with a relative reduction in propensity to consume, that is, when the growth decreases consumption costs and reduced profits, entrepreneurs find it inappropriate to increase investment [1, 6].

Multy-term world practice of state macroeconomic regulation confirmed the relevance of Keynes's scientific recommendations, and on the basis of his scientific ideas formed one of the most authoritative areas of modern economic research - Keynesianism. Over time, new Keynesian theories and economic cycle models emerged. It is worth noting such scientists - developers of the latest models of the economic cycle, such as A. Blinder, G. Menckyu, J. Akerloff. Remaining on the core positions of Keynesianism, these scholars have focused their attention on further developing the macroeconomic foundations of Keynesianism. These include the problems of price inertia and wages in the markets of monopolistic competition, unemployment, poverty, etc. The trying to investigate the impact of non-economic factors on the behavior of economic entities and economic development in general remains unchanged. Scientist J. Akerloff shows that the problem of information asymmetry is characteristic of the economy as a whole. Within the framework of this field of economic research, the principles of such economic science are formulated, within which the preferences of people and their decisions depend on the social context, their affiliation with some institutionalized group [7, 8].

Because New Keynesianism is a school of thought that is engaged in the development of macroeconomic theory, its representatives do not always adhere to one view of economic policy. Contrary to the theories of the new classics, the new Keynesianism suggests that recessions reveal inefficient functioning of markets. Elements of New Keynesian theory, such as menu spending, asynchronous pricing, poor coordination, and effective wages, are a significant departure from the

assumptions of a classical school that provides the intellectual basis for traditional economic justification. In the new Keynesian theories, recessions are caused by any market failure that affects the entire economy. Thus, the New Keynesian theory provides a rational justification for state intervention in the economy, such as countercyclical monetary or fiscal policy [9].

However, securing sustainable economic growth in the long term is the main goal of state regulation of the economy and financial policy, which reflects the realization of the socio-economic function of the state [10].

Summarizing the foregoing, it should be noted that thorough scientific calculations of scientists have had a huge impact on the formation of world economic thought, economic policy, and the system of categories and relationships of different schools is still used today in the development of specific instruments for regulating public financial policy [4].

The state financial policy of capital reproduction in the agricultural sector of the economy is now also considered in the categories of synergy effects (from Greek *συνεργία* - together; one, who acts) as a system and emergence as a subsystem [11]. The synergistic effect is that the joint efforts of public authorities and agrarian entities in the development and implementation of intensive financial reproduction policy measures, in aggregate, have a greater effect than their separate, autonomous functioning.

Obtaining a synergistic effect is due to the predominant effect of endogenous (internal) factors, based on the theory of organization and involves unidirectional action of the parties to financial relations in the agrarian sphere of the economy, one of which exerts regulatory influence and the other adequately perceives it. The theoretical basis for assessing the systemic effects of public financial policy in the agrarian sector of the economy at the level of the agrosphere and bioeconomy are the works of O. Popova, M. Talavir, and O. Talavir. The effects of emergence are determined by the exogenous (external) influence of public financial policy on capital reproduction in the agrarian sector of the economy as a system, on higher order systems - the agrosphere, the bioeconomy, and so on. The concept of "agrosphere", related to the biological term "biosphere", has actively entered into scientific circulation [11].

Its content is broader than that of agriculture, and reflects the multifunctional role of agriculture in society, its close link to sustainable development - social, economic, environmental. The triune (socioeconomic and environmental) basis of the agrosphere gives grounds to consider it as a qualitatively new system - the agrarian socio-economic-ecological system with a human-centric orientation of development. In the EU, the terms "agri-environment schemes, measures" are widely used. In most dictionaries the term "agrosphere" is interpreted as part of the biosphere involved in agricultural use (ie occupied by agro-eco-systems).

The concept of "bioeconomy" is based on the paradigm of production, which is related to biological processes, uses natural resources from the environment, requires minimal energy consumption and does not pollute the environment, since inputs are used repeatedly and completely transformed in the ecosystem [11].

At the present stage, developments in the technological framework of the fourth generation of bioeconomics, including information, nanotechnology and biotechnology, are progressive. In the current triad of power-business society, the bioeconomy is a balancing element in the relationship between producers, consumers and the state. Modern political and economic transformations in our country are possible provided that the main levers of regulation are shifted from macro to micro levels, to enhance economic sustainability, to enhance economic sustainability on the basis of strengthening the main economic base of creation and development of enterprises - capital.

Each new, higher level of economic development of the country requires not only a corresponding quantitative growth of the total capital, but also its qualitative changes, that is, an increase in the level of its profitability and efficiency of its functioning. The place of agricultural enterprises in this process is of exceptional importance, since the agricultural sector provides food security of the country and is the raw material base of processing, light, food and other sectors of the economy. Acceptance of urgent changes at the macro level, identification and ensuring their appropriate adaptation at the micro level encourages measures to be taken to increase the efficiency of functioning of the capital of agricultural enterprises. In this regard, it is especially important to

determine the directions of ensuring the profitability, the appropriate level of profitability of the total capital (and its structural elements) of agricultural enterprises as a criterion for successful management, qualitative evaluation of efficiency. formation of its assets; the main purpose of functioning of the capital of the enterprise is to meet the needs for the acquisition of the necessary assets and optimize its structure in terms of providing conditions for its profitable use. Belarusian scientist O.Tsalko believes that capital, as a systemic economic category, has two main functions: to generate income for owners and to recover themselves [11, 12].

Among the main characteristics that form the economic essence of capital, the author identifies the following: the object of economic management; object of ownership and disposal; object of sale; source of income; factor of production; accumulated value; the carrier of the liquidity and risk factor; investment resource. Generally, the essence of economic category "enterprise capital" can be formulated as follows: enterprise capital is a source of formation of its property, which characterizes the aggregate value of the enterprise's assets in tangible and intangible form, the use of which will bring economic benefits and strengthen the enterprise's potential. Thus, the agrarian sector of the economy has a certain specificity of the functioning of capital, namely: the main object of capital investment in agriculture, the factor of production and the main means of production is land, and the economic process of reproduction in agriculture is always closely intertwined with the natural; agricultural producers operate in very specific conditions, which are characterized by a seasonal gap between investment and working capital inflows, and the continuity of biological reproduction of resources, and therefore credit resources, especially long-term ones, play a crucial role in the development of agricultural enterprises [11, 13].

### Conclusions

The evolution of the conditions and fundamentals of capital formation and the theory of finance testifies to the constant search for its optimality. In the last third of the nineteenth century there is a transition of the economy into a monopolistic stage of development, which leads to the formation of new realities of development of capitalism, namely, more complex forms of management and relations between producer and consumer, increase of intensity of process of expansion of the market beyond national borders, and also qualitative changes in character and structure of processes of capital formation. Important contributions in this historical aspect to the further development of theoretical approaches to the formation of a new paradigm to substantiate the nature and basic characteristics of finance and capital have been made by the representatives of Keynesianism and the neoclassical school of economics, etc.

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**INVESTMENT AS A DOMINANT FACTOR OF SOCIO-ECONOMIC  
DEVELOPMENT OF RURAL AREAS IN THE REPUBLIC OF MOLDOVA**

**PETRASCU Svetlana,**

PhD student

Department of Business and Administration

State Agrarian University of Moldova

e-mail: [s.sasu@uasmd.md](mailto:s.sasu@uasmd.md)

**Abstract.** *The economic development of the rural areas of the Republic of Moldova is largely based on investments, foreign trade and remittances for economic growth. The purpose of the study is to analyze the role of investments in the economic development of rural areas of the Republic of Moldova. For the Local Authorities, it constitutes the main pillar, which influences the development of the village in economic and social terms.*

*Investment plays an important role on the country's economy, representing the material support of its economic and social development. It ensures the permanent capital increase, advances the technical and economic efficiency of existing ones and creates new places of employment. In this context, investment is the dominant factor of development the rural areas.*

**Key words:** *investments, socio-economic development, projects and programs, national economy, rural area.*

**JEL classification:** A14, E22, R10

**UDC:** 631.16:658.14(478)

**Introduction**

One of the problems of directing the flow of investments into rural areas is the limited ability to attract sources of capital from potential investors in the conditions of fierce competition between developed and least developed areas, and those that are most attractive to investors win.

The economic development of the rural areas of the Republic of Moldova is largely based on investments, foreign trade and remittances for economic growth.

At the same time, the main goal of the Republic of Moldova is to ensure a transparent and favorable business environment for foreign and local investors by supporting international law and protecting a market economy, private property, provisions against unfair confiscation of property and separation of powers between government structures.

Usually, when it comes to rural investment, we talk about the well-being of private families and entrepreneurship, where money can be a source of community development and can change rural life into a prosperous zone.

An analysis of recent studies and publications that began examining this problem showed that the main goal of the Republic of Moldova is to provide a transparent and favorable business environment for foreign and local investors, supporting international law and protecting a market economy, private property, provisions against unfair confiscation of property and separation of powers between government structures.

**Analysis of recent researches and publication**

Recent studies in the field of economics have shown that more than half of the population of the Republic of Moldova - 56.9%, lives in rural areas. Agricultural land covers about 74% of the country's territory, of which 54% is arable land. In 2018, 36.1% of people worked in the agricultural field.

Although, this percentage has grown slightly over the past 4 years, many rural communities have little to do with economic growth. We believe that to accelerate economic growth in rural areas, investments in this environment are still elements that need to be improved. Thus, strengthening the capacity in order to attract financial resources for the development of rural areas in the Republic of Moldova by improving drinking water supply services, waste management, maintaining local roads, developing leisure and sports services, telecommunications and public lighting, local and socio-economic development ( schools, kindergartens, cultural centers, libraries, medical centers), as well as

other comprehensive utilities, remain one of the main tasks of local public authorities of the first and second levels.

**Paper's objective** is to assess the impact of investment and to justify the role of investments in development of rural areas in the Republic of Moldova.

### **The main body of the academic paper**

According to studies in this area, Republic of Moldova is one of the well-known countries for mass migration to European countries. At the same time, although many citizens remain working in the black market, some of them return home and invest in their communities, especially in agriculture, social life and production, thus contributing to the socio-economic development of the countryside as a whole.

We believe that the first element in attracting foreign investment is basic legislation and economic investment.

International experience has shown that in order to ensure minimum conditions for attracting foreign investors, the investment and legislative framework in the economic fields must exist, function, be transparent, stable and predictable. However, this is a necessary condition, but not sufficient. At the same time, the ability to attract foreign capital is represented by the degree of openness of the economy to foreign investors.

According to several authors in this field, investments in a financial sense correspond to all cash expenditures that will bring profit or savings over a long period and which will be repaid within a few years. This phenomenon is similar to the use of long-term financing, including debt for a long period. Financially, investments are represented by all the capital with which they work. The financial definition of investments includes both the definition of accounting and the economic concept, which, in addition, has an aspect related to the need for working capital.

At the same time, investment is an activity. Investment activity, as one of the most important types of economic activity, significantly contributes to the success of an economic agent.

Investment activity plays a central role in the economic life, both in the production of goods and services and in the sphere of consumption, being the factor that simultaneously influences both supply and demand. The statement is proved by the processes of training and multiplication of effects, which are generated by any investment project, regardless of the activity sector that is implemented. The realization of an investment project in the sphere of goods and services production results in increased and diversified supply and, therefore, if it is validated by the market, increased incomes of economic agents.[4]

Justification of the volume and economic efficiency of investments at the macro- and microeconomic level requires knowledge of the methodological and theoretical problems related to the systematization of investments, since in essence investments are expenses intended for the implementation of a wide variety of works and activities. [6]

The Law of the Republic of Moldova about Investments in Entrepreneurship defines investment activity as "activities for making investments and doing business in relation to these investments with the aim of generating income".

A problem of directing the flow of investments to rural localities consists of the limited possibilities of attracting the sources of capital from the potential investors, under conditions of fierce competition created between the developed and the least developed localities, the victory being by the most attractive ones for the investors. Therefore, the field is more than the competence of the Local Public Authorities, which, in order to solve this problem, has to worry about increasing the investment attractiveness of the rural localities. The improvement of the investment attractiveness will contribute to the increase of the investment flow, therefore - to the increase of the level of development of the rural localities, to the increase of the quality of life of the rural population, respectively to the poverty reduction.

Financing of investment projects is a significant step in the investment process, according to which, after making an investment decision, financial resources are included in the investment budget and can be used to implement the project. In fact, the decision to invest makes a choice between local investment and external investment. Thanks to the decision to "finance", a choice is made between own resources and resources borrowed or attracted as a result of financing.

At the same time, the mechanism for financing of investment projects includes appropriate actions regarding the following:

- determination of funding needs;
- establishing an appropriate capital structure;
- assessment of the cost of financial resources in the medium and long term.

Through the financing plan for investment projects, an investment program is included into the balance sheet, consisting of a portfolio of ongoing investment projects, and the resources that the investor has or will be able to mobilize. It is important that the investor can mobilize the necessary resources from internal financing or from external financing. Thus, the problem of attracting capital resources should be considered in two interdependent aspects: in accordance with the sources and methods of financing. The financing structure of investment projects is based on internal financing and external financing. [9]

According to the World Investment Report for 2019, foreign direct investment (FDI) in Moldova has declined in recent years: in the case when the average annual pre-crisis value was estimated at \$ 330 million, FDI fell to \$ 228 million in 2018. [10]

Thus, total FDI is estimated at \$ 4 billion in 2018 (35.5% of GDP). Most FDI comes from other EU countries. The National Strategy for Attracting Investments and Export Promotion for 2016–2020 identified five priority sectors for investment and export promotion, namely:

- agriculture and food;
- cars;
- business services;
- clothes and shoes;
- electronics and cars.

In general, the economic and political environment of the Republic of Moldova is not particularly attractive for investors. The country faces a number of challenges, including the need to fight corruption, improve the investment climate, remove obstacles for exporters, turn remittances into productive investments, and develops a reliable financial sector. Administrative and judicial reforms are also needed.

Table 1. Comparative Investor Protection Indexes

Indicators	Republic of Moldova	Western Europe and Central Asia	USA	Germany
Transparent transactions	7.0	7.0	7.0	5.0
Managers responsibility	4.0	5.0	9.0	5.0
Shareholder Competence	7.0	6.0	4.0	8.0
Investor protection	6.3	6.4	6.5	6.0

Source: *Doing Business - Latest available data.*

The data in table 1 shows the comparison indexes for investor protection. Some of them, which relate to the Republic of Moldova, are more or less equal to the indicators that relate to the countries indicated in the table.

Many studies reflect the **strengths** of the Republic of Moldova in attracting foreign direct investment as follows:

- skilled and cheap labour;
- privatization of a number of companies on the verge of bankruptcy;
- taxes and fees favourable to investors;
- agricultural potential (wine, dried fruits, vegetables, sunflower, wheat).

**Weaknesses** that prevent FDI include:



- high level of poverty;
- an important segment of its informal sector;
- dependence on money transfers of expatriate workers;
- political instability and social tension;
- high level of corruption, poor governance and "nepotism";
- separatist aspirations of Transnistria.

The current law on business investment was developed in such a way that it complies with European legislative standards and defines the types of local and foreign investments. It also offers guarantees to respect investor rights, not to expropriate or act similar to expropriation, and to recover damages in case of violation of investor rights. The law allows investment in all sectors of the economy, while some activities require a business license.

At the same time, the Government took a number of measures to promote investment in the country. Companies investing \$ 250,000 can take advantage of tax credits for the first 5 years. Income tax has also been reduced. The government promotes equality between international and local investors and the fact that there are no restrictions on invested capital.

It should be noted that the Republic of Moldova has signed numerous bilateral investment agreements, which can be found on the website of the UNCTAD Investment Center. ( Conference on Trade and Development)

We agree with the opinion of economists of the Republic of Moldova that the development of a country depends of the effectiveness of all components of the investment sector, supporting the idea of the positive impact of investments on economic development.

Given the topic of rural investment research, we agree with the studies that have shown that the socio-economic development of rural areas faces many obstacles, and one of the major obstacles to this development is the lack of access to finance.

In a market economy, the main activity in which the majority of the rural population is involved belongs to the main sector of the market, namely to the agricultural sector. The source of development of this sector consists of investments or own financial resources, formed on the basis of profit received from economic activity or other financial resources. In most cases, agricultural enterprises do not have their own sources to finance the necessary investments. This is done using borrowed sources, such as: bank loans, deposits from founders or other sources of financing.

Obviously, the role of loans in financing investment projects is positive, contributing to the modernization of agricultural enterprises. But at the same time, the payment of interest is a burden that leads to a decrease in the economic efficiency of production when repaying a loan.

However, in order to increase the efficiency of the agricultural sector, the concept of agricultural loans provided by commercial banks of the Republic of Moldova, approved by financiers, was introduced.

In the same time, in order to develop the private sector the Government of the Republic of Moldova receives funds from its development partners under favourable conditions. Taking advantage of this assistance (credit schemes, grants or subsidies), Moldovan entrepreneurs can develop their businesses, significantly increase the quality and export capacity of their products, thus, becoming more competitive and creating new jobs. Interest rates for these favourable funds are lower or do not exist in case of grants and subsidies. Moreover, the repayment period of loans is several times higher than in case of commercial loans, many of them have grace periods as well. [5]

According to the conclusions of a number of experts in this field, the dependence on external sources of financing capital expenditures in agriculture has increased in recent years. This impressive dynamics of capital distribution during this period was achieved mainly due to an increase in the volume of external grants and loans for agriculture.

A number of other donors have contributed to the implementation of vital projects in the field of agriculture and socio-economic development of rural areas, such as: United Nations (UN), World Bank (WB), European Investment Bank (EIB). And a number of countries provided individual assistance: the Czech Republic, Switzerland, Poland, Romania, the USA, Sweden, etc.

Despite internal disagreements, a number of projects implemented in rural areas were very successful, such as:

- Compact Project (2010-2015), funded by the United States through the Millennium Challenge Corporation.
- Agriculture Competitiveness Project (MAC-P) 2012-2017, World Bank, Government of Sweden.
- Agriculture Competitiveness and Enterprise Development (ACED) Project (2011–2016), funded by USAID and the Millennium Challenge Corporation.
- IFAD (IFAD) 5 (2011–2016), funded by Denmark and the United Nations.
- IFAD 6 (2014–2020), Danish Global and Environmental Fund.
- ENPARD (2015-2022), funded by the EU.
- 2KR Privileged Farmer Assistance Project funded by the Japanese government.

Of particular note is the implementation of the Pilot Program for Attracting Money Transfers to the Economy ("PARE 1 + 1"), approved by Government Decision No. 972 dated October 18, 2010 for 2010-2012, the purpose of which was to inform and train labor migrants in the field of entrepreneurship and mobilize the human and financial resources of labor migrants from Moldova for the sustainable economic development of the Republic of Moldova. In the period 2010-2012. Under the program, 124 financing agreements were concluded and more than 76 million lei were invested in the national economy. Based on these results, the authorities extended this funding program, and until 2014, 411 non-refundable contracts were concluded. In total, the investments of the beneficiaries of the "PARE 1 + 1" program amount to 258.13 million lei, and non-refundable financing - 76.66 million lei. An analysis of enterprises by field of activity showed that migrant workers invested their financial resources accumulated abroad, mainly in agriculture - 58%.

In 2014, the Ministry of Agriculture, Regional Development and Environment of the Republic of Moldova, in conjunction with the Joint Implementation and Monitoring Group of Agricultural Projects funded by the World Bank, launched two grant programs for agricultural producers under the project "Competitiveness of Agriculture in the Republic of Moldova". The first grant program to facilitate access to retail markets is implemented by the Ministry of Agriculture, Regional Development and the Environment of the Republic of Moldova and has a budget of \$ 7 million. dollars. The second - grants to increase productivity through sustainable soil management, received a budget of 3 million. dollars. Another financing project implemented by the WB in 2014 provides for the allocation of US \$ 45 million for the Competitiveness Enhancement Project II (CAP II), which will increase export competitiveness and reduce the regulatory burden for agricultural enterprises in Moldova. According to information on investment projects administered by the Directorate of the Credit Line, from the beginning of the initial period of implementation of investment projects for the development of small and medium enterprises, about 6773 beneficiary sub-projects were financed, mainly from the rural sector, for a total amount of 2113. 2 million Lei, 88 , 96 million US dollars and 38.08 million euros (or the equivalent of more than 3.82 billion lei). At the same time, a large number of international donors and donor organizations, such as USAID, SIDA, IFAD, Soros Foundation, organizations from Japan (Moldo-Japanese project 2KR), Poland, Germany and the Netherlands, have increased during this period, efforts to support agricultural activities, including through investments, grants, loans with low interest rates and bank guarantees, through technical assistance. [8]

These projects and programs to attract financial resources made a huge contribution to the development of rural settlements of the Republic of Moldova, namely: services for the supply of drinking water, waste collection, maintenance of local roads, the development of leisure and sports, telecommunications and public lighting, local and social -economic development (schools, kindergartens, cultural centres, libraries, medical centres), as well as other comprehensive utilities. It should be noted that investment activity in the Republic of Moldova is coordinated by the current legislation. The first legislative act providing for investment activity was the Law on Foreign Investments, No. 998 of 04/01/1992 [7]

The investment strategy of the Republic of Moldova is an effective tool for the development of the whole country, which provides for the following activities related to the investment system:

- ensuring a favourable investment climate;
- attraction of foreign and local investments;
- access of companies to investment loans for the modernization of enterprises;
- promotion of investment projects;
- creation of a database of investment programs.

Also, it is very important to notice, that in order to increase investment, a State Economic Growth Strategy was developed, also, the Development and Investment Bank of the Republic of Moldova, the National Investment Promotion Agency were created. The activities of the agricultural sector are also coordinated by a number of laws, decisions and programs aimed at improving and the effectiveness of activities in this sector.

The Republic of Moldova could unblock additional investments by resolving regulatory and other issues. These problems vary depending on the degree of constraint imposed, complexity and lack of predictability. With the onset of the crisis, the level of investment in the EU, as well as in the Republic of Moldova, has significantly decreased.

Some economists believe that the level of investment will increase, but recovery may remain modest, reflecting, among other things: low demand, a decrease in the leverage effect of enterprises, and strict loan conditions. The identification and removal of these obstacles to investment is part of the effort to improve the basic conditions and eliminate bureaucratic delays and regulatory blockades, as part of the so-called "third pillar" of the Investment Plan for Europe. [4]

### **Conclusions**

We conclude that the role of foreign direct investment (FDI) is not only necessary, but practically possible and really very favourable for the economic revival of the Republic of Moldova. First of all at the rural areas level, the investments directly contributed to the job creation and contribution to local budget.

We believe that, the volume of FDI is far from reflecting the real absorption potential of the Moldovan market, and is far from satisfying the needs for external sources, which will positively affect economic development as a whole.

However, the development and effectiveness of activities, both at the level of the national economy and at the level of rural areas, are categorically dependent on investments.

Foreign investment has become an important and stable source of financing and implementing the country's economic policy. International investment resources are important components of the restructuring of the national economy, prerequisites for the resumption of production growth and social improvement.

To ensure the minimum conditions for attracting foreign investors, the investment and legislative framework in the economic sphere must exist, function, be transparent, stable and predictable. However, this is a necessary condition, but not sufficient. At the same time, the ability to attract foreign capital is represented by the degree of openness of the economy to foreign investors, as well as the ratio of the population and political parties to foreign investment.

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**DIFFERENT LEVELS OF SALARIES IN UKRAINE: REASONS, IMPLICATIONS  
AND RELEVANT REGULATORY TOOLS**

**PEPA Taras,**

*PhD, Professor,*

*Chernihiv National Technological University, Ukraine*

*E-mail: [tarrasp@gmail.com](mailto:tarrasp@gmail.com)*

**SHVETS Pavlo,**

*Candidate of Economic Science, Senior Researcher*

*Ptoukha Institute for Demography and Social Studies*

*of the National Academy of Sciences of Ukraine*

*E-mail: [pavelshvets@ukr.net](mailto:pavelshvets@ukr.net)*

**Abstract:** *The article examines problems in relation to the existing differentiation of work salaries among Ukrainian people given the fact that the level of income inequality in Ukraine has grown extraordinarily high compared to other European countries also undergoing market reformation. Detailed review is given to the factors influencing salaries' differentiation, namely: regional, inter-sectoral, professional-qualification, etc., as well as challenges and threats resulting from the existence of such high-level differentiation in the country.*

*Analysis of factors and reasons for continuous labour remuneration differentiation have been examined and assessments made on the ways to mitigate impact of negative factors. Also, authors have formulated general proposals as relates to the official policy on prevention of further aggravation of salaries' differentiation in Ukraine.*

**Keywords:** *salary, labour remuneration differentiation, income level, inequality, regulation of salary levels, wage, wage rates, qualification, profession.*

**JEL Classification: J31**

**UDC: 331.101.3(477)**

Effective operation and development of labour market in Ukraine requires adequate system of labour remuneration which should both ensure its reproductive function as well as reflect the dependence of the pay level of working people on efficiency and productive outcome of their work, along with consideration of their relevant qualifications, skills, experience, etc. However, presently in Ukraine the process of labour remuneration has proven very specific and sophisticated thus resulting in not only quite low pay level for many, but also reflecting the very existence of unsubstantiated pay differentiation in various spheres: regional level, economy as a whole, based on economic sectors, and at qualification and professional level.

As a result, the low pay level has become one of key problems in Ukraine, primarily because the narrowing of the volume of free social services and abandoning of price regulation on staple commodities (due to globalization processes and Ukrainian economy integration into the world economic space) puts main burden of a working person and his/her family reproduction on the factor of labour remuneration. This is resulting in the increased severity of low pay problem which leads to insufficient means for ensuring quality life of the people as a basic requirement for the development of national labour potential. Moreover, the high level of labour remuneration differentiation in the country (both inter-sectoral and inter-regional) ignores individual characteristics of the working people, and therefore cannot ensure proper reproduction of human capital which ultimately demotivates its further build-up.

Furthermore, the social-political aspects of this problem must not be overlooked as well, since the labour remuneration differentiation transforms into social polarization and reduces common ground for national reconciliation and in some cases may lead to significant social disturbances. Based on polls conducted by the sociological group "Rating" 83% of respondents admitted that they had experienced the lack of money they earned at work, and absolute majority of Ukrainian people considered themselves poor. UN research data also suggest that 60% of the Ukrainian population find

themselves beyond poverty line, while according to the US Bloomberg agency in 2017 Ukraine remained in top 10 poorest countries (7th place) [1, 2].

Since the labour remuneration level presents one of major factors of the Ukrainian labour market functioning and development, special attention, in our opinion, should be paid to the issue of examining and evaluating the pay level differentiation as well as identifying factors which influence its emergence. The result of this should be ensuring optimal and just labour remuneration differentiation through efficient regulation of its key elements with relevant legal instruments which, in turn, should promote effective increase in labour remuneration levels.

Differentiation of the disposable income of the people is rooted economically in the labour remuneration differentiation resulting from the social-economic variations of labour. Thus, the differentiation shall be viewed not merely as a qualitative indicator, but also as a phenomenon which presents an integral part of the social-economic system. Therefore, disposal income differentiation presents an objective social-economic phenomenon which is the result of social product distribution process in monetary form among individuals or social groups based on the production conditions and income distribution principle adopted in the society.

The study of labour remuneration differentiation identifies its component types, namely: sectoral, regional, professional (qualifications, rank), gender. Sectoral differentiation means variance in salary levels of working individuals based on the specific area of economic and industrial activities they are involved in. Regional differentiation manifests itself through salary levels' disparity in various regions as a result of many relevant factors, especially sectoral structure of regional economy. Professional differentiation reflects variance in salary levels based on specific professional groups, ranking, qualification skills, etc. Gender differentiation presents the difference between labour remuneration for men and women as a result of different scope of accumulated human capital (general and specific), concentration of working men and women in different sectors of the economy, at different positions and with different profession, as well as existence of discrimination of women in the labour market.

Among the key reasons for labour remuneration differentiation first of all identified are differences existing in the development of economic sectors and territories, correlation between demand and supply at regional labour markets based on professions, skills, qualification levels, etc., profitability of enterprises, regulatory norms related to labour remuneration as determined in sectoral and collective agreements, etc., difficult labour conditions, actual value of a specific position, level of competencies, etc.

Continuous lack of efficient changes in this sphere results in a very low level of labour income for the working people. This calls for immediate reforms in the labour remuneration system, especially given the obvious fact that the salary increase, as a main source of income for working individuals directly influencing their wellbeing, provides necessary positive effect on all processes of economic development in the country, namely: increases purchasing power of the population along with enhancement of domestic demand which leads to increased production outcome in the real sector of economy; promotes investment activities; increases the quality of labour force and reduces external labour migration; creates necessary conditions for legalizing labour relations and reduces shadow processes in the economy, etc.

Unfortunately, the existing statistical data does not allow for comprehensive characteristic of the above described problems because in most cases the labour remuneration process is not duly monitored across the entire spectrum of working people. The national survey of the population on the issues of employment, which covers practically all working individuals including those working at small enterprises, does not have questions related to remuneration and salaries. Moreover, the official data on shadow pay levels remains extremely sketchy. Nevertheless, in 2017 the Association of Chartered Certified Accountants (ACCA) published its rating of countries with the most segments of shadow economy where Ukraine was placed among top three "leaders" (the level of Ukrainian shadow economy was assessed at 45,96% of the Ukrainian GDP) [3]. In its turn, the Ministry of economic development and trade of Ukraine in 2018 had estimated the level of shadow economy at 30% of the official GDP [4]. Even though such data cannot be truly deemed accurate and full, the general understanding of the existing situation presents dire picture in the sphere of labour remuneration in Ukraine.

According to the results of recent studies by the Ukrainian academia neither EU countries nor US have effective legislative norms regulating the process of determination (or establishment) of some specific level of labour remuneration in the GDP or in the cost of the product, despite the fact that this is a very important indicator of macroeconomic policy. With this, the European Union and United States cannot be deemed outright champions of "free" market (including labour market too), but rather on the contrary - supporters of Keynesian views on moderately controlled market.

In the developed countries like US and Japan the portion of labour remuneration in GDP corresponds to over 75%, in European countries - 80%, while in Ukraine this figure merely reaches 40% (the lowest level was in 2016 - 36,6%) (fig. 1). And all this against the background of continuous increase of the gross profit and mixed income over the period of 2013-2018 - from 37,65 to 43,1%, while a large part of revenues has been comprised by social support and other transfers. Therefore, the logical conclusion is that labour remuneration does not properly perform reproductive function and thus cannot provide necessary livelihood for working people.

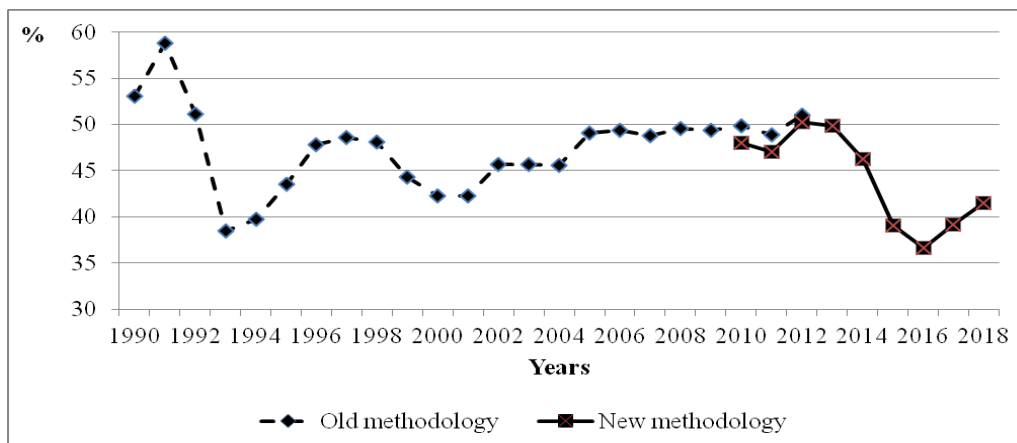


Figure 1. Labour remuneration in the Ukrainian GDP structure based on income categories in 1990-2018.

Taking into account the fact that  $\frac{2}{3}$  of the economic net profit is channeled to owners of the capital and top managers as dividends, such trend together with very high salaries of highly-paid workers creates significant income differentiation based on specific social groups of the population. Thus, stimulation by the state of increased labour remuneration and other work-related income along with simultaneous restraining and slowing down of growing non-work super-profits remains the most important task today to overcome profound and prolonged crisis in the sphere of labour remuneration and work force reproduction. In this context it can be noted that evaluation of the current situation in Ukraine as relates to correlation between salaries and profits very vividly reflects the sharp classical statement by political economist D. Ricardo: "low wage is another name for high profits".

For the last five years Ukraine has been experiencing continuous drop in the disposable income of the population. The key factors which influence the level of such income in Ukraine include the following: military conflict and increased number of internally displaced persons (as of January 2019 - around 1,5 million), reduced GDP (over the period of 2013-2018 the decrease was 8,5% in prices of 2010), high inflation index (from 112,4% to 143,3%), increased tax burden, rapid devaluation. Analysis of the population income dynamics shows that for the last few years the nominal income has partially grown, however real income has fallen sharply (for instance, in Q2 of 2015 the real disposable income dropped 34% compared to the year 2014). Thus, it becomes obvious that if in the early stages of post-socialist transformations the labour remuneration differentiation could well be a stimulus for economic development, today it is inevitably becoming its serious hindrance. The factor of high number of people with low income leads to significant social expenses from the budget, increased requirements toward social policy measures, reduction of solvent demand, weak investment capabilities of the population as well as threatens social conflicts.

As relates to the regional differentiation of labour remuneration, the coefficient of regional differentiation based on real wages in recent years has been close to 2,0-2,3. It has to be said that

significant regional differentiation in most cases results from sectoral specialization of a region: industrial or agricultural direction of its economy. The general trend suggests that in industrial regions the labour remuneration level is much higher as compared to the agricultural areas.

The share of real wages in general volume of income currently corresponds to 40%, however in western Ukrainian regions this number merely reaches 30%. This means that the state social transfers still remain a significant source of income for many people, with pensions being its largest part. Therefore, the special character of regional differentiation at present lies in excessive dynamics of variation coefficient growth compared to the pace of cash income and wage growth with insignificant differences observed between oblasts (provinces) as relates to purchasing power factor. In essence, the difference between cash income in oblasts has been growing more rapidly than progressing disproportions in their economic potential and income level growth. This trend clearly represents quite a dangerous situation when regional labour differentiation is bringing the decrease of actual wellbeing of the people.

So, in 2018 the maximum absolute spread of average monthly wage differentiation in regions was 8016,8 Hrn. or 82% as compared to the median figure of this index in Ukraine (table 1). The observed values of square variation coefficient represent the existence of regional differentiation in labour remuneration, however dynamics of all presented coefficients allows to say that the size and intensity of such differentiation have been dwindling. So, although Ukraine is currently experiencing inter-regional discrepancies in wage levels the trend toward steady decrease of average wage differentiation in the regions has already taken hold.

Table 1. Statistical evaluation of regional wage differentiation in Ukraine\*

	Years							
	2000	2010	2013	2014	2015	2016	2017	2018
Average monthly wage per working individual, Hrn.								
average in Ukraine	230,0	2239,0	3265,0	3480,0	4195,0	5183,0	7104,0	8865,0
maximum	405,0	3431,0	5007,0	5376,0	6732,0	8648,0	11135,0	13542,0
minimum	135,0	1659,0	2359,0	2527,0	2994,0	3695,0	5554,0	6969,0
median	207,4	2021,7	2921,3	3106,4	3724,1	4598,0	6444,3	8016,8
Variation spread, Hrn.	270,0	1772,0	2648,0	2849,0	3738,0	4953,0	5581,0	6573,0
Differentiation level	3,0	2,1	2,1	2,1	2,2	2,3	2,0	1,9
Average general square variation	58,8	367,2	543,0	575,0	760,2	972,9	1103,9	1324,8
Average selective square variation	60,0	374,8	554,2	586,9	775,9	993,0	1126,7	1352,2
Oscillation coefficient, %	130,2	87,6	90,6	91,7	100,4	107,7	86,8	82,0
Square coefficient of variation, %	28,9	18,5	19,0	18,9	20,8	21,6	17,4	16,9

\* does not include temporarily occupied territories

Results of the ranking based on the level of average monthly wage per working individual allow to identify regions which persistently have lowest ratings (Ternopil, Chernivtsi, Chernihiv, Kirovograd and Zhytomyr oblasts). At the same time, there is a group of regions which have constantly enjoyed high ratings (city of Kyiv, Donetsk, Kyiv, Dnipropetrovsk and Zaporizja oblasts). In some regions observed is significant growth of such rating (Zakarpattya, Volyn, Vinnytsya, Lviv and Odesa oblasts) or its decline (Lugansk, Kirovograd, Rivne and Chernivtsi oblasts).

Dynamics of statistical evaluations of the labour remuneration regional differentiation levels reflects the trend toward its decrease, while regional ranking results based on average monthly wage demonstrate inverse dependence between regional rating and the pace of wage growth. Quite stable and rigid remain groups of regions with low, average and high pay levels, while significance of average monthly wage differences per groups has been substantiated by statistical criteria. The calculated variation and localization coefficients demonstrate decrease of both labour remuneration level differentiation in each group as well as level of wage fund concentration.

As relates to the inter-sectoral labour remuneration differentiation, the sectoral correlation of



wage levels had a high range of 2,8 times in 2018. This means that the size of labour remuneration is determined primarily by belonging to a specific area of economic activities in contrast to prevalent global practice when its primary formation factors include quantity, quality and results of labour. Thus, the inter-sectoral differentiation level in developed countries does not exceed 1,5 - 2 times.

According to data from the State Statistics Committee of Ukraine the highest pay level in the country in 2018 was observed among those employed in aviation transportation and financial sectors, and in relation to industrial types of activities - among workers of mining industry and production of main pharmaceutical products and medicines (wage level in these types of activity exceeded the medium range by 1,3-1,8 times). As a contrast, the pay level in health care institutions has remained almost 30% lower than the medium wage range for economy as a whole, and in educational sphere - lower by almost 20%. As per aggregate data on average monthly wage in 2018 based on specific type of economic activities traditionally highest pay was observed in the following areas: financial and insurance activities (16161 Hrn.), information and telecommunications (14276 Hrn.), state management and defense (12698 Hrn.), and professional, scientific and technical activities (12144 Hrn.). All these sectors enjoyed average monthly salary above the average pay calculated for the entire country - 8865 Hr. At the same time, the pay level in health and social services sectors, administrative and auxiliary services, education and cafeteria/dining services was about 70-75% of the average national indicator. Also low traditionally remained pay level in agricultural sphere, construction, arts, sports, entertainment and recreation. Moreover, inter-qualification correlations in labour remuneration do not comply with the principle of equal pay for the same type of work (low pay and irregularities in labour remuneration in the budgetary (official) sphere, outdated system of qualification ranking, lack of motivation to apply flexible pay structures at enterprises, etc.)

Specifics of the modern labour market, such as its heterogeneity as relates to the quality of work force and its professional qualification level, especially preservation of a significant portion of low-efficient labour, contributes to the described scope of the labour remuneration differentiation. Rigidity of the professional-qualification structure of the labour market as relates to structural changes in economy upon formation of the labour force price also somewhat impacts labour remuneration differentiation (through lack of comprehensive approach toward personnel training, devaluation of labour force services, low level of professional mobility, dissatisfaction with labour conditions and pay levels, etc.) In general, the old situation lingers when economic situation in specific sectors correlates insignificantly with qualifications of employed workers and does not properly respond to relative complexity of used labour. At the same time, along with the spheres of excessive differentiation, there are types of activities with much lesser discrepancies in pay level, although the reality would suggest to the contrary.

Furthermore, Ukrainian specifics with regard to the labour remuneration lies not merely in the high level of differentiation, but also in its deformed character as within the range of factors directly influencing wages of Ukrainian workers the internal ones, that play leading role in western models (education, qualification, work experience), are relegated to the background. Among the dominating factors arise those which have exogenous character in relation to working personnel, namely: specific economic sector (financial or aviation transportation); region (capital city, export-oriented or with prevailing mining industry); size and location of the place of residence; financial state of an enterprise. Sectoral differences thus assume a much more significant role as compared to the qualification-related differences.

Another important factor that influences the described model of differentiation is segmentation of the Ukrainian labour market: work force is in fact strongly tied up to a specific area, while local markets with their own prices for labour are being formed. Internal migration of the population is restrained by underdeveloped institutional infrastructure (first of all, lack of affordable housing) as well as the fact that largest part of income comes from the people's integration into local environment (acquaintances with right people, private households, etc.), and therefore any relocation prospect brings a danger of decreased livelihood and wellbeing rather than any improvement.

Modern Ukrainian legislation covers practically no issues in relation to pay for qualified work, but rather focuses on the amount of minimum pay level. Data from studies conducted by the State Statistics Service of Ukraine in 2012 and 2016 [5, 6] identified two major trends in labour

remuneration differentiation within firms and enterprises. First of all, observed was an increasing gap between remuneration to management of enterprises and majority of hired personnel which meant enhanced status-related differentiation. Secondly, a steady trend was in place with regard to narrowing of the difference between qualified and unqualified workers' pay (something similar can be observed at present in the system of labour remuneration in scientific and educational spheres). Yet is obvious that some kind of sensitivity threshold should be preserved upon transition from less qualified to more qualified labour. In this context, high expenses for education become one of the inequality factors with regard to labour remuneration, however it stimulates the desire of an individual to obtain vocational training or attend refreshment courses which will ultimately have a positive impact on labour productivity and thus contribute to the pace of economic growth.

Some changes have already taken place in the sphere of labour remuneration, however the amount of minimal wage still significantly lags behind the levels of EU countries and remains lower than the UN established poverty threshold of 5 USD per day. Low level pay and increasing unsubstantiated labour remuneration differentiation in practically all spheres together with inefficient support to purchasing power through indexation mechanisms and taxation of cash income, and continuous growth of debt which leads to further impoverishment present clear danger for the country's economy and social stability. In developed countries minimal wage functions as a social protection instrument against low remuneration level and sharp drop in purchasing power of the population as a result of inflation. Employers are forbidden to pay salaries lower than minimal wage [7, p.4], and such countries upon determining the amount of minimal wage first of all take into consideration the dynamics of average wage levels. The European Council recommends to set minimal wage at the level of 60% of national average salary, while in Ukraine the size of minimal wage is determined on the basis of established subsistence for working individuals. However, for the minimal wage to be able to perform stimulating function and guarantee social protection of working class it must be higher than the mere subsistence level. Based on EU standards, the amount of minimal wage should constitute 2,5 times of hand-to-mouth subsistence [8, p.84], while in Ukraine minimal wage has long been lower than subsistence level and only in 2008 their became equal (fig.2).

Figure 2 shows that the average wage in Ukraine is growing much quicker than the minimal one, which corroborates that upon determining minimal wage in Ukraine the dynamics of average pay is basically ignored leading to unjustified drop in the hired personnel income.

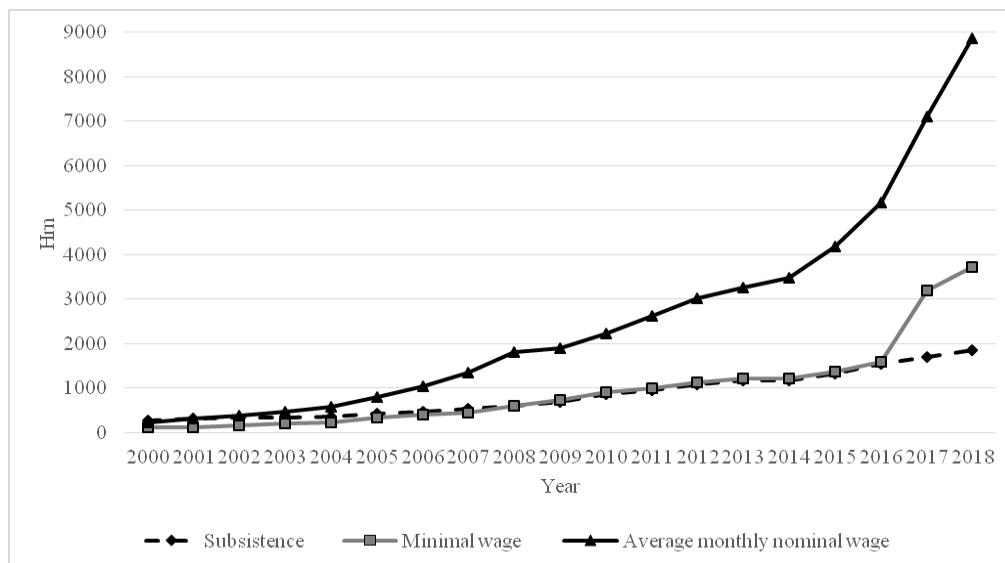


Figure 2. Dynamics of the average pay in Ukraine changes in accordance with the state standards in 2000-2018

Minimal wage which is a key mechanism of the state regulation of labour remuneration was being determined in 2013-2014 by the state at the level of subsistence for working individuals. In conflict with the national legislation and recommendations by the international institutions, the budget

deficit index was and still remains key factor which is taken into consideration in the country to determine levels of subsistence and minimal wage, and this practically balances out the influence of other criteria, first of all the real cost of consumer basket and positions of social partners during joint negotiations on the issue.

The double-size increase in January 2017 of the minimal wage amount to 3200 Hrn. helped induce the growth of labour income for almost 4 million low pay workers, however due to changes in its structure and substance [9] this did not lead to such level of wage raise that had been expected by the people. In addition to that, the artificially restrained level of subsistence for working individuals and lack of efforts to ensure minimal wage raise in correlation with inflation level kept the main state social guarantee in labour remuneration in the very last place among similar indicators in EU countries, and thus prevented its effective participation in income distribution and growth of social protection of the working population. It means that the state guarantees such a level of minimal wage which is unable to satisfy minimum needs of a working individual, and cannot guarantee (as stated in article 48 of the Ukrainian Constitution) the right of the people to sufficient livelihood, and thus does not stimulate productive labour which ultimately creates a serious threat to economic and social stability in the country and removes significant "beacon" in the labour market for all those involved. Real level of restoring purchasing power of the minimal wage should be reviewed with consideration of meager consumer basket and new social-economic context in which reproduction of working population is occurring today. Moreover, available educational and health services which are provided on a free basis are significantly behind the real needs of the people.

Despite noticeable narrowing in wage differences, its differentiation level remains quite high while its criteria do not respond to the challenges of modern economy. Under conditions of weak correlation of labour remuneration differentiation with labour force quality the level of return on human capital continues to drop and stimulus for its build-up weakens. It can therefore be observed that with regard to labour remuneration differentiation two extremes have formed and continue to strengthen with equally negative influence in both economic and social context. On one hand, the artificial wage leveling has already taken hold and continues its rapid expansion, especially as relates to budgetary sphere. More so, such wage leveling is based on extremely low general level of pay which is several times lesser compared to the value of labour force cost as well as pay levels in other countries, including even some CIS countries. On the other hand, prevalent remains the unsubstantiated and unwarranted extremely high differentiation in the levels of real wages, especially this is evident through the gap in levels of minimal and average wage, on one side, and the pay of top government officials and corporate management representatives, on the other. In order to eliminate such unsubstantiated gap it is necessary to introduce progressive taxation scale on income, including wages. In this context it would be advisable to apply zero taxation to minimal wage while wages of 10-times minimal amount and higher should be taxed at a rate of no less than 30-40%. Such approach would comply with both the objective and scientifically substantiated criteria for labour remuneration differentiation (its length, productivity, intensity, complexity, quality, responsibility, social significance, safety, implementation conditions, etc.) as well as fundamental principles of social justice and social responsibility.

Another example of effective approach toward the state regulation of wages which deserves attention is the one used in countries like Japan and Belarus where labour remuneration for management representatives, including top-level managers, is rigidly tied to the average or minimal wage level across the entire corporation, and thus it cannot exceed such levels more than 3-5 times. So, the improvement of wage rates system must lead to restoration of optimal correlations between pay levels of various professional-qualification groups of workers as well as ensure optimal correlations between minimal and average, minimal and maximum, average and maximum wage levels. Limitations on the latter one in commercial sector would be advisable to implement not by direct administrative regulation but rather efficient usage of indirect regulatory methods. Also, the share of rate in wage amount shall be no less than 60-70%, and rates should be used to ensure minimal level of labour remuneration as relates to specific professional-qualification groups. Any payments above the rate level should be determined based on specific work results for each workplace. This approach will allow to eliminate deformities and disproportions, and would ensure proper

correspondence of remuneration to complexity of the work performed and qualification level of an individual as well as reflect personal achievements and results.

Another aspect of labour remuneration differentiation is the correlation between the pay in budgetary sphere and non-budgetary sectors of economy. Effectively, the state determines pay levels in the budgetary sector thus directly regulating an inflow of personnel to this sector, so when such pay level remains relatively low all qualified and productive personnel would leave state enterprises and organizations and move to the private sector. Unfortunately, in the budgetary sphere much lower labour remuneration levels are observed compared to non-government sectors of economy, and latest calculations demonstrate that over the period of 2010-2018 the average pay in budgetary sphere in Ukraine have not yet come close to the average level in the economy. For instance, generally in educational, health and physical development spheres the average monthly expenses for personnel salary constitutes 0,6-0,7 of the nominal wage within the economic sector.

Under such circumstances, the average pay in budgetary sphere cannot ensure even minimal labour force reproduction level, let alone expanded reproduction, and this is given the fact that budgetary sphere employs quite a large number of working personnel with higher education. In its own turn, low pay in the educational, health, culture and arts spheres significantly reduces the quality of services provided to the population, and thus induces spread of shadow relations at social-cultural institutions and health organizations. So, in order to survive and provide livelihood to their families the workers of budgetary sphere take bribes, and this inevitably reduces availability of their services to low-income segment of the population. Ultimately, low pay level in budgetary sectors makes them much less attractive for economically active people and, in the event, continuous such dynamics may result in displacement of labour force from such sectors.

Upon examining labour remuneration differentiation processes and its impact on employment due attention shall be also paid to the heterogeneity of the labour force quality and its professional-qualification capabilities which are characterized by presence of a large number of low-efficiency jobs. Highly-qualified professionals employed in various sectors of economy perform tasks characterized by high quality of obtained education as well as corresponding knowledge and skills required by application of modern technologies. Thus, such workers enjoy stable guarantees of employment and high price of labour. On the other hand, representatives of low-qualification and non-prestigious professions are mainly involved in traditional sectors of economy with prevalent manual labour; and although the demand for such labour still remains quite high, the supply is limited due to the lowest pay levels in such sectors. Also, surplus of specialists of some professions in the labour market leads to devaluation of labour force and its services, on one hand, as well as increase of unjustified differentiation in labour remuneration, on the other. The important instrument to help overcome such disproportions should be the proper consideration of ongoing changes and shifts in the labour market structure by restricting vocational training for surplus professions and expanding training for professions and specializations which are in high demand in the labour market.

Reducing inequality in pay levels may include various processes and thus should require individual substantiation in each specific case. In a sense, it can result from special measures of social policy, for instance re-consideration of the minimal wage or wage rates with simultaneous tightening of the rate structure and rate increase in budgetary sphere, etc. In this event, a re-distribution of general labour remuneration fund will occur to the benefit of low-pay personnel, and this was happening a lot few years ago. On the other hand, reduction of inequality may also result from objective processes like uneven drop in income of various groups of workers during economic crisis. This process seems to be evident at present.

Since in Ukraine the raise of average wage to a large extent is prompted by salaries' increase in most highly paid groups, the majority of working people in the country continue receiving wages lower than the average level. More accurate explanation of the existing situation can be given through the analysis of median wage index which actually relegates half of the population to a segment of low income group. Median wage, as a rule, is lower than the average one, however in economies with relatively even distribution of income the gap between average and median wages constitutes no more than 15-20%. Should we compare median wage and hand-to-mouth subsistence in Ukraine it would become obvious that the purchasing power of the half of working people over the period of

transformational reforms has fallen and now barely exceeds two times the subsistence level. Studies conducted in Ukraine confirm unsatisfactory level of the most of social standards associated with decent wage and remuneration, and thus require improvements to the social policy currently under pressure from the low share of wages in the structure of people's income and existence of significant differentiation in the sizes of salaries which is further compounded by the gender inequality. All this leads to a conclusion that Ukraine still has imperfect labour remuneration system that contributes to further stratification of the society, increased discrimination on the part of employers as well as other negative consequences.

To eliminate such disbalances it is necessary to, first of all, strengthen the connection between wages and labour productivity without allowing neither extended lagging behind nor outpacing; secondly, increase, at least within the budgetary sector of economy, the dependence of wages on qualification level of a working individual thus strengthening remuneration for qualified labour which should ensure adequate return on human capital; thirdly, find proper balance between highest and lowest pay levels through streamlining of re-distribution processes by effective taxation mechanisms, though avoiding negative impact on the duly justified wage differentiation. Therefore, to eliminate negative implications of labour remuneration differentiation it would be advisable to promote efficient policy of its regulation with the following key objectives:

1. Establishment of high labour remuneration standards and renewed pay differentiation for working people of different qualifications. This requires determining of the size of minimal salary per position at the level of minimal wage. Adjustment of higher wage rates to comply with the effective today adjustment coefficients, which may take some time to implement (for instance, over a five-year period), with the minimal wage remaining a key social guarantee for unqualified labour remuneration. At the same time, the rise in pay for qualified labour should remain one of main objectives of the state policy on wage regulation.

2. Stimulation of personnel higher qualifications. To do so, any additional payments or bonuses shall be set aside from the size of minimal wage which shall remain a basic social guarantee for unqualified labour remuneration.

3. Elimination of existing labour remuneration differentiation as relates to highly-qualified personnel in budgetary sphere through wage raise in such segments of official sector where wage reforms have not yet been implemented (medical workers, etc.)

4. Setting up of a task force to develop progressive taxation scale for working individuals in order to realize policy on income leveling for highly educated and qualified personnel in the state and private sectors as well as establish competitive environment among various employment sectors.

5. Establishing of economically substantiated difference between minimal and maximum wages at the state enterprises in order to reduce excessive gap between labour remuneration for qualified state sector personnel which currently serves as a risk factor for increased social tension.

6. Bringing the size of minimal wage (quite likely in a number of periodic stages) to the level of 50-60% of average as per EU standards which would allow to rank employed personnel as the middle class of the country.

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**POSSIBILITIES AND LOCALIZATION OF SOCIAL ENTREPRENEURSHIP  
DEVELOPMENT IN UKRAINE**

**BATAZHOK Svitlana,**

PhD in Economics, associate professor,  
Bila Tserkva National Agrarian University, Ukraine  
e-mail: [batazhok@ukr.net](mailto:batazhok@ukr.net)

**TKACHENKO Kateryna,**

PhD in Economics, associate professor,  
Bila Tserkva National Agrarian University, Ukraine  
e-mail: [K-Tkachenko@ukr.net](mailto:K-Tkachenko@ukr.net)

**Abstract.** *The presence of a large number of social problems and vulnerable populations in Ukraine forces us to look for new and innovative approaches to solving them. The use of commercial approaches in the social sphere is a worldwide trend that has proved positive in many countries, given its financial sustainability and significant social impact. Social entrepreneurship, as one of the new hybrid organizational forms, which involves the use of business methods to solve various social problems.*

*A social enterprise differs from other enterprises in that its social effect is a deliberate result, not a by-product of activity. The social goals are enshrined in the statute and are binding. Profit from business activities is allocated to the achievement of social goals. The assessment of social and economic impact is a factor in the development of social entrepreneurship and the involvement of donors and investors. Promoting social entrepreneurship will help overcome paternalistic perceptions of social problems in society. The new trend of social entrepreneurship is manifested in various forms: corporate social responsibility, venture philanthropy, investment impact, etc. This trend is increasingly known as the «fourth sector of the economy».*

**Keywords:** *social entrepreneurship, social enterprise, financial aid, startup, incubator, accelerator, economic and social impact.*

**JEL classification:** L26

**UDC** 338.22-029(477)

**Introduction**

Since 2015 social entrepreneurship (SE) in Ukraine began to develop more actively as a forced reaction of society to the deteriorating socio-economic situation. The SE is becoming more widespread in Ukraine due to its ability to solve social and economic problems.

The creation and development of social enterprises is linked to needs that cannot be fully met by the state at present for various reasons (the most urgent of these are overcoming unemployment, strengthening social protection and reaching vulnerable populations). For EU, the motivation for creating a social enterprise is the ability to diversify funding, reduce their dependence on donor funds, and be more autonomous in making decisions about spending directions.

Methodology of work - general and special methods of scientific cognition were applied in the work: system analysis and synthesis, deductive and inductive methods, methods of analogies, generalization and comparison, table method.

The results of the work - the criteria that clearly define and separate social entrepreneurship from traditional businesses are justified and applied. The types of social enterprises by organizational and legal form, regional location, sectoral affiliation, social purpose are analyzed. The ways of ensuring the sustainable development of social enterprises and the sequence of stages of evaluating the effectiveness of the results of their activity are suggested.

**Analysis of recent researches and publications**

Significant contributions to the development and analysis of problems associated with the development of social entrepreneurship have made scientists S. Alward, G. Dees, B. Drayton, J. Kikal, T. Lyons, J. Mayr, I. Marty, M. McLean, A. Predo, F. Sprekley and others. Among the Ukrainian authors who study the problems of social entrepreneurship, we can mention the works of Z. Varnalii, Z. Galushka, O. Kireeva, V. Udodova, V. Shapoval and others. Socially oriented business activity in

Ukraine requires further study of new organizational forms, development of innovative and commercial ways of solving issues in the social sphere and their practical implementation.

**Paper's objective** is to find out the essence of the concept of social entrepreneurship, to study its characteristics, significance and state of development in Ukraine.

### **The main body of the academic paper**

In essence, SE is defined as a business that solves social problems in communities. The purpose of which is to achieve economic and social impact. SEs are denoted by three letters P: Profit - profit (business), People - people (society), Planet - planet (environment), which indicates the self-sufficiency of the enterprise in the resources used for its own reinvestment and social investing. International and domestic experience shows that there are no better alternatives to solving social problems than entrepreneurial activity, since this type of activity has a double effect: profit enhances the quality of life of the population and ensures the viability of the enterprise by reducing the need for ongoing financial assistance. A social enterprise differs from other enterprises in that its social effect is a direct result, not a by-product of activity. This means that social goals must be enshrined in the company's charter. Another difference between social enterprise and ordinary business is the distribution of profits. This criterion specifies how profit will be distributed from business activities according to social goals. In Ukraine, they identify corporate social responsibility (CSR) with SE. The main purpose of socially responsible entrepreneurship is to create a product or service and make a profit, with social impact being an additional aspect, the relevance of which is determined by the decision of management. For a social enterprise, social impact is its essence and a necessary component.

Since 2015 the SE is developing more actively in Ukraine, which is a community action to worsen the socio-economic situation. In 2013. 41 social enterprises operated, 2016–2017. 150 social enterprises. Social enterprises are created to solve the problems of unemployment, social protection and integration of vulnerable groups into society. However, Ukraine lacks a single clear definition of SE in the legislative and professional fields. The Social Business Directory defines a social enterprise as an organization (regardless of its legal form) that solves social and / or environmental problems. The key criteria for affiliation of an organization to a group of social enterprises are [2]:

- employment of vulnerable populations (such as ATO veterans, IDPs, persons with disabilities, rural residents, etc.);
- the profit from the activity is wholly or partly directed to support the statutory activity of a public association, charity, charitable foundation;
- profits are wholly or partly spent on financing certain types of services for socially vulnerable groups.

Such an approach and definition are limited only by the social component and do not take into account that a social enterprise is an independent business entity created under the law to produce products and provide services to meet social needs and profit. This is the component attracted by organizations and foundations that provide financial support to business projects with the potential to achieve social impact.

Taking into account the above approaches, SE can be defined as entrepreneurial activity aimed at solving social problems at the expense of income from own activity. Forming a proper understanding of the concept of "social entrepreneurship" in Ukraine will open new perspectives for effective cooperation of entrepreneurs with organizations and foundations providing financial support.

Lack of resources in the state budget and financing of the social sphere on a residual basis forces people and communities to become more active and to seek innovative approaches to solving their problems, so SE develops more quickly than a certain reaction to the difficult economic situation. The use of business approaches in the social sphere is being applied worldwide and no alternative has been found so far. If the local governments make a comfortable environment for doing business, including social ones, there will be an effect of scale: the filling of the local budget will increase, the level of unemployment will decrease, the welfare of the whole community will increase.



The economic consequence of social entrepreneurship is an increase in aggregate economic efficiency, since it attracts resources that were previously unsuitable: vulnerable groups, waste of production and livelihoods, and their various combinations [1].

According to the Catalog of Social Enterprises, in 2017 The most common sectors of activity in Ukraine were: rehabilitation of vulnerable categories of population (18%), agricultural production and marketing (15%), sales of goods (charity shops, on-line sales, hand-made) (14%), food industry and catering establishments (12%), garment production (8%), educational services (7%), ecology (4%), health care (4%), tourism (3%). But often social enterprises are not limited to one industry, but operate as multidisciplinary or combined enterprises [2].

The choice of industry depends on the requirements of time and development of the business environment. With decentralization in local territorial communities, there is a need to purchase social services. The most promising are enterprises whose activities are aimed at meeting the needs of the state in providing social assistance. The number of information technology (IT) businesses is growing significantly due to the demand for IT solutions, in particular in the public and public service sectors.

An important classification feature of social enterprises is their social purpose, as it distinguishes them from ordinary profitable enterprises and business projects. Social enterprises focus their efforts on achieving several goals at the same time, but the most actively social enterprises work on employment of socially vulnerable groups (61%), generating profits to support the activities of the organization (53%), generating profits to support services for certain populations (40%), generating profits for the nansuvannya certain types of services (27%) [2].

The chosen line of business and the social purpose of the social enterprise often influence the decision to choose the form of profit sharing. This criterion specifies how profit from a business is distributed according to social goals. In Ukraine, the most common options are:

➤ All profits are reinvested in business expansion. This approach is inherent in social enterprises created by people from socially vulnerable categories for self-help and employment, as well as cooperatives aimed at improving the quality of life of the community. In Europe, such enterprises are referred to as WISE (Work Integration Social Enterprise) and are supported by the authorities because they perform two important functions: 1) provide social services to clients (who are also employees); 2) enable representatives of vulnerable groups to earn their living independently and not feel dependent on state aid. Often, such social enterprises are not profitable because they cannot compete with traditional businesses, but, if available, create additional jobs for the employment of even more people from vulnerable populations [4].

➤ Part of the profit is reinvested, part goes to social goals. Such distribution is characteristic of social enterprises created by public organizations and charitable foundations. A portion of the profits earmarked for social purposes is transferred to a non-governmental organization or charity fund that spends money to achieve social impact. This variant of profit sharing is the most widespread in the world, as it contributes to the development of the commercial component and to greater social effect. The proportion of profit sharing can vary depending on factors such as competition, inflation, market conditions, price, cost, tax system, and more.

➤ All profits go towards achieving social impact. This approach is used by social enterprises, mostly created by the tandem of the GO-PRIVATE ENTREPRENEUR (GO-LLC), when the NGO provides certain means of production (premises) for commercial activity to the use of the PRIVATE ENTREPRENEUR (or private enterprise), instead all profits are returned to the public organization. This type includes almost all charity shops, which have different legal forms and transfer profits to social projects (their own or that of other organizations).

By organizational form, the most common social enterprises are LLCs (25%), private entrepreneur (15%), Enterprises units (13%), agricultural cooperatives (11%), joint social enterprises EU / PRIVATE ENTREPRENEURS and EU (14%). By duration of activity, social enterprises operate from 1-3 years (48%), 4-9 years. (29%), over 10 years. (23%). The number of employees is mostly small enterprises up to 5 people (56%)%, 6-10 people (19%), 11-50 people (16%), more than 50 people (9%). The largest number of social enterprises are in northern (43%), in particular in Kyiv (20%), and in the western regions of the country (27%). There are no social enterprises only in Rivne region [2].

Table 1.: Number of social enterprises in the regions of Ukraine in 2017.

Region	Number	Region	Number
Vinnitska region	4	Mykolaivska region	5
Volinsk region	1	Odessa region	3
Dnipropetrovsk region	6	Poltava region	9
Donetsk region	8	Rivnenska region	0
Zhytomyrska region	5	Sumy region	2
Zakarpatska region	8	Ternopil region	3
Zaporizhzhya region	8	Kharkiv region	7
Ivano-Frankivsk region	2	Kherson region	4
Kiev region	8	Khmelnitsky region	3
Kirovogradska region	3	Cherkasy region	6
Lugansk region	5	Chernivtsi region	5
Lviv region	15	Chernigiv region	5

Source: [2].

The creation and development of social enterprises is linked to the perceived need to solve social problems.

A problematic issue remains the access to finance needed to create and develop social enterprises. The market is full of financial support for development from various organizations, which is directed to the development of the joint venture. In practice, the amount of aid is often limited to startup funding and is no longer earmarked for further development. Financial assistance is provided for a clearly defined activity and does not meet real and often unforeseen needs. Ukrainian social entrepreneurs have limited access to credit, investment and funds from private companies. This is due to ignorance of the investment field and the inability to find contacts to collaborate in the business environment. Most of them do not have development strategies, financial and marketing plans.

For the successful development of social enterprises, it is very important to support them at the stage of developing a business model and launching a startup. This is what incubators and accelerators provide. They specialize in preparing and launching social enterprises. Incubator is an organization whose activity is aimed at providing social enterprises with the necessary knowledge, skills and tools to transform an idea into a business model. Accelerator is an organization that aims to support social startups and prepare them to receive investments during growth and scaling. In Ukraine, the functions of incubators and accelerators are similar, and the services they provide do not differ. The main task is to create an attractive investment product or service with start-ups. The main services offered by incubators and accelerators are business skills development, mentoring support and networking.

Incubators and accelerators in Ukraine are [2]:

- Impact HUB Odessa offers incubation programs, consulting services, is a venue for educational events and networking.
- The Ukrainian Social Academy offers programs for future leaders and social entrepreneurs.
- 1991 Open Data Incubator - Ukraine's first nonprofit incubator that helps turn open government data into real startups that provide services to Ukrainian citizens, businesses and government agencies.
- Greencubator develops an ecosystem of sustainable entrepreneurship, low-carbon innovation and a green economy in Ukraine and Eastern Europe.
- SILab is a school of social entrepreneurship, a joint initiative of Chasopys Creative Family and the Ukrainian Philanthropists Forum.
- YEP - a network of academic business incubators that provide business education for young people with a view to developing the entrepreneurial ecosystem of Ukraine.

- YEI - a youth entrepreneurship incubator designed to bring together creative young people's initiatives and support the development of their business projects.

Most Ukrainian incubators and SE accelerators work only at the expense of grants, which does not ensure their sustainability and does not contribute to systematic work.

Corporate business incubators are developing in Ukraine. Big business gets access to innovation, outsourcing R&D costs to solve technical problems, and the ability to acquire innovative companies and technologies. Startups gain access to the market and large customers, the ability to test products, attract expertise, feedback and advice from industry experts and mentors, and the ability to commercially launch a product in partnership with a key industry player. Examples of such incubators are [2]:

- Radar Tech18 is a technology cluster that integrates industry-leading corporate accelerators such as Agro, Telecom, Fintec, Energotech.
- Agrohub19, which positions itself as a collective influence organization, supporting the implementation of agribusiness innovations through fairs of ideas and hackathons, resulting in short pre-acceleration programs or long-term corporate acceleration programs to implement more technological solutions in agricultural companies.

Most incubators and accelerators in the world operate on the basis of institutes and universities, as interesting innovative projects are mostly initiated by student youth. In Ukraine, the potential of higher education institutions is being used to a limited extent. There are incubation programs at higher education institutions [2]:

- Metropolitan Andrey Sheptytsky Center of Ukrainian Catholic University, where UCU's Center for Entrepreneurship started operating.
- Polyteco is a youth IT business incubator that operates on the basis of the Science Park of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".
- Start-up Business Incubator KNU is a youth business platform based at Taras Shevchenko National University of Kyiv, which specializes in creating favorable conditions for startup projects of young scientists and students of KNU.

Recruitment of incubation / acceleration program participants occurs through the announcement of the contest on official websites and social media. The main criteria for selecting participants in the program are an innovative idea, motivation to develop and scale it, having a team, professionalism (technical skills) and a willingness to exercise social influence. The duration of the programs offered by Ukrainian incubators / accelerators is two to six months (1-3 months of intensive training and 1-3 months of support). The result of such programs is a business plan, which is an application for start-up funding in the form of a grant. Incubators and accelerators are an important part of SEs in Ukraine. The quality and quantity of social enterprises depend on their further development.

In Ukraine, financial support for the development of social enterprise is provided primarily by international donor organizations through the implementation of technical assistance projects. Donors who have provided significant support for the development of SEs in Ukraine over the last decade include USAID, the United Nations Development Program (UNDP), the governments of Germany and the United Kingdom. They provide financial resources to overcome socio-economic challenges, develop capacity at the individual, institutional levels. The programs include training for individuals who want to start a social enterprise, train coaches and mentors to provide further support, develop and print information materials, events to promote the SE idea, and provide seed funding or access to preferential credit. The amount of start-up funding in the form of a non-repayable grant is typically between \$ 500 and \$ 10,000; loan size - from \$ 10,000 to \$ 100,000 for a maximum term of three years [2].

State support for the joint venture has become available in Ukraine. A striking example is the Ukrainian Donetsk Kurtul, a regional program of support for small and medium-sized businesses, which was implemented by the Donetsk Regional State Administration in 2017. It gave the entrepreneurs of Donetsk region a chance to grow their business and to create new market niches: entrepreneurs received grants up to 500 thousand UAH. on their projects. Today, on average, four jobs are created during one project. Total during 2017: 136 projects were implemented for a total amount

of UAH 31.9 million, 50% of funding was provided from the regional budget and 50% from the local budget. For 2018, financing of UAH 340 million is planned, including UAH 140 million from the regional budget and UAH 200 million - from the budget of the State Employment Service. Local budgets are required to provide funding of 30% of the total grant.

A type of social investment in Ukraine is crowdfunding platforms, both Ukrainian (for example, the Common Idea Platform, the Ukrainian Charity Exchange) and foreign (Kickstarter, GlobalGiving, Firstgiving). Crowdsourcing is a method of collective funding based on voluntary contributions. For example, the Kickstarter-supported SolarGaps project, Ukrainian startups in education, tourism, and the environment, such as ZELENEW, WOWkids, EdEra books, Mobile Technology Studio, WordArt, etc., are supported through Community Cost. An interesting example of crowdfunding is the Urban Space 100 public restaurant in Ivano-Frankivsk, created by hundreds of individual investors, each contributing \$ 1,000 and co-owning the restaurant. Urban Space 100 was opened on December 27, 2014. The restaurant operates and generates revenue, 80% of which goes to community initiatives and projects. The restaurant's founders make decisions about which projects to support. The idea of creating a restaurant belongs to the platform "Warm City", which was searching for founders and launching a restaurant. Today, Warm City is working on an Urban Space Global program that involves opening similar restaurants in other cities on a social franchise. The first such restaurant was the Urban Space 500 in Kiev, opening in December 2018.

There is an increasing interest from investors and donors in supporting social business. Sustainability of a social enterprise and its potential to increase profits are very important. Even if funding is provided to a non-profit organization, having a sustainability strategy is still a prerequisite for obtaining it. According to investors, even grants should lead to a profitable business. Otherwise, it is not a social enterprise, but a non-profit organization.

An obstacle to providing financing to investors is that Ukrainian social entrepreneurs are not sufficiently financially literate, prefer grants, do not have a system of measuring results and social impact. Investors are interested in break-even and growth potential of social projects, so it is important for them to be able to turn funded projects into profitable business models. They want to invest in powerful businesses with strong teams that can implement their business ideas.

The SE organization includes entrepreneurs, business associations, corporations, donors, foundations, social investors, incubators, accelerators, higher education institutions, organizations providing intermediary and research services, government bodies, territorial communities, mass media. SE in the development stage of Ukraine, so it is difficult to assess the effectiveness of its operation. Social enterprises are not part of the network of traditional companies and corporations and often cannot apply for a contract for certain jobs and services because of their low competitiveness. There is no effective interaction between the participants of social entrepreneurship.

It is necessary to organize professional and cultural events among social entrepreneurs regarding possible ways of obtaining financing, the distinction between grants and investments, explaining the essence of non-repayable and return investments, the basics of lending, etc. Personal meetings between SE subjects at thematic conferences, events, and sessions are indispensable. It is important to invite foreign social entrepreneurs, foreign social investors and mass media to such events. An important element of effective interaction between the participants of the SE is social videos, conducting activities among the population to clarify the essence of the SE and build trust in it. It is important to study and disseminate information about successful social business projects that will help attract new investments.

A systematic monitoring and evaluation of the definition of social impact is needed. Currently, social impact is determined at the case-by-case level rather than the overall impact of social enterprises at country level. The social enterprises that have received the grants report to the donors on certain indicators without really determining the social impact on society as a whole. At the enterprise level, only the number of assisted persons and the financial results of the activity are recorded. There is no single accepted toolkit for assessing the efficiency of an enterprise in terms of economic and social benefits. The introduction of tools for measuring social impact will allow to determine the efficiency of the enterprise, will help to find potential investors.

It is suggested to evaluate the effectiveness of social enterprise performance in such a sequence [3].

The first step is to identify measurement entities that are dependent on stakeholders who have different interests in economic and social performance. The following entities are interested in the economic results of social enterprise activity:

- the state: the growth of the country's GDP and the increase in the state budget revenues through payment of taxes established by the current legislation;
- local self-government bodies: improving employment rates and the employment of socially vulnerable groups; increase in local budget revenues through tax payments;
- social enterprise owners: interested in the financial results of the activity, as it is the basis of development for the achievement of social goals;
- Employees: The economic interests of employees of a social enterprise are linked to wages and other types of financial incentives;
- Consumers of products: interested in purchasing products (goods, works, services) of appropriate quality at a lower than market price;
- market infrastructure organizations (banks, suppliers, credit unions, investment funds, etc.): interested in improving the financial performance of a social enterprise, if it uses their services.

Accordingly, the objects of measuring the economic results of social enterprise activity will be: the volume of production and sales of products (goods, works, services); product quality and price; taxes; pay; fulfillment of obligations undertaken to market infrastructure organizations; the employment rate of the population; financial results of operations, etc.

The object of measuring social outcomes can be: pay; working conditions; occupational safety; participating in local community issues; impact on the environment; raising the level of well-being of employees; consumer benefits in terms of price reduction, quality improvement; availability of products (goods, works, services); labor integration of beneficiaries; socialization of beneficiaries; psychological adaptation of beneficiaries depending on the specific activity of the social enterprise.

The second step is the definition of performance metrics - that is, the formation of a set of metrics that meet the capabilities of measuring a particular object.

The first group - cost indicators, with their help to measure the volume and structure of resources that a social enterprise uses in its activities. These include the amount of financial resources spent, the number of staff involved, the amount of equipment needed to carry out the activity, and so on.

The second group - indicators of volume (or product), measure the volume of services provided, the product produced, the work performed. Depending on the specifics of social activity, the following indicators may be: the number of beneficiaries, the volume of production of goods or the number of services provided, the number of types of services or range of goods, etc.

The third group is the result indicators designed to assess the quantitative or qualitative changes that have occurred in clients (consumers) as a result of social enterprise activity. These are usually attributed to the number or proportion of people who have improved their social status.

The fourth group - quality indicators, reflect the degree of satisfaction of the recipient with the goods or services according to their purpose. For each social outcome, these indicators are specific, which can be a reduction in the time to wait for service, the number of complaints, etc.

Fifth group - performance indicators that characterize the relationship between the resources expended and the volume of goods or services produced. These indicators are also specific, but most often use indicators of the cost of services per beneficiary, the number of beneficiaries per employee of a social enterprise, time spent per employee to service one beneficiary, etc.

The sixth group - performance indicators - is measured by the ratio between the resources consumed and the results obtained. For example, financial expenses per person who have had a positive change in their social status.

The seventh group - impact indicators - characterize the positive changes in social indicators at the local community, city or region level.

For each of the groups of indicators a benchmark should be established, ie specific values of quantitative indicators, as a rule these are the target values of social enterprise performance indicators within the planning period.

The third stage is the identification of sources, the collection and processing of information. It is necessary to determine the main sources and methods of gathering information for calculating the selected indicators. Sources of information in the process of measuring the performance of a social enterprise are the documents of its financial and statistical reporting, the results of special surveys, information on the results of the activities of other similar enterprises, the results of questionnaires, interviews.

The fourth step is to calculate metrics, compare their values with a specific base, and get "feedback". The actual values of the calculated indicators are compared: with the planned; established standards (if any); indicators of the previous period; indicators of other similar organizations (if possible); with mid-market metrics. Social enterprise activity directly or indirectly affects a wide range of stakeholders, so it is advisable to receive suggestions, comments and questions about the evaluation results from them.

The fifth step is to evaluate the results of comparison and decision making. Based on the analysis, management can make the following decisions regarding the activities of the social enterprise: change nothing and continue the activity; adjust the goals of the activity; review performance; develop activities to improve performance.

Evaluation results are used to improve internal organizational and economic mechanisms, to present the desired results to stakeholders, to inform the public about the main achievements of a social enterprise, to improve the quality and competitiveness of goods and services, to improve existing or develop new projects, and so on.

Social enterprises need to use evaluation mechanisms to improve their operational efficiency; design and produce products and services that create greater social impact; ensure the transparency of its activities in accordance with the requirements of investors and other stakeholders. Impact measurement is an important tool to track - mission commitment, investor income, and donor confidence.

Impact assessment increases funding, enables reliable investment; win tenders / contracts, strengthen the image and build up the "brand" of the social enterprise; report to stakeholders; make more informed decisions.

In addition, the following factors must be considered in developing and implementing the methodical approach to assessing social enterprise performance: developing an effective evaluation system requires considerable time and resources, as well as appropriate staffing skills; information about the results of the evaluation should be used to make management decisions, not just for reporting; the performance appraisal system should be simple and easy to apply. Employees' awareness of the goals and results of the social enterprise helps to increase its effective activity.

In the process of performance appraisal, a social enterprise may face risks: taking into account the interests of a large number of stakeholders and a wide range of activity goals can complicate the appraisal system with a large number of indicators, which in turn can lead to significant resource costs and reduce the efficiency of such a process; the presence of indirect results of activity; delayed manifestation of results of activity; insufficiently defined goals; specificity of the results of the activity, which is manifested in the limited possibility of their quantitative measurement, difficulties in measuring the social effect (not all activities are quantifiable, especially in the sphere of services).

The importance of evaluating the performance of a social enterprise is due to the fact that it will facilitate the effective planning of the activity of such enterprise, as well as enable the potential investors to calculate the future performance of the social enterprise, the amount of potential income and control the efficiency of use of invested funds. For employees and beneficiaries, monitor whether the social enterprise's activities are in line with the stated purpose. For local governments - to make an objective decision on the advisability of promoting a particular social enterprise. For the social entrepreneurs themselves, the evaluation of the activity of the enterprise is the basis for optimization of further activity and helps to demonstrate its advantages for attracting investors.

### **Conclusions**

Most social economy entities in Ukraine are community organizations that solve community problems. Social enterprises focus their attention on achieving social, environmental or social goals rather than earning a profit, so their funding needs differ from traditional businesses. The social investment market in Ukraine is developing spontaneously, and traditional investors are not ready to invest in social enterprises. As a consequence, donors are the main source of funding for social enterprises, especially at the stage of their creation. Donor resources are very important for supporting start-ups, promoting the idea of social entrepreneurship, responding quickly to social challenges related to employment needs and providing services to vulnerable people. Grants give you the opportunity to create a social enterprise, get start-up capital, and build basic business skills for teams. At the same time, the availability of donor resources and their accessibility lead to the fact that supported social enterprises neglect the need to maintain their sustainability, oppose themselves to the business community, do not reach the level of self-sufficiency and cease their activities after the grant is completed.

Social investment in Ukraine is generally underdeveloped. There is no system of mutual funds that deals with this system, there are individual social investors, but the investment is chaotic. International investors are not interested in coming to Ukraine because they do not see strong teams and attractive business opportunities that can compete in international markets.

The main problem for social entrepreneurs is their lack of knowledge in the basics of business, marketing, management, accounting and so on. A social enterprise must be successful, sustainable and competitive in the social investment market, enabling it to function and grow. The ability of entrepreneurs to turn funded projects into profitable business models is important. Investors want to invest in powerful businesses with strong teams that can implement their business ideas.

Promotion of the SE will help to overcome paternalistic perception of social problems in society, activate and involve citizens and business in solving them, more active interaction in the triangle "state - civil society - business", formation of business "with meaning". It is necessary to ensure regular interactive personal communication and networking, continuous peer-to-peer training, exchange of experience, meetings of funding organizations with social enterprises. Businesses, successful startups, government and media need to be involved. Participation in such regular meetings of partners from other countries will help attract external investment in Ukraine. Assessment of social and economic impact is the motivator for the development of the joint venture and attracting new donors and investors.

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## IMPROVING OUTSOURCING PROCESS IN MANUFACTURING INDUSTRY OF ATU GAGAUZIA

**GHENOVA Svetlana,**

Doctor of economics, Assoc. professor,  
Comrat State University, Republic of Moldova  
e-mail: [svetlanaghenova@gmail.com](mailto:svetlanaghenova@gmail.com)

**Abstract:** *The Gagauzian Enterprises (ATO Gagauzia, Republic of Moldova) in the period of development of ITC-technologies converge to the fact that human resource management will be more effective if it will deal with outsourcing experts and specialists of the company. The wide range of created opportunities for the development of manufacturing industry in the ATU Gagauzia (Republic of Moldova) this publication considers. An analysis of the production and economic performance of the manufacturing industry, in connection with the problems of regional authority's regulation of the manufacturing market. The characteristic of production and technical potential of the manufacturing industry in the country and its use is given. Much attention is paid to creation conditions of investments in the fixed capital of the industry and the development of methods of regional authorities of the regulation of investment activities. The publication covers the foundations of the formation and management of the regional human resources. The central objective of this publication author are the analyses and presenting the basis of the stimulation of manufacturing industry development and the attraction of investments to the region, realizing that only by developing the economy through domestic and foreign investments can create the good conditions for increasing the paces of production, improving the quality of products, expanding the boundaries of product sales. The Gagauzian entrepreneurs pays constant attention to the activities of businesses in the autonomy and builds a constructive dialogue to identify the solutions of any issues by initiating and adopting regulations to encourage entrepreneurial activity and investment in the region. The building blocks for such an enabling policy are the openness of the region to domestic and foreign investors, improving the business and investment climate, and the creation of preferential conditions for attracting investments to the main sectors of the region (including manufactory industry)*

**Key words:** Manufacturing industry, Free economic zones, ATU Gagauzia, Human Capital, ITC-technologies, ITC-outsourcing, Human Capital, Investor

**JEL classification:** L11, L53

**UDC:** 338.45.027(478-29)

### Introduction

The term outsourcing appeared in the everyday life of Western companies in the 80s last century, since then its popularity has been growing steadily. According to Gartner Group, the turnover in the outsourcing market is growing annually by 16.5%. Fortune magazine claims that at least 90% of modern enterprises use outsourcing to implement at least one business process. Outsourcing appeared in our country a little later and developed much more slowly due to a number of reasons, which we will talk about a little later, allows not only simplify the process of the company (numbers of which is more than 6500 on the territory 1834 square kilometers), but also improve the efficiency of the organization. Therefore, outsourcing can be represented as a component of an effective management. In turn, considering the using of outsourcing in the conditions of the discovering / developing of the new customers marketing, the cross-border integration of the Republic of Moldova can get the opportunity of rapid economic development in today's competition. The chapter explores such direction of activity as the ITC-outsourcing in terms of evaluating its impact on the performance of economic development.

Most studies and examples of the developing new markets into practice are focused on using the ITC technologies. With all these difficulties, can simplify the use and further development of the new consumers markets, using outsourcing. This firstly, cost effective, and secondly avoids the additional risks associated with the integration. Thus, the use of outsourcing in the development of new markets gives us advantages such as adaptability to changing market conditions, the element of effective management and maximum flexibility in the implementation of the task. The importance of the ITC- outsourcing in the activities of enterprises in socio-economic development of Moldova, their underutilized potential, an unfavorable business climate and the need for a substantial improvement in



the policy effective development of new consumers markets has determined the relevance of the author's research topic

### Background

Gagauzia's current manufacturing industry builds on its strong industrial past. The Manufacturing industry of ATU Gagauzia is vibrant and growing, and consists of labor intensive enterprises. They are active in producing apparel, leather goods, furniture, construction materials, equipment and spare parts for agricultural machinery, cosmetics, pharmaceutical products, and refined petroleum. Moreover, several industrial skills are well-preserved

A total of 150 enterprises (*out of which 40 large ones*) represent the current industrial base of Gagauzia. In 2017, the industrial production registered a growth of 23.3% compared to 2016, amounting to 1 587,4 million MDL. The share of the manufacturing sector of ATU Gagauzia accounts for 3% out of its total economy and employs about 6000 people

Why business process outsourcing to manufacturing industry ATU Gagauzia? First of all its depend of the «Human Capital»:

- Gagauzia is an autonomous region of the Republic of Moldova. The region is home to 162,000 inhabitants. The municipality of Comrat with a population of 26,200 inhabitants is the administrative center of autonomy;
- More than 80 percent of the total population speaks the Gagauz language, which is closely connected with the Turkic language family. This allows the Gagauz people to understand and speak Turkish and Azerbaijani. Russian and Romanian languages are the second most common languages in Gagauzia. English is widely spoken and understood among young people;
- Labor resources - the able-bodied population is 104.8 thousand people, which make up 64.8% of the total population;
- Annually, about 750 students graduate from Comrat State University, two colleges and 3 vocational schools

The second factor, which show the background of business outsourcing of ATU Gagauzia is its «Location» items:

- Distance from mun. Comrat to the capital of the Republic of Moldova, Chisinau, is 100 km;
- Direct flights to Chisinau from Vienna, Munich, Frankfurt, Rome, Milan, Paris, London, Istanbul, Moscow, etc.;
- Time compatibility with all European countries and most CIS countries. Central European time + 1 hour;
- Citizens of the USA, EU, Turkey and the CIS can travel to the Republic of Moldova without visas

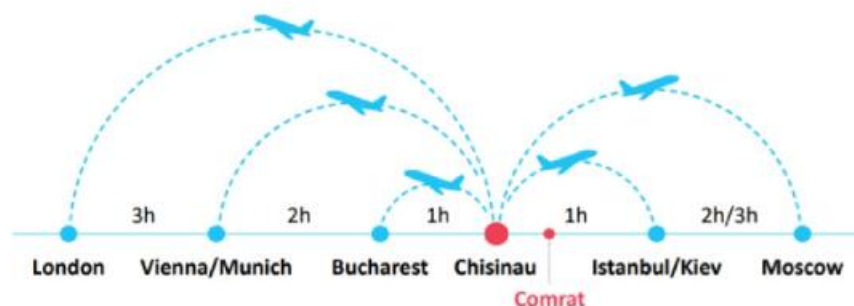


Figure 1. Destinations and time to reach destinations from the Republic of Moldova by air travel  
 Source: Compiled by the author according to the data provided by the Informational National Bureau of Statistics of the Republic of Moldova

The third argument confirming the necessary of implementing business outsourcing in the ATU Gagauzia is the «Cost efficient destination»:

- Low operational costs; office rental prices; utilities;
- Lowest labor costs in Europe;
- Low taxation - income tax from individuals and legal entities, payments to the social insurance fund;
- Corporate income tax is only 12%, while benefits for the IT sector provide an opportunity for exemption from most social taxes if the gross income of an IT specialist is above \$ 680;
- One of the best wired internet connections in the world, and also one of the cheapest

Another important, fourth, factor determining the willingness and need to implement outsourcing is «Certainty for investors»:

- Stable and predictable economic situation in the region;
- Openness and flexibility of regional authorities in regard to the stimulation of investment activity;
- Support provided to investors by the leadership of Gagauzia;
- Openness and flexibility of regional authorities regarding incentive measures investment activity
- Well-developed infrastructure of modern means of communication

The fifth factor, which very clear the background which helps to implement the business outsourcing of ATU Gagauzia is it «Incentives for investors in Gagauzia»:

- The provision of in-kind grants - the transfer of land, buildings, structures, machinery and equipment ;
- Tax incentives - reimbursement of income tax on entrepreneurial activity for each calendar year for a period of up to 5 years;
- Investment subsidies - reimbursement of up to 30% (not more than 5 million lei) of actual costs for construction and installation works, purchase of equipment without VAT;
- Reimbursement of up to 50% of the costs of retraining personnel for the manufacturing industry;
- Single (unified)window - allows the investor to draw up the necessary documents and obtain permits faster than on time

### **The research methodology**

The materials used in this chapter are the normative acts of the European Union and Republic of Moldova, textbooks, monographs and other publications specific to the theme, national and international conference materials that helped the author to understand and explain the statement, aspects and problems of development, identify the priorities of the strengthening of the ITC-outsourcing in the activities of enterprises, in socio-economic development of Moldova. The quantitative analysis is performed on selected data and processed by the author based on Eurostat, the statistical yearbooks and other publications of the National Bureau of Statistics of Moldova, databases of ATU Gagauzia (ATU-Autonomy Territorial Unit) and other official communications of the institutions. The empirical study, analysis of the links provided the meanings and explanations pertinent to the phenomena and processes occurring in the national market ITC- outsourcing

Outsourcing is the process of transfer by a company the parts of production or business processes of another company that is an expert in this area. Currently the ITC outsourcing market characterized by the presence of a large number companies from different countries. Now has existing the highly specialized companies and contractors operating in various industries. As world experience shows, leading in the field of outsourcing countries like USA and Great Britain. However, gaining more and more turnovers and Europe, and Asia, and other countries of the world. Outsourcing allows to simplify not only the process of the company but also increase organization effectiveness. Consequently, outsourcing can be thought of as a component of effective company management

Business Process Outsourcing (BPO) in Republic of Moldova is developing fast due to its multilingual population and excellent internet and telecommunication infrastructure. The large international companies present in Moldova have developed contact centers for the Moldovan and foreign markets. The number of companies that have opened specifically to serve foreign markets is constantly growing. The main areas of BPO are call centers and contact centers, payroll processing, accounting, business intelligence, data entry and IT services. Most companies started their activities in Chisinau, the capital of the country, but they are interested in activities in other regions of the Republic of Moldova where there are universities. Mun.Comrat is one of the five largest settlements in Moldova, which are provided with labor resources with higher education. The investors are able to service your customers from ATU Gagauzia in EU, Turkey and CIS markets with inherent cost advantages and in various languages. The Republic of Moldova has one of the best-wired internet connections in the world, as well as one of the cheapest in terms of price per MbitGagauzia is a place where it is possible to provide BPO services at the lowest operating costs in Europe. BPO has the potential to become the fastest growing segment in the field of information technology (IT) in Gagauzia. Due to the presence of human resources and infrastructure, BPO in Gagauzia has a high potential for growth and can become a generator of employment, especially for young people. The Gagauzia laid the foundations of IT education to support the development of BPO, as well as the development of information and communication technologies (ICT) with higher added value: software development, administration of applications and infrastructure, development of web platforms, etc.

**Top reasons to invest in manufacturing industries in Gagauzia.** In ATU Gagauzia there is also a big potential for the production of automotive components(wire harnesses, car covers, car seat covers)

Table 1. The factors determining the investment attractiveness of the processing industry of ATU Gagauzia (2017)

<b>Factor</b>	<b>Characteristics of the factors</b>
Labor force	Competitive labor and production costs in the region (Labor Average net wage ca. 195 EUR/month, Production cost: 0.05 EUR per minute). This creates a competitive business environment formanufacturing.Human resources are one of the most important assets of ATU Gagauzia ATU Gagauzia offers an active, skilled and multilingual workforce. Widely spoken languages: Romanian, Russian, Gagauzian, Turkish, English, Bulgarian, Ukranian
Flexibility and short delivery time	Flexible, reliable and quick delivery tailored to customer needs. Most major destinations both from the EU and CIS can be reached within 2 truck days. Orders are executed and delivered on average within 2 weeks, with no minimum order restrictions
Proximity and easy access to major markets	Gagauzia's trade is largely liberalized to both the European Union, the Commonwealth of Independent States and Turkey
Long standing experience	Industry tradition is stretching over decades, including an experienced labor force in Apparel clothes, knitwear, etc., leather processing & leather goods; wool processing (sheep); blankets and pillows manufacturing (connected to sheep)

*Source: Compiled by the author according to the data provided by Economic development Department of the Executive Committee of ATU Gagauzia*

The goods that can be produced competitively in the Republic of Moldova: Automotive components, Textile, Apparel, Footwear and Leather goods, Furniture

**ICT sector in Republic of Moldova and development perspectives in ATU Gagauzia.** The level of development of the ICT sector in Moldova has grown significantly over the past 6 years, showing rapid growth and reaching a level of 460 million euros in 2015 and with a significant contribution to the country's GDP (about 7% in 2015). During this period, exports of software products almost quadrupled. In addition, a study by International Data Corporation (IDC) (March 2015) indicates that the ICT sector is one of the most promising areas of development in the Republic

of Moldova. At the same time, Gagauzia has great potential to contribute to the development of the ICT and BPO sector in Moldova. Every year, about 25 specialists in the field of information technology and mathematics graduate from the Faculty of Economics of Comrat State University. To cover the high demand for IT professionals for fast-growing. As part of the ICT sector in Moldova, and to promote ICT investment opportunities in the region, the Gagauz authorities intend to provide an appropriate academic environment for the training of ICT specialists. By the academic year 2018-2019, the Faculty of ICT will be created at Comrat State University, where more students enrolled in working with various information systems, computer technology, computer engineering communication systems, programming, etc. will be able to enter

Along with this, favorable tariffs for utilities are offered in ATU Gagauzia (table 2):

Table 2. The utility cost in ATU Gagauzia

Internet:	Rent price per 1 Gbit of bandwidth is as low as 15 EUR/month
Water:	0.726 EUR/m <sup>3</sup> in Comrat 1.7 EUR/m <sup>3</sup> in the region
Renting office prices:	1.5 - 7.3 EUR/m <sup>3</sup>
Sewerage:	0.586 EUR/m <sup>3</sup>
Electricity:	0.10 EUR/kWh
Gas:	0.34 EUR/m <sup>3</sup>

*Source: Compiled by the author according to the data provided by the Informational National Bureau of Statistics of the Republic of Moldova*

Today the IT field is the most developed area. High quality specialists must take into consideration all current changes on the labor market, as well as new trends, research achievements and development of technology. Usually, the labor market uses programmers or system administrators. Consequently, the personnel component of IT outsourcing is mainly determined by graduates technical specializations to the direction of the programming and network engineering, or representatives of IT companies. The most companies are located in the capital of Republic of Moldova – Kishinev. In the Republic of Moldova there are approximately 400 companies operating in the field of information technology

Qualified specialists (students) who are educated in specialties specific to this sector can work in companies and increase their productivity:

- There are four faculties with a 4-year education cycle at Comrat State University. The university prepares highly qualified specialists in the field of economics, law and agriculture. During the 2016-2017 academic year, 384 graduates graduated from Comrat State University;
- The Department of Foreign Languages offers the study of Gagauz, Romanian, English, German and Greek;
- 2 colleges: Comrat College and Agricultural Technical College in the village Svetlii; 179 in starters in 2017. Specialties: agronomy, accounting, transport, agricultural mechanization, marketing, agricultural technology;
- 3 vocational schools (Comrat, Chadyr-Lunga, Vulcanesti); 142 graduates in 2017: Specialties: seamstress, carpenter, mechanic, electrician, plasterer, builder;
- The vocational training center, with branches in 7 localities where students undergo training in specialties: woodcarving, mechanics, seamstress, accounting, cosmetology, etc.; 190 graduates in 2017.

The Russian is the language of instruction in all educational institutions of Gagauzia, although Gagauz and Romanian are taught as compulsory languages. English and German are taught as foreign languages.

*Communication infrastructure in the ATU Gagauzia:* is maintained at a high level and has impeccable coverage, both wired and wireless communications. Fixed-line communication is available in all locations, however less, the number of mobile subscribers is growing very fast relative to landline. In the ATU Gagauzia there is a high level of development of Telecommunications. There are 3 leading telecommunication companies offering their customers 3G / 4G communication services. In

the table 3 is presented the key facts, which confirmed the high level of development the telecommunication area in ATU Gagauzia:

Table 3. The key facts of the development telecommunications in ATU Gagauzia

Key fact	Data
The penetration rate of a fixed line internet connection has reached	47.65 % in the ATU Gagauzia (in the Republic of Moldova – 45%)
International companies, like Orange and Teliasonera, are present in the local telecoms market	for around 20 years
Created conditions for lowest fixed broadband costs	5th in the world
Number of users of 4G	the 4G services in 2015 in Moldova has grown 4 times compared to 2014
4G territory coverage in Moldova have grown	2.5 times reaching 84 %
Number of users of internet services in Moldova both fixed lines and mobile	has reached 2 million 294 thousand
Mobile internet in Moldova has reached the penetration	rate of 49.4 %

The fixed telephony market is dominated by Moldtelecom – a joint-stock company with the state being the unique stockholder. The company provides fixed telephony and internet services of national coverage. The mobile communications market in Moldova, as well as in Gagauzia, is served by two international groups: Orange (French) and Teliasonera, Moldcell (Swedish). Moldtelecom is also present in the mobile market with its subsidiary UNITE. With a total of 4,460,000 subscribers and 82.1% of active users in Moldova, mobile telephony in 2017 reached a density of 103%.

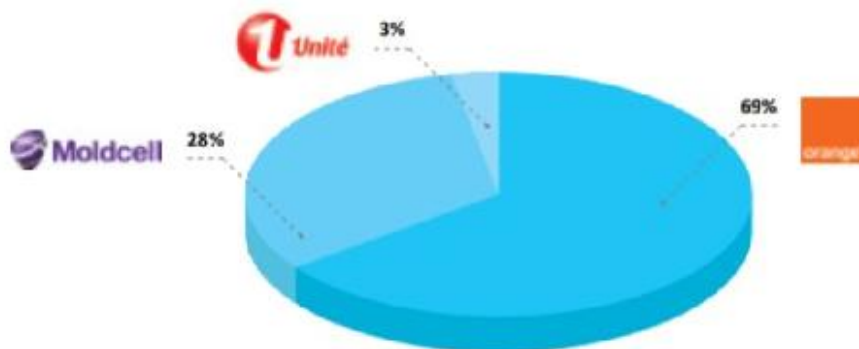


Figure 2. The structure of the mobile market in ATU Gagauzia

Source: Compiled by the author according to the data provided by the Informational statistical bulletin «The socio-economic situation of the Republic of Moldova in 2018, the National Bureau of Statistics of the Republic of Moldova» (2018)

In 2017, the capacity of Moldova's Internet access channels increased to 350 Gbit / s. This evolution was caused by an increase in investment in the development of fiber optic and 4G networks, an increase in the number of users and the growing demand for Internet services. The market structure by connection type also proves that wired Internet services in Moldova are at a high level of development, since fiber is the most common type of connection

Table 4. FTTx (Optic fiber) Download speed

Country	Speed	Rank
Moldova	41.78 Mbps	19
Bulgaria	38.28 Mbps	25
Russia	29.88 Mbps	37
Slovakia	29.78 Mbps	38
Czech Republic	29.59 Mbps	39

Source: Ookla.com

Table 5. Largest providers of internet services in Republic of Moldova

Name of Companies	Marketshare, %
Moldtelecom	61.9
Starnet	23.1

Source: [www.anrceti.md](http://www.anrceti.md)

The Fixed internet subscribers by type of access in in the Republic of Moldova is covering the most by two largest operators (figure 3):

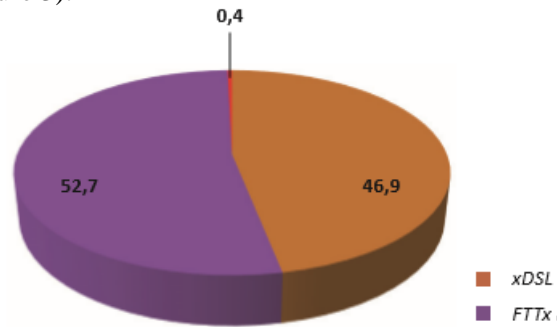


Figure 3. The Fixed internet subscribers by type of access, 2017

Source: [www.anrceti.md](http://www.anrceti.md)

The dynamic structure of number of subscriber in Gagauzia 2013-2017years is progresses with steady growth dynamics (in conditions of the penetration rate in Gagauzia – 14.06%) (Figure 4):

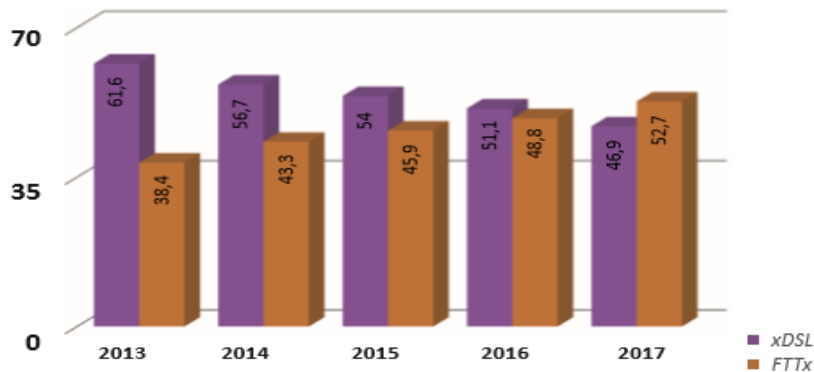


Figure 4. The dynamic structure of number of subscriber in Gagauzia 2013-2017 (in %)

Source: [www.anrceti.md](http://www.anrceti.md)

In the table 6 is presented the key facts, which confirmed the high level of development the mobile internet in ATU Gagauzia:

Table 6. The key facts of the development telecommunications in ATU Gagauzia

Key fact	Data
All mobile network operators offer 3G High-Speed Downlink Packet Access (HSDPA Internet access) throughout the country including Gagauzia region	since 2008
Long-Term Evolution (LTE) standard for high-speed wireless communication for mobile phones and data terminals was launched by Orange Moldova and Moldcell	in 2012
At the moment Orange Moldova and Moldcell can be accessed	in 65 localities throughout the country at 150 MBps
The market still has a lot of room to grow	penetration level 48.5 %,
There are three main operators of mobile internet services	Orange Moldova, Moldcell and Moldtelecom

Source: Elaborated by the author on the basis of on the conducted research

The Law of the Republic of Moldova N. 77 on IT parks regulates the creation and operation of information technology parks. The purpose of the law is to stimulate development of the IT industry in Moldova through the provision of benefits for companies resident in the IT park. The law entered into force on 01.01.2017. The main benefits provided to domestic and foreign investors - residents of IT parks - can be listed as follows:

- The common tax in the amount of 7 percent of the turnover, which should replace: income tax on business (PNPD); personal income tax (PNFZ); contributions to social and health insurance funds; local taxes and property taxes;
- The state control over the activities of residents of the IT park is carried out every three years (in accordance with the requirements of the law) and at the same time by all controlling bodies;
- The state provides a five-year guarantee for preferential activities established by law

The law provides for the following activities that can be performed in IT parks as part of the preferential regime:

- Software development (customer -oriented);
- Computer games editing;
- Other software products editing;
- Computer equipment management and operation;
- Data processing, web-page administration and related activities;
- Web portals activities;
- IT consulting services;
- Other IT services

It is noteworthy that the parks will be "virtual" and residents will work from their own offices located in the Republic of Moldova. IT companies will become virtual residents of IT parks after registering as residents and accepting all obligations stipulated by law. Despite the fact that sophisticated hardware is not manufactured locally, both international and local companies specialize in the maintenance and supply of hardware. Moldovan ICT companies benefit from the presence of leading companies such as HewlettPackard, Intel, Microsoft, IBM, and local registered companies such as DAAC System Integrator and MCS. The Moldavian Association of ICT Companies promotes the development of the ICT sector in the Republic of Moldova through partnerships between private companies, state institutions and international organizations in order to increase the competitiveness and development of this sector and the potential of companies, expand the market, attract investment in the country and participate in the decision-making process and regulatory processes nationally and internationally

### **Conclusions**

Summarizing the findings of the studies conducted in the chapter, can be stated that attractive conditions for the development of ITC - outsourcing are created in the ATU Gagauzia

Advantages of outsourcing in IT technologies which can get region ATU Gagauzia is:

1. Examination: often at a foreign supplier (outsourcing company) there is a special equipment or technical experience that helps to solve the set tasks much better and faster than it would occur within the company;
2. Cost reduction: the great attractiveness of doing business through outsourcing reduces the cost of labor, work and even equipment;
3. Staff flexibility: according to James Buki, "outsourcing will allow operations that have seasonal or cyclical requirements, bring additional resources when they are you will need, and let them go when you're done" - the perfect solution to saving money on search, selection, adaptation and development of personnel;
4. Reducing IT costs through efficiency and economy of scale from the supplier services;
5. Access to world-class knowledge, experience and resources;
6. Minimization of significant capital of IT infrastructure costs;
7. Confidence in future IT costs

Although outsourcing IT functions, whether internal or offshore, seems attractive in terms of cost savings and other benefits, there are disadvantages and risks of using outsourcing. Some potential disadvantages for outsourcing are:

1. Loss of control over critical business services;
2. Lack of flexibility in the services received;
3. Damage caused by morale / culture clashes (between the service provider and the client);
4. Distraction from the need to manage the relationship with the service provider;
5. Language / cultural barriers: they can involve both employees and customers, especially when clear explanations of problems and solutions are required;
6. Different time zones: it can become an obstacle to communication and coordination with the company for hire;
7. Slower traction: language barriers combined with time differences can sometimes lead to an increase in projection / resolution time

To minimize the risk, it is necessary for the organization to recognize the cultural similarity between itself and a specialized firm. Working relationships often require trust and geographic proximity. Similarities can be found in historical context or in a common language. Outsourcing success usually occurs between organizations that operate in similar industries. Understanding technical language and organization best practices helps create a strong working relationship. Outsourcing allows management to transfer some functions of a specialized company. Their transfer allows management to focus on larger issues within the organization. As a rule, specialized company that deals with outsourcing IT-work, boasts technological capabilities that are superior to the organization. Organizations see ITC outsourcing as a cost-effective means of expanding in other countries and in new markets.

If companies are looking for short-term assistance or cheaper rates for simple tasks, outsourcing can be the right step for the company. However, one should remember about possible risks and select an outsourcing company wisely, and not just the most profitable (cheap) in economic terms, as it often turns out that the company receives results of poor quality and irrelevant appointments

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**NATURAL AND ECONOMIC FUNDAMENTALS OF LAND USE  
(on the example of ATU Gagauzia)**

**PARMACLI Dmitrii,**

Doctor Habilitatus of Economic Science, professor,  
Comrat State University, the Republic of Moldova  
e-mail: [parmad741@mail.ru](mailto:parmad741@mail.ru)

**DUDOGLO Tatiana,**

PhD in Economics., interim associate professor,  
Comrat State University, the Republic of Moldova,  
e-mail: [dudoglo\\_tatiana@mail.ru](mailto:dudoglo_tatiana@mail.ru)

**Abstract:** *This work presents an assessment of the current composition of agricultural land in the context of regions and in general for the ATU Gagauzia and it demonstrates the socio-economic role of land in the development of the region. The qualitative characteristics of agricultural land in the autonomy for each settlement, as well as the results of the transfer of land to private ownership and the existing structure of business entities on the basis of land ownership are given. The structure of the sown area of autonomy is presented in the form of a table. The article emphasizes that the achieved land productivity in the autonomy lags significantly behind the potential opportunities of the fertile chernozems of the region, for which the table shows the scientifically-based (potential) and prevailing levels of productivity of the main agricultural crops in the ATU Gagauzia for 2009-2018. Farmers of autonomy achieved fruit yields less than 1/3 of the scientifically based level, yields of corn and winter wheat are slightly higher than 2/5 and 1/2 respectively, sunflower is 2/3 and grapes is almost 3/4. There are listed the causes of such a sharp drop in land use intensity. In conclusion, it is noted that the efficiency of land use in agriculture in modern conditions is determined by a more complete use of the potential of land fertility and the provision on this basis of a substantial increase in crop yields.*

**Key Words:** *agricultural land, arable land, effectiveness of the land use, productivity, soil, land fertility, structure of sown areas.*

**JEL classification: Q15**

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**Introduction**

For a country that has in fact a full development of the land resources and a high population density, and the economy of which is largely determined by the level of development of agriculture, the problem of using agricultural land becomes of vital economic, environmental and social importance.

The question is quite natural: how effective are used land resources in agriculture, in which the economic and natural processes of reproduction are closely linked?

ATU Gagauzia is located at the epicenter of the zone with insufficient moisture, in the zone of unstable (risky) farming. The average annual rainfall is about 380 mm. Agriculture on the territory of the autonomy is often harm by the adverse natural phenomena. These include droughts, dry winds, strong winds, dust storms, late spring and early autumn frosts, hail and others [1, p. 61-63].

Land is the most important wealth of our society, which is why increasing its productive power is a national task. Improving soil fertility is one of the main tasks of agriculture and of each land user. The subsoils of our territories are practically deprived of ore and combustible minerals, our own hydropower resources are very limited, and forest tracts occupy a small area. Therefore, the main natural productive forces used in the region are climate (heat and light resources) and especially soils, which largely determine the economic potential of autonomy, their role in the international division of labor [2, p. 21].

**Analysis of recent research**

Modern agricultural science is looking for new ways to improve the efficiency of agricultural production. In this sense, the work of Pavlik V.P. is of interest. [3, p. 61-63] and Shpykuliak O.G., Materynska O.A. [4, p. 31-33], which proposed a new approach to assessing the effectiveness of products and gave explanation to the factors for its growth.

The studies of Altuhov A.I. also appear to be important [5, p. 2-11]. In them, the author explores the modern approach to assessing the effectiveness of land use in agriculture.

Among the Moldovan authors, it should be noted the work of doctors of the habilitat of economic sciences A. Stratan, V. Doga and E. Timofti, who developed and proposed in their studies their own options for the economic mechanism for increasing agricultural efficiency based on rational use of land [6, 7, 8]. Work of Doctor of Economics L. Todorici is also of great importance and its aim is to study the problems of sustainability of agricultural production [9].

### **Statement of the main results of the study**

Agricultural lands of Gagauzia account for 138 thousand ha, arable land and perennial plantings occupy 104.7 thousand ha and 10.9 thousand ha, respectively (Table 1). The plowing area is one of the highest in the world: cultivated land (arable land and perennial plantings) occupies 83.8% of agricultural land.

Table 1. The composition and structure of agricultural land in ATU Gagauzia  
(on 1<sup>st</sup> of January 2019, ha)

Indicators	Region			ATU Gagauzia
	Comrat	Ceadir-Lunga	Vulcanesti	
Area of agricultural land	63138	48852	25982	137973
including				
arable land	46743	38777	19228	104748
orchards	2022	1534	452	4008
grapes	4446	2332	3245	10023
nut plantations	233	82	517	833

Source: data from the Office of the Cadastre, Land Fund, Ecology and Water Resources of ATU Gagauzia

The territory of autonomy is located in the Bugeac steppe, which is part of the south-Moldavian hilly plain. Its surface is crossed by wide valleys, and the slopes are cut by numerous ravines. The relief of the region is characterized by steppes and small hills, there are also small rivers Ialpuj, Ialpujel, Lunga and Lunguta. Gagauzia, like the rest of Moldova, is located in the Carpathian seismic zone. The soil in the ATU Gagauzia is represented by carbonate chernozems - 65.4 thousand hectares and typical low-humus chernozems - 63.4 thousand hectares. The water resources of the region are mainly represented by groundwater sources with a volume of 8-10 million m<sup>3</sup>. Surface sources are limited. In the territory of ATU Gagauzia there are two large reservoirs: in Comrat - with a water mirror area of 1.7 km<sup>2</sup> and in Congaz - 4.9 km<sup>2</sup>. Mineral reserves on the territory of the autonomy are insignificant and are represented by sand, clay, and insignificant deposits of brown coal, which lies in thin layers and is of poor quality, which makes its extraction not profitable [10, p. 11-12].

The qualitative characteristics of agricultural land is characterized by rather high bonitet indicators (Table 2). The weighted average score at the beginning of 2018 is 58 points.

As can be seen from the table, the soil quality index is presented in the decreasing order, starting with of the city of Ceadir-Lunga (66 points), Mun. Comrat (65), Vulcanesti (65), v. Congazcic de Sus (62), p. Etulia (60) and the village of Cismichioi (60). Low soil quality index (bonitet) is a characteristic of the lands of the village of Bugeac (48) and the village of Carbalia (45).

In ATU Gagauzia 64271 ha or more than 44% out of 145 thousand ha of examined lands are subject to varying degrees of erosion. Every 15 hectares of land is heavily eroded, which, of course, causes serious concern to land users.

Soils, as noted above, are the main type of natural resources in ATU Gagauzia, and they are the most important criterion for determining the productivity of the main factor of production in rural areas. The effectiveness of land use largely depends on the fertility of soils, their rational and targeted use, protection from adverse natural and human actions, scientifically based land reclamation and chemicalization of agriculture.

As a result of land privatization in the countryside, new agroformations were created on the basis of former collective farms and state farms, and they have the form of agricultural cooperatives, limited

liability companies, joint-stock companies, and also peasant (farmer) farms. As of the beginning of 2019, there was one collective farm in the autonomy (collective farm "Pobeda", the village of Copceak), 8 cooperatives, 14 joint-stock companies and 312 limited liability companies. With few exceptions, new agricultural enterprises covered 200-400 hectares of arable land and perennial plantings located in three to four different massifs, and peasant farms consist up to 30-40 hectares. The existing crop rotation systems were violated everywhere, and field cutting has undergone significant changes.

Table 2. Qualitative characteristics of agricultural land in the ATU Gagauzia  
on January 1, 2018

№	Name of administrative territorial unit	Total agricultural land (ha)	Examined lands (ha)	Weighted average assessment of soil bonitet (in points)	Eroded land			
					Total	lowly	moderately	highly
1	Comrat	12563	12350	65	4620	2267	1538	815
2	Ceadir-Lunga	7311	6925	66	1894	1323	506	65
3	Vulcanesti	12638	12152	65	6196	3668	1435	1093
4	Avdarma	5213	5069	51	3283	1785	986	512
5	Baurci	6044	5819	57	1927	1108	508	311
6	Besalma	4695	5000	51	2240	836	871	533
7	Besghioz	4218	4169	58	1388	836	503	49
8	Bugeac	1866	2040	48	1111	387	336	388
9	Carbalia	1732	1714	45	1041	404	361	276
10	Cazaclia	8144	7952	49	3677	1644	1374	659
11	Ciriet-Lunga	4536	4436	53	2572	1481	717	374
12	Chirsovo	8510	8549	57	3528	1820	1080	628
13	Cioc-Maidan	6042	5659	53	3143	1555	944	644
14	Cismichioi	7639	7756	60	3471	1892	991	588
15	Chioselia Rusa	896	837	53	359	150	91	118
16	Congaz	10625	10854	58	3632	2194	1099	339
17	Congazcic de Sus	2831	2575	62	1343	943	266	134
18	Copceac	8940	8891	58	2737	1913	701	123
19	Cotovscoe	1173	1145	55	482	217	121	144
20	Dezgengea	8044	8304	59	4688	2738	923	1027
21	Etulia	5041	4929	60	2224	962	949	313
22	Ferapontievca	2811	2734	58	1204	991	213	
23	Gaidari	4161	4071	54	1946	924	737	285
24	Joltai	2681	2614	56	1592	1114	442	36
25	Svetlii	2310	2546	59	713	491	199	23
26	Tomai	6331	6204	54	3260	1811	945	504
	<b>Total</b>	<b>147004</b>	<b>145294</b>	<b>58</b>	<b>64271</b>	<b>35454</b>	<b>18836</b>	<b>9981</b>

Source: data from the Office of the Cadastre, Land Fund, Ecology and Water Resources of ATU Gagauzia

Obviously, the creation of new enterprises was carried out without taking into account the need to form optimal-sized farms that allow cultivating crops on the basis of modern intensive and highly-mechanized technologies, maximizing the use of potential land productivity and ensuring high break-even yield levels.

A significant part of crop production is now produced in households and peasant (farmer) households on small land plots, mostly using outdated technologies. Many technological operations are partially mechanized or manually performed. In this regard, the problem of land consolidation and the enlargement of agricultural enterprises to the optimal size remains very urgent.

The transfer of land to private ownership is completed. More than 4/5 of arable land, almost

nine out of ten hectares of perennial plantations are transferred to private ownership. By the end of 2018 around 83.9% of them were in the use of peasant (farmer) holdings and households in the Republic of Moldova. Agricultural enterprises account for 50.5% of the cultivated, 31.8% belong to peasant (farmer) enterprises, and 17.7% in households. A similar structure is observed in the ATU Gagauzia. As we can see, half of the arable land is cultivated by small land users. It is quite obvious that small land allotments do not allow land users to use modern complexes of machines that provide mechanized cultivation of grain and other crops [11, p. 60].

In agricultural practice of developed countries there are increasingly used modern high-intensity crop production technologies. The introduction of optimal doses of organic and mineral fertilizers, the purchase of high-yielding varieties and hybrids, modern plant protection products, and the saturation of the industry with high-performance equipment, which significantly reduces losses during harvesting, require huge amounts of financial investments per unit of land area. Nevertheless, the reality shows that the current state of land use in the industry has considerable reserves of growth returns on the main means of production. The existing low saturation of the industry with material and financial resources, the relative sufficiency of labor in the countryside can increase the return on land use by 25-40%, if introduced the proper organization of production, the competent use of the achievements of science and best practices, and increased technical discipline. And these are huge reserves.

Since the beginning of the 90s, the agrarian policy of the Republic of Moldova was aimed at ensuring socio-economic processes related to changes in ownership and management in rural areas, liberalization of economic activity, adaptation of the industry to work in a market environment. However, this led, unfortunately, to the degradation of agricultural land, and lack of effectiveness of land use.

The fuller and highly productive use of land, increasing of soil fertility, maintaining the economic equilibrium in nature are the most important problems of modern agriculture in the ATU Gagauzia.

The sown area of crops in farms of all categories of autonomy amounted to an average of 94,315 ha for 2016-2018, of which 62.6% was occupied by cereals and legumes, 35.3% by industrial crops, 0.2 % by potatoes, vegetables and melons, 1.9% by feed crops.

A special and extremely important place among the branches of crop production is grain production, which forms the basis of crop production and all agricultural production. It accounts for more than 3/5 of the sown area.

Note that in the structure of grain and leguminous crops, wheat and corn occupy more than half of the entire sown area. Attention should be paid to the high share of sunflower. Approximately every third hectare of crops in the autonomy is occupied by this highly profitable crop. Thus, wheat, corn and sunflower crops account for more than 4/5 of all crops (82.9%). That is why it is very important to ensure a high yield per unit area of crops of these crops.

At the same time, potatoes and open-field vegetables are not essentially grown in agricultural enterprises in the ATU.

An important role is given to feed crops. However, due to the sharp reduction in the number of cattle in the post-privatization period, less than 2% of the sown area is allocated for feed crops. Noteworthy is the very low proportion of feed crops in the structure of crops and an excessively high proportion of sunflower. The structure of the sown area of autonomy is presented in Table 3.

At the beginning of 2019 agricultural land occupied 142674 hectares in the autonomy. As a result of privatization, less than 1% of the land are now in state ownership.

Studies have shown that the achieved land productivity in autonomy lags significantly behind the potential capabilities of our fertile chernozems (Table 4).

As can be seen from the table, autonomy farmers achieved fruit yields less than 1/3 of the scientifically based level, the yields of corn and winter wheat are slightly above 2/5 and 1/2 respectively, sunflower higher by 2/3 and grapes by almost 3/4. Thus, the greatest lag is noted in the fruits and corn production.

Here are just a few reasons for the low productivity of land.

In agriculture, the level of chemicalization in the production of grain, industrial, vegetable and other crops has significantly decreased. In 1980-1990 the removal of the main elements of plant

nutrition was offset by the introduction of mineral and organic fertilizers by 60%, nowadays - by only 10%. Over the past 20 years, the application of organic fertilizers in Moldavian fields has decreased from 9.7 million tons to 0.07 million tons or 140 times, mineral fertilizers - 27 times, the use of water for irrigation has significantly decreased.

Table 3. The sown area of crops in the ATU Gagauzia  
(in farms of all categories, ha)

Indicators	2000	2016	2017	2018	In average for 2016-2018	
					total	%
<b>Cultivated area, total</b>	76091	90675	94966	97303	94315	100
<b>Grains and leguminous grains</b>	49763	58690	57857	60427	58991	62,6
Spring and winter wheat	26302	34984	32475	35897	34452	36,5
Spring and winter barley	5335	10608	9753	7904	9422	10,0
pea	6393	-	1306	1771	1026	1,1
corn	10938	11969	13788	14158	13305	14,1
<b>Industrial crops</b>	15958	29822	35235	34926	33328	35,3
sunflower	13942	27741	31319	32258	30439	32,3
rapeseed	-	1981	3834	2668	2828	3,0
tobacco	1986	100	82	-	61	0,1
<b>Potatoes, vegetables and melons</b>	712	112	73	503	229	0,2
potatoes	-	-	-	-	-	-
vegetables	624	5	-	4	3	-
melons	88	107	73	499	226	0,2
<b>Feed crops</b>	9658	2051	1801	1447	1766	1,9

Source: given according to the General Department of the Agro-Industrial Complex ATU Gagauzia

Table 4. Science-based (potential) and prevailing levels of productivity of the main agricultural crops in the ATU Gagauzia

Crop	Yield, t/ha				
	potential	actual average		ratios of actual productivity to (%)	
		in 2009-2018	actually achieved (for the 3 most productive years)	% of potential level	% of actually achieved level
Winter wheat	48,0	27,5	34,5	57,3	79,7
Corn	66,0	27,8	39,4	42,1	70,6
Sunflower	25,8	17,9	22,2	69,4	80,6
Fruits	228,5	65,2	107,7	28,5	60,5
Grapes	76,7	54,0	82,5	70,4	65,5

Source: elaborated by the authors based on [12, p.96-97]

The reasons for such a sharp drop in the level of land use intensity are not only due to a decrease in the use of organic and mineral fertilizers, insufficient and incomplete material and technical support, which reduces the adaptation of the industry to adverse weather conditions, but, just as importantly, an overall decrease in the quality of technological operations, caused in addition to the above reasons, by an excessive fragmentation of land. The latter also had that negative consequence, which led to a total disruption of crop rotation, of the normal alternation of crop cultivation.

The complete independence of land users has also led to a significant change in the structure of sown areas in the direction of a sharp decrease in the share of peas and perennial grasses, which contribute to increasing soil fertility, and an increase in the sown area of sunflower and winter rape, as highly profitable crops, but most significantly depleting the soil. That is, we have come to such a

structure of crops that is not consistent with the recommendations of science and best practices. In the pre-reform period, perennial grasses and peas occupied 16% of the autonomy in the structure of sown areas, nowadays it is just 4.0%. So, on average for 1981-1990 every third hectare of winter wheat was sown according to the best predecessors with leguminous crops, in recent years only every ninth hectare was sown accordingly.

In contrast to the developed countries of the market economy, the Republic of Moldova still lacks mutually beneficial marketing ties between producers, processors, and retail chains. Producers of agricultural commodity products, as a rule, do not have the necessary information about the consumers of their products, market prices, competitors, the state of the domestic and world markets for certain goods and their development forecasts. And this leads to the fact that rural producers cannot plan the volume of production and the structure of products in the medium term. They are forced to annually change the structure of sown areas, which negatively affects the efficiency of using the main means of production - land.

It cannot be ignored that at present, science has developed high-yielding varieties and hybrids from grain crops, sunflower, and other crops. However, they require, as a rule, a higher agricultural background (higher doses of fertilizers), expansion of irrigated land, i.e. to introduce methods which are not currently implemented. A return to primitive old technologies with utilization of modern varieties and hybrids is a self-deception, a path to nowhere, which is now confirmed by low productivity.

**In conclusion**, it should be noted that in modern conditions the effective use of land in agriculture and in the entire agricultural economy as a whole, is greatly influenced by the fuller use of the land fertility potential and the provision on this basis of a significant increase in crop yields.

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**LAND AS A SOCIO-ECONOMIC BASIS OF STATEHOOD  
(on the example of ATU Gagauzia)**

**PARMACLI Dmitrii,**

doctor habilitatus of Economic Science, professor,  
Comrat State University,  
E-mail: [parmad741@mail.ru](mailto:parmad741@mail.ru)

**DUDOGLO Tatiana,**

PhD in Economics, lecturer,  
Comrat State University,  
E-mail: [dudoglo\\_tatiana@mail.ru](mailto:dudoglo_tatiana@mail.ru)

**BESSARAB Irina,**

master student of the Moldova State University,  
E-mail: [irabessarab17@gmail.com](mailto:irabessarab17@gmail.com)

**Abstract.** *This work highlights the role and importance of land in agriculture, use of which is largely determined by the solution of one of the vital problems associated with the food supply of the population. The leading sphere of the agro-industrial complex is agriculture, which is a very complex socio-economic, organizational-economic and technical-technological system, always fulfilling the role of a locomotive that ensures the development of many sectors of the country's economy. Each agricultural worker provides work for from 7 to 10 workers in related sectors of the country's economy. Authors of this study propose methodological approaches to the classification of the forms of farming (agricultural organizations, peasant (farmer) households and individual households) which are based on the type of economic activity and legal form. Land relations occupy a special place in the general system of socio-economic relations due to the specificity of land as one of the elements of natural resources and at the same time as an indispensable business entity. Determined by the needs of socio-economic development, they are of paramount importance in human life. The peasants look at land not so much as the economic space of management, but as the foundation, the pillar of property for each and everyone, the guarantor of truth and justice. Land for the peasant is life itself. The land on which his ancestors lived and worked was the main measure of values for the peasant. It was the earth which was often defended against enemies. The most important feature of peasant life was a close connection with the land. This connection is important for all mankind as a science about our environment, our survival and balanced development.*

**Keywords:** *land, land relations, agriculture, peasant, habitat, socio-economic development.*

**JEL classification:** Q15

**UDC:** 332.012.2(478-29)

**Introduction**

In modern agrarian transformations, the question of land remains the most acute. The nature of its use largely determines the solution to one of the vital problems associated with the food supply of the population. As the main and irreplaceable means of production in agriculture, land is the basis for the development of the entire agro-industrial complex, it is a constant source of wealth and a national treasure of any state. Moreover, unlike other means of production, which, in the process of economic use, wear out, lose their useful qualities and drop out of production, the quality of land, being a product of nature itself, can be improved with proper and rational use, as well as its productive power can be infinitely enhanced by the application of capital, labor and science, according to K. Marx.

**Analysis of recent research and publications**

The issues of land use significance are considered in the economic literature from various perspectives. In particular, in their publications A.Rasskazova and R.Zhdanov introduce the concept of the effectiveness of sustainable land use [1, p.23-25], S. Siptits examines problems of combining the efficiency and sustainability of the functioning of agri-food systems based on the rational use of land as a basic factor in the industry [2, p. 56-59], and I. Romanenko and N. Evdokimova analyzed



placement of crop production in the territory, which ensures a high degree use of the bioclimatic potential of the region [3, p. 60-63].

Among the Moldovan authors, it should be noted the work of doctors of economic sciences A. Stratan, V. Doga and E. Timofti, who in their studies developed and proposed their own options for the economic mechanism for locating production and rational use of land [4,5,6]. Of great importance is the study of Doctor of Economics L. Todorici, aimed at studying the problems of sustainability of agricultural production and assessing the level of stability of productivity of land in the regions [7].

### **Research Content**

***The importance of land in the system of multi-structured farming in the autonomy.*** From classical economic theory it is known that food production is the first condition for the existence of mankind and all production in general. "People, - as noted F. Engels, referring to K. Marx, who discovered the law of the development of human history, - first of all, should eat, drink, have a home and dress before being able to engage in politics, science, art and religion, etc.". Therefore, the creation of a steadily developing, competitive and efficiently functioning agro-industrial complex is the primary task of each state if it sets as its goal the provision of food security and economic independence. As Jean-Jacques Rousseau once said, the only way to keep the state independent from anyone is agriculture. At least even if you have all the riches of the world, but you have nothing to eat - you depend on others. These are the wise words of the great French writer and philosopher, and they gained a special significance in world practice.

Proclaiming in words the development of the agro-industrial complex as one of the main priorities of its economic policy, the country's leadership in fact finances this most important sphere of the economy according to the residual principle, restraining not only the solution to the food problem, but also significantly aggravating the already difficult situation in related industries. The fact is that the leading sphere of the agro-industrial complex is agriculture, which is the most complex socio-economic, organizational, economic and technical-technological system, always plays the role of a kind of locomotive, which ensures the development of many sectors of the country's economy. Moreover, each agricultural worker provides with work, according to various estimates, from 7 to 10 workers in related sectors of the economy. Therefore, states interested in their food security, as a matter of priority, create favorable socio-economic conditions for the sustainable development of their own agriculture, which is its effective management on the basis of expanded reproduction with increasing growth in the production of basic agricultural and livestock products through the rational use of land and other resources, widespread use of the latest achievements of scientific and technological progress, the most progressive forms of labor organization, while maintaining and multiplying the ecological state of the environment. Carrying out the development of agriculture in precisely this way, highly developed states guarantee their food security and economic independence, ensuring stable growth in the production of high-quality food products that are affordable and satisfy the needs of the population according to physiological norms.

In the course of economic transformations in agriculture, a multistructured agrarian way of organization was formed, and it is represented by various forms of management and structures. In the framework of this study was proposed a methodological approach to the classification of the forms of farming management (agricultural organizations, peasant (farmer) households and individual households) based on the type of structure of economic activity and legal form. The economic justification for the allocation in the agricultural sector of the region of 6 household structures:

- for family consumption;
- family business;
- private;
- state;
- cooperative;
- public.

The basis of the family consumption structure is family work and production for personal needs. This way is the most numerous and is represented by household goods. The family business form was developed in peasant farms, which carry out their activities by the forces of their family

members and in the household goods of the population. The private structure is based on private property, it has been developed in agricultural organizations of various organizational and legal forms and is characterized by the use of collective labor and the relatively large size of farms. Separately, it is necessary to highlight the state, cooperative and public forms, as they have their own distinctive features and characteristics. The state structure is based on state ownership and is represented by state, municipal and autonomous institutions. The cooperative way, although it is based on private property, but at the same time involves the personal labor participation of members (owners) of the cooperative. Non-profit organizations created on the basis of different forms of ownership (state, municipal and private) in the form of associations, unions, public and religious organizations should be included in the public structure.

Currently, small forms of management are experiencing big problems with the commercialization of their products, and processing of the production, they have limited technical resources for the provision of transport services, tillage and other works. To solve these problems, a new form of organization in rural areas is becoming more common - agricultural consumption cooperation, the main activities of which are the collection and sale of products, their processing, provision of material and technical resources, the implementation of agricultural measures, the provision of transport and other services through the combination of forces and funds of cooperative members, borrowing to form a production base.

***Earth as a factor in preserving national characteristics of social economic development of society.*** An important area of modernity is the deep transformation of land relations. The objects of these relations in the agricultural sphere are agricultural lands (arable land, perennial plantations, hayfields, pastures), lands of rural settlements, lands of forest and water funds located in rural areas. In the system of these relations, two links are distinguished. The first link is the legal basis of land ownership, including the rights to own, use and management of land; the second link is the economic mechanism for regulating land relations, including fee for the land use, regulatory and market prices, economic incentives and sanctions.

Is Earth an economic resource, human habitat or home? The questions raised are the eternal philosophical and practical dilemmas faced by humanity... This is the only, unique and irreproducible economic resource of its kind, this is the only human habitat destined for by God, and at the same time is his native home, where there is warmth, comfort, joy and the love, faith, and hope that inspire man.

Land relations occupy a special place in the general system of socio-economic relations due to the specificity of land as one of the elements of natural resources and at the same time as an indispensable household object. Determined by the needs of socio-economic development, land relations are of paramount importance in human life. Earth is indispensable for human society, and above all, because it represents the only habitat of all human generations. The Earth, being the only habitat and a native home for a person, feeds this person, grows him and will someday accept into his motherly fold. Earth is the most important component of the natural environment, which functions according to the laws of a living organism, helps to purify the atmosphere, stores water resources, and is a breeding ground for all living things.

The cornerstone of land relations is agricultural land, which is and will be the main source of production of goods of universal significance which is food. In this sense, agricultural land forms the basis of social production and human activity. Hence: historical experience has prompted people and states to treat agricultural land as a national wealth and impose certain restrictions on the right to manage this resource, according to the requirements of the time and circumstances. It should be remembered that the peasants look at the land not so much as the economic space of management, but as the basis, the foundation of property of each and everyone, the guarantor of truth and justice.

Today, pragmatism and individualism began to dominate in public relations, and entrepreneurial activity, as one of the priority economic resources, is primarily aimed at generating advantages and profit. Hence here comes the importance of state regulation of land management, which should ensure the achievement of the following goals:

- safety and rational use of land resources;
- targeted use of agricultural land and land with agricultural purpose, depending on the quality characteristics determined in accordance with the land cadastre;

- compliance with environmental requirements for the economic use of land;
- the priority of the land law, land use regime, state registration and regulation, in which the alienation of land resources, their transfer and circulation are allowed only on the basis of direct legislative acts.

In general, the application of land legislation serves as a form of state regulation based on the power-organizing functions of the state. In this case, the main functions of state regulation of land relations should be: accounting, planning, distribution and redistribution, the function supervision over the proper use of land, control and security. The accounting function is basic for the remaining functions of state-legal regulation of land relations, since the effectiveness of planning, distribution, redistribution of lands, control and protection, their proper use depends on the accuracy of knowledge about the availability and condition of the land fund.

***Land use is the basis of rural areas.*** Land for the peasant is life itself. The land on which his ancestors lived and worked was the main measure of values for the peasant. It was the earth which was often defended against enemies.

A person who does not know his roots, does not love his homeland, which "does not dream of grass from his home," will not respect the traditions, culture and national feelings of another nation.

The earth is endowed with a certain educational purpose. It lies in the fact that sometimes it causes an inexplicable desire to follow good examples, established norms and rules, traditions of our ancestors. The most important feature of peasant life was a close connection with the land. This connection is important for all mankind as a science about our environment, our survival and balanced development.

The traditional occupation of the peasantry was agriculture. The land and labor on it were for the peasant the basis of his life. The harming has aroused in the peasant a special, reverent attitude towards the land. In the definitions of the land, the peasant used the most delicate epithets: "mother-land", "land-nurse". In the worldview of the peasant, the earth is a "gift of God," and the right to work on it is sacred. Defining oneself as "salt of the earth" expressed the consciousness of the peasants of the importance of the work of a plowman. Agricultural work for the peasant was more than just a process of material reproduction, it was the basis of his spiritual life.

The objects of scientific interest are tools and methods of cultivating the land, crops produced, the nature of community land use, the role of traditions and innovations in the economic structure of the village.

The list of crops grown in the region was generally traditional for the region, with some exceptions. Of the cereal crops, these are wheat, rye, oats, and barley. The leading role was played by winter wheat as a leading food crop. Among the crops, corn is traditional as well as peas. As for technical culture, sunflower has always been cultivated in our region. Of the perennial plantations it should be noted the long tradition of cultivating grapes, fruits and various berries. Grapes in our conditions have always been in great demand, both technical and table varieties. A wide variety of pome and stone fruit varieties were cultivated in the villages of the region. Among pome fruits, prevail apples, pears, quinces, among stone fruits prevail plum, apricot, peach. In small volumes, walnut and mulberry were invariably grown in the region.

A small variety of cultivated berries should be recognized. Gooseberries were preferred. In conditions of risky agriculture in the southern zone of the country, due to lack of moisture, vegetable production is notable for its small volumes, but a wide range. The same objective reasons did not allow the production of potatoes in the volumes necessary to fully meet the needs of the region.

***Agricultural production is the lot of the majority of the rural population.*** The population, especially as a human resource, is the main wealth of the country and of the ATU Gagauzia as well. The permanent population of the autonomy at the beginning of 2016 amounted to 152.2 thousand inhabitants or 4.0% of the total population of the Republic of Moldova (including the population of the Left Bank of the Dniester). Most of the employed population works in education (19.7%), industry (18.1%), agriculture (15.1%) and trade (12.6%). For 1 person employed in the economy, there are 3.6 people who are not employed in the economy of the region [8. p.19-20].

In recent years, informal employment has increased. From 2010 to 2015, the number of people employed in the informal sector of the economy increased from 354 thousand people up to 418

thousand people, or by 18%. Their share in the total number of employees increased from 31% to 35%. The share of workers in the formal sector, respectively, decreased from 69% to 65%. With informal forms of employment, most workers cannot even rely on relatively small pensions and other social guarantees, since they do not pay social taxes. Accordingly, the budget system does not receive social and other tax payments [9, p. 44-45].

A significant part of those employed in the informal sector of the country are engaged in agricultural activities and produce products exclusively for personal consumption. From 2010 to 2015, the number of people employed in personal subsidiary plots increased from 105.0 thousand people to 156.9 thousand people, or 1.5 times. They comprise 38% of those employed in the informal sector, 41% of those employed in agriculture and 13% of all those employed in the economy. Excluding this group, the number of people employed in the economy in 2015 amounted to 1047 thousand people against 1204 thousand people officially considered to be employed (157 thousand people, or 15% less), and the employment rate of the population was only 35% against 40% officially recognized.

In the sectoral structure of employment in the autonomy, the agricultural sector prevails, which accounts for 32% of all employed in the economy, non-agricultural sectors account for 68% of the employed, respectively, including industry - only 12%. The sectoral structure of employment has a pronounced "agrarian" nature of payments [9, p. 45].

Economic activity related to land cultivation, despite its high labor intensity and low efficiency, is still very widespread in autonomy. This "vitality" is due to a number of reasons. Autonomy has become a region of chronic underemployment. The destiny of many of its residents, seeking to provide themselves with employment, is usually unskilled seasonal and / or temporary labor. In the case of employment, residents of the autonomy, as a rule, do not leave completely agriculture, which is mainly due to the unstable position of the labor force in the labor market.

At the end of the period of temporary work, they have to return to their native villages and live again depending on agriculture for a certain time until the next attempt to find a job. This nature of the participation of rural residents in a market economy has given rise to a typical economic pattern for our time — seasonal farming... which plays the role of stabilizing rural incomes in the face of fluctuating labor demand. Such circumstances contribute to the preservation in the autonomy of agriculture in the form of an auxiliary occupation

As we can see, agriculture, which provides primarily the means of subsistence, rather than profit, is widespread in the autonomy quite widely and at the same time they show some stability in the conditions of fluctuations in market prices for agricultural products. In other words, the decline in the number people, which depend on agriculture is much lower than is evident from official statistics. The opinion that this area of the economy in the near future will not play a significant role is perhaps premature.

### **Conclusions**

It is difficult to judge nowadays the prospects for maintaining a commitment to using land for self-sufficiency. Here, apparently, one should take into account the complex combination of not only objective factors (low rates of economic development of the country as a whole, high real unemployment), but also the subjective ones: the socio-cultural local factors of the population and its attitude to the land use. Agricultural occupation in the eyes of a significant part of the region's population is something more than just a labor-intensive way of life-support that promises little benefit. This is a type of activity that allows you to maintain your identity and traditions.

Thus, agriculture over the current period gains particular importance for ensuring food security, in combating poverty and protecting the environment through sustainable use of land resources; All these areas are important in the development of common regional needs. In addition, the region has a large number of pasture lands, which ensures animal farming, especially sheep.

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## USE OF BIOLOGICAL POTENTIAL IN CREATING INTERSPECIFIC GENOTYPES OF VINES

**GAINA Boris,**

Academician, Professor, Dr. Hab.,  
Academy of Sciences of Moldova,  
e-mail: [b.gaina@mail.ru](mailto:b.gaina@mail.ru)

**ALEXANDROV Eugeniu,**

Dr. Hab. in biological sciences,  
Institute of Genetics, Physiology and Plant Protection,  
e-mail: [e\\_alexandrov@mail.ru](mailto:e_alexandrov@mail.ru)

**Abstract.** *The expected results in modern agriculture can be obtained by applying environmental technologies and taking into account the genotype functionality factor. Knowing the functional properties of the genotype and the use of environmental technologies for growing grapes, in the future it will be possible to create balanced, sustainable and diversified agroecosystems, which will guarantee the protection of natural resources, sustainable development of society and public health. The grape sector needs to create new grape varieties, with stable productive potential, to produce high-quality derived products. As a result of the crossing of the species *V. vinifera* L. ssp. *sativa* D.C. ( $2n=38$ ) with *Muscadinia rotundifolia* Michx. ( $2n=40$ ), root-specific genotypes of grapes were obtained, to which ecological cultivation technologies can be applied, for example: Malena, Nistryana and Algumaks as table varieties and Augustine, Alexandrina and Amethyst for fresh consumption and for processing.*

**Key words:** *biological products, genotype, environment, functionality, ecological viticulture.*

**JEL classification:** Q 16, R 14, Q 51

**UDC:** [634.848.1:634.849]:57.047(478)(043.2)

### Introduction

Society is developing steadily when it consumes high-quality products of natural origin, rationally uses natural resources, and the environmental impact is minimal. Environmental protection is a global problem that should become a national priority, since it directly relates to the living conditions and health of the population, achievement of economic interests, as well as opportunities for sustainable development of society [12, 13]. Sustainable development means that way of development of human society, which is aimed at meeting the needs of the current generation, without affecting the level and quality of life of future generations. Each generation should strive to satisfy its own needs, without leaving various generations of debts for future generations, including environmental ones - depletion of natural resources or pollution of soil, water, air, etc. [13].

Organic viticulture is becoming increasingly popular around the world. This trend is based on a system of technological methods aimed at maintaining the biodiversity of grapevine, the successful cultivation and consumption of grapes with minimal use of chemical treatments, and therefore with minimal content of their residues in the crop [2, 3, 19].

The development of human society requires special attention to problems related to environmental protection and the rational use of natural resources. There is no doubt that it is necessary to know the possibilities of the genetic potential of genotypes depending on climatic conditions, which have a significant impact on programming the quantity and quality of products [13].

Agriculture, depending on pedo-climatic and socio-economic conditions, should provide the population with high-quality food-derived natural products, supply of raw materials for industry, rational use of natural resources and conservation of biodiversity. One of the main tasks of agriculture is the identification of new genotypes that can easily adapt and develop in the context of climate change without harming the environment. To achieve this goal, you need to have genotypes with increased functionality.

Derived grape and wine products make a significant contribution to the development of the country's economy, and therefore it is necessary to pay special attention to the creation of vineyards

with the introduction of environmental cultivation technologies. It is necessary to create genotypes with increased functionality and the choice of technology for growing grapes, which would allow to obtain high-quality and high productivity, with a minimum number of protection products, and maybe without them, thereby preserving the environment and biological diversity, as well as the presence of a minimum of these substances in berries and grape and wine-derived products [6, 7, 9, 14, 15].

To obtain the highest quality grape and wine derivatives, three main factors must be taken into account: genotype (variety), location of the vineyard (pedo-climatic conditions) and technology (cultivation and processing). Despite the fact that *Vitis vinifera* L. ssp. *sativa* D.C. has a high genetic potential, yet intraspecific genotypes cannot cross the genetic barrier of high sensitivity to changes in climatic conditions within the growing area, therefore it is necessary to create interspecific genotypes with high-quality products and resistant to environmental factors [6, 7, 9, 10 - 12, 14].

A research on this issue was carried out by the Research Institute of Organic Agriculture, in Switzerland, which published data on the total area of organic vineyards in the world. In 2015, this area was more than 400 thousand hectares. It has been found out that the transition of vineyards from traditional to organic technologies takes 3 years, after which the grape harvest is considered to comply with the established requirements. As for the growth rate of the area of vineyards cultivated according to the organic technologies, it was established that from 2005 to 2015, it trebled. The world leaders, in terms of area of organic vineyards and production of organic grapes, are Spain – with 85 thousand hectares, France – 75 thousand hectares, Italy – 65 thousand hectares, Mexico – 35 thousand hectares and China – 20 thousand hectares. Currently, the shares of areas of organic vineyards in European countries are as follows: Austria – 10.7 %, Italy – 10.3 %, Spain – 8.9 %, France – 8.7 %, Germany – 7.5 %, Portugal – 1.5 % [15]. More than 270 thousand hectares of organic vineyards are cultivated on the European continent, which makes up 67.5 % of the total area of organic vineyards in the world. This new trend in grape cultivation is developing rapidly in China, Turkey, Italy, Germany, Argentina, Chile, Australia and South Africa.

### **Materials and methods**

The subject of the research was the collection of grapevine plants of the Institute of Genetics, Physiology and Plant Protection, Chisinau, Republic of Moldova. The collection includes 140 genotypes of interspecific and intraspecific, grafted and own-rooted genotypes of grapevine. The method of distant hybridization was used to create interspecific own-rooted genotypes of grapevine [4-7]. Studies were conducted in accordance with the methods of describing grapevine varieties [1, 8, 9], Methodical Recommendations for Grapevine Breeding, Study of grapes to determine how to use them. Uvology [11, 22]. The physicochemical assessment of derivative products of interspecific genotypes of grapes was performed in accordance with the methods for analysing derivative products [12, 10, 16]. To determine the resistance of the studied genotypes to phylloxera, pathogenic microorganisms etc., the methods mentioned in Normal and Pathological Anatomy of Grapevine Roots and Complex Protection of Grapevine [14-17, 21, 22] were used.

### **Results and discussions**

Based on the functionality of grape taxa, it is possible to create genotypes that will provide an opportunity to increase the efficiency of interspecific hybridization of grapes in the process of improving valuable qualities. But, in order to achieve the set goal and obtain results, it is necessary to evaluate the genotypes included in the selection process from the point of view of functionality in relation to pedagogical conditions. To determine the functionality of genotypes, a comparative analysis of ampelographic, agrobiological, technological and physiological properties in relation to climate change is necessary. Taxa with enhanced functionality must be included in the process of creating interspecific genotypes based on pedo-climatic conditions.

In the process of selection of grapes, it is necessary to take into account the functional properties of the genotype: growing technology; fertility; productivity (in relation to the vegetative period and pedo-climatic zone); ratio of growth and fertility; histo-anatomical and biochemical properties; resistance to diseases and pests; resistance to low temperatures; the chemical composition of berry juice and derivatives (wine, distillate, etc.); bunch ripening (early - later); the appearance of a

bunch; pulp properties; aroma and taste; resistance to cracking berries; the ability to store and transport grapes; use (fresh use); processing (wine, distillate, juice, etc.); recycling [1, 9, 10, 20].

Knowing the functional properties of the genotype and the use of environmental technologies for growing grapes, in the future it will be possible to ensure the creation of balanced, sustainable and diverse agroecosystems, which will guarantee the protection of natural resources, sustainable development of society and public health.

Ecotechnologies contribute to the creation of a variety of sustainable balanced agroecosystems, the rational use of natural resources, the reduction of the use of polluting technologies, the restriction of the use of chemical-synthetic substances and the reduction of potentially destructive agricultural work.

In the European market, there is a great demand for organic grapes, and it equally applies to grapes intended for consumption while fresh (table varieties) and those for the production of wine and distilled drinks. The organic cultivation of grapevine leads, on the one hand, to a reduction in the contamination of grapes with residues of the substances used to protect them from diseases and pests, and on the other hand, to a lower degree of environmental pollution (soil, water and air) [11, 12, 15].

The European Union supports organic viticulture, by subsidizing this type of activity of winegrowers (at the transition stages from traditional to organic cultivation of grapevine), covering the losses of economic agents whose vineyards have suffered from hail, epiphytotic diseases and prolonged rains that have led to crop loss. However, taking into account the fact that the demand for organic grapes (table and wine grapes) is constantly raising, not only in Europe, but also in North America and East Asia, at present, their price is 40-60 % or even 100 % higher. This, of course, attracts winegrowers, and today about 10 % of vineyards in the countries of the European Union are certified as "organic". In France, in Alsace, some programs have been created to inform people about the peculiarities of the organic cultivation of grapevine, and their students are representatives of the grape-growing and winemaking industry of most EU countries, as well as Canada, the USA, Israel, Australia, New Zealand, China etc.

Currently, the technology of cultivation of organic grapevine must be consistent with certain standards: for example, the use of copper is limited to 3 kg per hectare per year, and the maximum sulphur application – 6 kg per hectare per year. There are countries where these standards differ in the direction of a slight decrease, but in all cases, the extract (infusion) of nettle, bark and leaves of oak, leaves of walnut, calendula etc. are widely used along with fungicides based on copper and sulphur.

However, the cultivation of grapes according to the organic technologies in the Republic of Moldova faces certain difficulties, which are the main reason behind the slow introduction of this new trend of the grape-growing and winemaking. One of them is the absence of biopreparations, produced on an industrial basis, to inhibit the growth of micromycetes (*Botrytis cinerea* etc.) and pests (leafroller moths etc.). For example, in France, a biopreparation made from *Trichoderma viride* is produced under the brand name Trichodermin B14; it has been proven to suppress the growth of mould fungi on berries and leaves in rainy weather by more than 60 % [13]. However, it has been found that this biofungicide loses a part of its action during the months with dry weather (August-September) which reduces the effectiveness of the treatment and increases the risk of micromycete infection at the beginning of the rainy period (September-October) [18]. Moreover, it has been found that the action of Trichodermin B14 is inhibited by residues of copper ions on leaves and berries, which remain after previous treatments of vineyards. In this case, the scientists from the French National Institute for Agricultural Research [3] have begun to grow the biomass of the antagonist *Trichoderma viride*, against grey mould, enriched with copper ions. Under these conditions, the biofungicide was resistant to the inhibiting effect of copper residues on leaves and berries and provided more than 75 % growth inhibition in mould fungi.

Another problem in organic viticulture is the isolation of areas with grapevine in the stages of conversion (within 3 years) from those cultivated nearby, by traditional technology. As a rule, the easiest way of solving this problem is to choose an entire vineyard (plantation), surrounded by other agricultural crops (fodder grasses, sometimes cereals etc.), or shelterbelts, often encountered in our country. The generally accepted rules for organic cultivation of grapes also stipulate the absence of any source of chemical or biological pollution (wastewater treatment plants, chemical plants, landfills



etc.). In our opinion, the prices for the certification of plantations, which have been established by international organizations, licensed in this regard, are too high and unjustified, especially in cases of small plantations of grapes and other berries, fruits etc.

Other advantages of organic methods are a significant reduction in environmental pollution, lower costs for the purchase and use of expensive chemicals, as well as higher sale prices for wine and table grapes. In the EU markets, the price of certified organic grapes is 40-60 % or even 100 % higher as compared with the price of grapes cultivated by traditional methods.

Among the main problems faced by this new technology of cultivation of grapevine, there are the difficulties of using classical varieties of the genus *Vitis vinifera* L., because of the high susceptibility to the attack of micromycetes and pests, and the low frost tolerance. These are very important factors under the harsh conditions of the continental climate in our country, with high humidity and heavy rains in spring, which create favourable conditions for the development of dangerous diseases and pests, and which complicate the timely and effective use of chemical remedies in the framework of the organic technology.

On the other hand, in the second half of summer and early autumn, the weather contributes to the development of other diseases, among which, powdery mildew (caused by *Oidium*) and grey mould of grapes are the most dangerous. The way out of this difficult situation may be the wide use of new grapevine varieties with higher resistance to biotic and abiotic environmental conditions [4]. The last fifty years of breeding grapevine have resulted in the creation of some promising varieties of wine grapes to be cultivated by organic methods: Viorica, Legend, Riton, Luminita, (Moldova), Bianca, Chardonel, Aletta, (Hungary), Vidal Blanc, Triumph of Alsace, Shamborsin (France), Fleurtai, Soreli, Savignon Cretos, Julius, Sagiovese etros, Merlot Chorus, Cabernet, Jerez, Julio, Caberigne Cretos, Julius, Sagiovese etret (Italy), Cabernet Jura, Pinotin, Cabernet blanc (Switzerland), Aromatny, Muscat Odessa, Zagreus, Rubin Tairovsky, Aghat Tairovsky, Golubok, Illichivsky early, Sparkling, Ovidiopol, Odessa Black, Rodnichek etc. (Ukraine). Grapevine varieties with high resistance to diseases and pests have been obtained and recommended for breeding and cultivation in Crimea – by the Institute of Viticulture and Winemaking "Magarach", in Russia – by the All-Russian Research Institute of Viticulture and Winemaking "Ya.I. Potapenko", in Bulgaria – by the National Institute of Viticulture and Oenology in Pleven, in Romania – by the Research and Development Institute for Viticulture and Winemaking "Valea Călugărească". However, the above-listed varieties are susceptible to phylloxera, which makes it necessary to create vineyards from planting material grafted on phylloxera-resistant rootstocks.

The viticulture sector needs new grape varieties, with stable productive potential, for the production of high-quality derivative products. The European grapevine varieties of *Vitis vinifera* L. ssp. *sativa* D.C., registered in the Republic of Moldova, as well as in other wine-producing countries, are susceptible to phylloxera (*Phylloxera vastatrix* Planch.) and that is why vineyards should be created from planting material grafted on phylloxera-resistant rootstocks. Besides, because grapevine is sensitive to low temperatures in winter, additional measures are necessary to protect plants during the period of vegetative rest [1, 7, 22].

To obtain competitive products, it is necessary to use mandatory chemical treatments to prevent or destroy pests, micromycetes and other pathogenic agents. However, these treatments affect the cost of production and pollute the environment. The creation of own-rooted grapevine plantations is a good prospect, but for this, it is necessary to enrich the grape assortment with new genotypes, resistant to diseases and pests. As a result of research, a methodology was developed for the creation of own-rooted interspecific genotypes of grapevine *Vitis vinifera* L. ssp. *sativa* D.C. x *Muscadinia rotundifolia* Michx., resistant to biotic and abiotic factors. Donors of valuable agrotechnological traits were included in the breeding process, as a result of which high-quality, stable and productive grapevine genotypes were created [2, 7].

Mastering the biological potential of interspecific genotypes will allow obtaining high-quality products from grapes, reducing costs and the use of chemicals in the process of controlling micromycetes and pests. The created genotypes have significant agrobiological and technological potential, which allows developing further research in the field of genetics and breeding of grapevine, using the method of distant hybridization. Thus, after of crossing *V. vinifera* x *M. rotundifolia*,

interspecific genotypes of grapevine have been created in BC<sub>3</sub>, with acquired agrobiological and technological properties, which allow expanding the area where grapevine can be cultivated in the northern regions and reducing the number of chemical treatments that will contribute to obtaining ecological products and protecting the environment. In the process of identifying the genetic functionality of the related taxa, *V. vinifera* and *M. rotundifolia*, characterized by low combining ability, it was found that this obstacle could be overcome by backcrossing.

A wide range of recombinants, which allows improving the efficiency of distant hybridization in the process of selection of valuable characteristics, has been obtained as a result of this process [4, 5, 7]. The differences in the classification of interspecific genotypes of grapevine based on DNA profiles (SSR markers) and ampelographic criteria prove the importance of *genotype x environment* specific interactions in the development of biological and technological features of the hybrid. The multilateral research on biological and agrotechnological features, the participation in hybridization of the genotypes of different ecological and geographical origin of *V. vinifera* and *M. rotundifolia* and the elimination of aneuploid forms during subsequent crosses leads to the stabilization of the interspecific genome ( $2n = 38$ ) with valuable agrobiological features and stability. The interspecific genotypes *V. vinifera* x *M. rotundifolia* can be propagated by cuttings from own-rooted, competitive planting material, to obtain early-ripening grapes [7].

When creating new grapevine varieties, by interspecific and intraspecific hybridization, it is very important to take into account the concentration, in the berries, of such chemicals as resveratrol, which ensures the resistance of the plant to adverse environmental factors. A comparative analysis of the concentration of resveratrol in the juice of wild grapes and its concentration in the berries, obtained after hybridization, has shown that, in the juice of wild grapes, the concentration of resveratrol is approximately two times higher than in subsequent generations, obtained as a result of hybridization. That is, as more generations are created, moving away from the wild representatives of the species, the concentration of resveratrol in the juice of the grapes keeps decreasing. The created interspecific genotypes of grapevine have been studied in detail according to agrobiological and technological criteria [2, 7].

The evaluation of the quality of grapes and derived products, over the years, has made it possible to select and cultivate promising own-rooted genotypes of grapevine. The interspecific genotypes of *V. vinifera* x *M. rotundifolia* are easily propagated by cuttings and can be cultivated on their own roots, thereby offering the opportunity to skip some practical steps, as well as reduce financial costs in the process of producing planting material and growing grapevine. According to the uvological and oenological criteria, the grapes of the new genotypes are not inferior to the classical varieties of *V. vinifera* in their biochemical composition and organoleptic qualities. Besides, they can be grown in the northern areas, where most plants of *Vitis vinifera* L. ssp. *sativa* D.C. do not withstand low temperatures in winter. Studying the physicochemical properties of blue-violet grapes of the interspecific genotypes (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.), it has been found that phenols, resveratrol and pectins are present in them in larger quantities than in green-yellow grapes, also exceeding the amount of these substances in the berries of the varieties of *V. vinifera* L. The quantity of resveratrol in the juice of berries of the interspecific genotypes of grapevine is 6.68 mg/l in berries with a green-yellow hue (BC<sub>3</sub>-510 etc.), 9.3 mg/l in berries with a pink hue (BC<sub>3</sub>-520 etc.) and 14 mg/l in berries with a blue-violet hue (BC<sub>2</sub>-3-1, BC<sub>3</sub>-660 etc.). From the populations of interspecific genotypes BC<sub>3</sub> (*V. vinifera* x *M. rotundifolia*), several promising own-rooted varieties have been selected, among them, there are table grapes, such as Malena, Nistreana and Algumax, and wine grapes: Augustina, Alexandrina and Ametist [3, 5, 7].

Using the biological potential of interspecific genotypes will make it possible to obtain high-quality derivative products under conditions of organic farming, which implies a reduction in the use of synthetic and natural chemicals in the fight against diseases and pests.

### Conclusions

1. From the populations of interspecific genotypes BC<sub>3</sub> (*V. vinifera* x *M. rotundifolia*), several promising own-rooted varieties of table grapes have been selected, such as Malena, Nistreana and

Algumax, and other selected varieties, such as Augustina, Alexandrina and Ametist, can be used as table grapes too, but also as wine grapes.

2. Growing interspecific genotypes of grapevine will decrease the negative impact on the environment by reducing the number of chemical treatments.

3. Due to the high resistance of distant hybrids to pests and diseases, the costs associated with the creation of planting material are reduced. Besides, as mentioned above, the number of chemical treatments during the cultivation process is reduced, thus minimizing environmental pollution.

4. In addition, the area of cultivation of grapevine can be expanded to the north, where the climatic conditions are unfavourable for the varieties of *V. vinifera*, which cannot tolerate the low winter temperatures, while the studied interspecific genotypes are more winter-hardy.

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## EFFECTS OF THE NON-CONVENTIONAL TREATMENT IN MAGNETIC FIELD APPLIED ON A STEEL FOR GEARINGS

PAPADATU Carmen Penelopi <sup>1,2</sup>

<sup>1</sup>. PhD. in Materials Science, Lecturer, Dunarea de Jos University of Galati, Romania

<sup>2</sup>. PhD. Associate Professor (P.O.), Bogdan Petriceicu Hasdeu University of Cahul, Moldova  
e-mail: [papadatu.carmen@yahoo.com](mailto:papadatu.carmen@yahoo.com)

**Abstract.** *An alloyed steel grade for machine parts construction used in industry have been considered and this material was subjected to a classical improvement treatment or a thermo-magnetic treatment before a plasma nitriding process – the last one being a thermo - chemical treatment. Studying the superficial layer, it was taken in consideration the distribution of the phases in case of the classic treatment procedure versus the case of the non-conventional treatment in magnetic field applied before plasma (ion) nitriding.*

*Plasma nitriding applied after a non-conventional treatment in magnetic field to the steel used in industry, have been studied in this paper.*

*The samples have been tested using an Amsler stand for wear tests (dry friction) and the diffractometric analysis completed this study. This study is a short review of the researches realized in the last few years.*

**Keywords:** *Steel, non-conventional treatment*

**JEL classification:** L62, Z21

**UDC:** 621.01:672

### Introduction

The technical progress made it possible to use very hard materials in several fields like manufacturing pieces for the car industry, the pieces for railroad, in aeronautics and in the mechanical industries. For gearings, toothed wheels suffer special treatments to increase the hardness of the flanks of gearing. The studies are focused to obtain an increasing of the wear resistance using plasma nitriding.

Plasma nitriding is a thermo-chemical treatment with diffusion process and the interaction of the nitrogen with the basic material lead to structural constituents whose nature determines a major hardness of the nitrided layers. The thermo-chemical treatment modifies the grain limit and the resistance of the treated steel.

The magnetic field applied during the part of the improvement treatment of the steel grade lead to appear mechanical oscillations which can be considered as the effects of the Magnetostriction. The magnetic field applied leads to a decreasing of the residual austenite amount (A<sub>res</sub>) during the annealing/hardening treatment of the gearing or tools steels, according to the literature [1, 2, 4].

The subject of ion/plasma nitriding mechanism has been studied by many researchers, for example: Kölbel (1965), Keller (1971), Hudis (1973), Roliński (1978); Karpiński (1979), Szabo and Wilhelmi (1984), Marchand (1989), Michalski (1993, 2000), Koloswary (Romania, 1995-2000); Preda A. and Levcovici D. (Romania, 2000), Walkowicz (2003).

The reason for the amount of work was the complexities of the phenomena occurring near the cathode.

### Methods and material applied

For the experimental program, the samples have been realized as rollers from a steel grade for improvement treatment for machine parts construction with the following principal content: 0.42 % C, 0.02% Al, 1.02 % Cr, 0.17 % Mo, 0.68 % Mn, 0.22 % Cu, 0.33 % Si, 0.26 % Ni, 0.030 % P, 0.026 % S. The existence of the Molybdenum content in the composition of the steel induces a decreasing of the stiffening phenomenon.

The first stage from the complex program of treatments consisted of thermo-magnetic treatments. The second stage of the treatments consists in the applying the thermo-chemical treatment in plasma.

There are mentioned the following treatments which have been selected for different samples: Treatment T1 represents a hardening at 850°C and a high tempering treatment at 580°C, with cooling

in water - being the classic improvement treatment followed by a plasma nitriding at 530°C; Treatment T2 represents a complete martensitic hardening in weak alternative magnetic field and a high tempering with cooling in water in strong magnetic field, followed by a plasma nitriding treatment at 530°C.

The temperature of plasma nitriding process was 530°C.

After the treatments, the wear dry tests on Amsler Machine have been made.

### Results obtained and discussions

After every hour of wear tests, the samples were subjected to diffractometric Analysis. In figures 1 and 2 were presented diffractometric aspects regarding the plasma nitride layer in the cases of the treatments T1 and T2. It must be mentioned that the treatment T2 is a non-conventional treatment in magnetic field followed by plasma nitrided at 530°C.

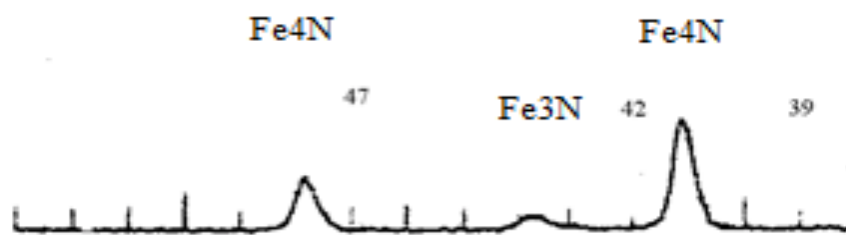


Figure 1. Diffractometric fragment corresponding to nitrided layer in case of T1 classic treatment

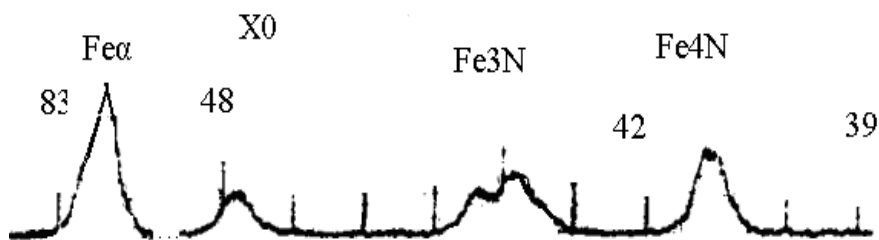


Figure 2. Diffractometric aspects corresponding to the samples subjected to non-conventional treatment T2

It can be observed that in the case of non-conventional treatments in magnetic field applied before plasma nitriding, the amount of  $\text{Fe}_3\text{N}$  and  $\text{Fe}\alpha$  (M) in superficial layer increased. This is a reason to observe that the non-conventional treatment – an improvement treatment in magnetic field – applied before thermo-chemical treatment determines the increasing of the hardness and the wear resistance of the steel.

By analyzing diffractometrically (Figures 1 and 2) the samples treated with T2 before plasma nitriding, which underwent a complete hardening and a high tempering, with only the cooling in magnetic field (A.C.) with the  $H = 920 \text{ A / m}$  (T2) the amount of martensite is highest compared to other samples (T1). The percentage of carbon (% C) being the average for the analyzed steel (up to 0.6%), the evolution of the degree of tetrahedral of martensite in certain processes or over time can be controlled by the evolution of the diffraction line (211) [1,2, 3].

It can be observed that in the case of non-conventional treatments in magnetic field applied before plasma nitriding, the amount of  $\text{Fe}_3\text{N}$  and  $\text{Fe}\alpha$  (M) in superficial layer increased. This is a reason to observe that the non-conventional treatment – an improvement treatment in magnetic field – applied before thermo-chemical treatment determines the increasing of the hardness and the wear resistance of the steel.

By analyzing diffractometrically (Figures 1-2) the samples treated with T2 before plasma nitriding, which underwent a complete quenching and high tempering, only the cooling in magnetic

field (A.C.) with the  $H = 920 \text{ A / m}$  (T2) the amount of martensite ( $\text{Fe}\alpha$ ) is highest compared to other samples (T1).

The martensitic phase - in the range ( $44^\circ - 45^\circ$ ) - in the superficial nitride layer, besides the  $\text{Fe}_3\text{N}$  and  $\text{Fe}_4\text{N}$  phases, provides the layer with a good hardness and a wear resistance higher than the investigated samples treated classically. Martensite ( $\text{Fe}\alpha$ ) is a tough constituent, and the martensite with nitrogen (phase  $\alpha$ ) is the most durable phase in the nitrided layer [2, 4, 6, 7].

Martensite is a solid carbon solution in  $\text{Fe}\alpha$ , which has a large amount of dissolved carbon, giving it a high hardness. In the process of martensitic transformation, not all austenite passes into martensite, so there remains an unformed austenite quantity - called residual austenite (A<sub>res</sub>). After hardening, the residual austenite ( $\text{Fe}\gamma$ ) and the martensite ( $\text{Fe}\alpha$ ) are found in the steel, which, diffractometrically, conduct in the diffractogram at spectrum of diffraction showing diffraction lines specific to both austenite and martensite.

The thickness of the white (nitrided) layer increased in the cases of non-conventional treatments T2 (see figure 3).

The morphology of the nitrided layers depends on the core microstructure resulting from the transformation of chromium carbides into chromium nitrides. Microstructures must be stable during the nitriding treatment.

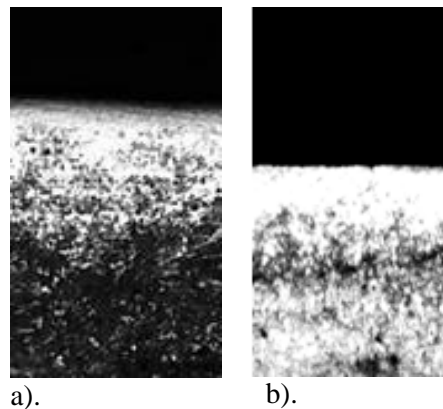


Figure 3 Microstructures of the superficial layers: a). Nitrided layer which corresponds to classic treatment T1; b). Nitrided layer which corresponds to treatment T2, ( $\times 100$ ) Nital attack 2% [2].

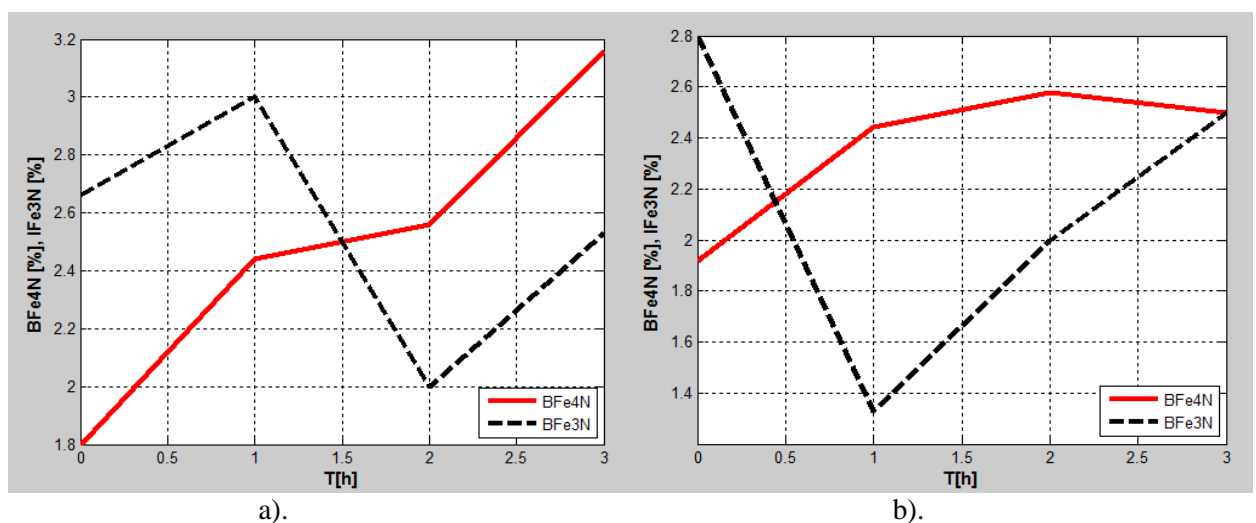


Figure 4. Internal tensions of second order ( $B_{\text{Fe4N}}$ ;  $B_{\text{Fe3N}}$ ) in the superficial layer after plasma nitriding process, for samples: a). subjected to T1 treatment, during three hours of wear tests for  $Q = 750 \text{ N}$ ,  $\xi = 10\%$ ; b). subjected to T2 treatment, for  $Q = 750 \text{ N}$ ,  $\xi = 10\%$ .

In figure 4 (a, b), internal tensions of second order in the nitrided layers have been represented and the differences are majors, comparing the classic treatment effects with the non-conventional treatments effects (T2).

### Conclusions

Due to friction wear tests, it was possible to study the depth distribution of the  $\text{Fe}_3\text{N}$  and  $\text{Fe}_4\text{N}$  phases in the superficial layer. The distribution of  $\text{Fe}_3\text{N}$  and  $\text{Fe}_4\text{N}$  phases on the plasma nitrided layer is uneven, which demonstrates that the nitriding process does not flow uniformly, being influenced by several factors, especially the nature of the nitrided material.

At the same time, a change in the distribution of the  $\text{Fe}_4\text{N}$  phase comparing to  $\text{Fe}_3\text{N}$  in the superficial layer is observed. Thus, at the classically treated sample, the distribution is cyclic, the greater evolution is at the  $\text{Fe}_4\text{N}$  comparing to  $\text{Fe}_3\text{N}$  phase, which gives the superficial layer a hardness and resistance to wear ( $\text{Fe}_4\text{N}$  phase being a hard phase, more than  $\text{Fe}_3\text{N}$ ). In the T2-treated sample case, the evolution of the  $\text{Fe}_3\text{N}$  and  $\text{Fe}_4\text{N}$  phases in the plasma nitrided layer is evenly increasing - in the case of  $\text{Fe}_4\text{N}$  - which is a positive thing regarding the increase of the wear resistance and the hardness of the nitrate layer, while the evolution of the distribution the  $\text{Fe}_3\text{N}$  phase is down.

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# CLASSIFICATION OF CUBIC DIFFERENTIAL SYSTEMS WITH A MONODROMIC CRITICAL POINT AND MULTIPLE LINE AT INFINITY

**ȘUBĂ Alexandru,**

Doctor habilitatus in physical & mathematical sciences, Professor,

Tiraspol State University,

Chișinău, Republic of Moldova,

e-mail: [alexandru.suba@math.md](mailto:alexandru.suba@math.md)

**TURUTA Silvia,**

Institute of Mathematics and Computer Science,

Chișinău, Republic of Moldova,

e-mail: [poderioghina\\_silvia@yahoo.com](mailto:poderioghina_silvia@yahoo.com)

**Abstract.** In this article, we classified the cubic differential systems with a non-degenerate monodromic critical point and multiple line at infinity. We show that there are 5 distinct classes (respectively, 10, 6, 6) of such systems which have the line at infinity of multiplicity 2 (respectively, 3, 4, 5).

**JEL classification:** C 02

**UDC:** 517.2

## I. Introduction

We consider differential cubic systems of the form

$$\begin{aligned} \dot{x} &= y + ax^2 + cxy + fy^2 + kx^3 + mx^2y + pxy^2 + ry^3 \equiv P(x, y), \\ \dot{y} &= -(x + gx^2 + dxy + by^2 + sx^3 + qx^2y + nxy^2 + ly^3) \equiv Q(x, y), \quad \gcd(P, Q) = 1 \end{aligned} \quad (1)$$

and the vector fields  $\mathbb{X} = P(x, y) \frac{\partial}{\partial x} + Q(x, y) \frac{\partial}{\partial y}$  associated to systems (1).

For (1) the origin  $O(0,0)$  is a non-degenerate critical point of a center or a focus type, i.e. is monodromic.

Denote  $k(x, y) = sx^4 + (k + q)x^3y + (m + n)x^2y^2 + (l + p)xy^3 + ry^4$ . If  $k(x, y) \equiv 0$ , then the infinity is degenerate for (1), i.e. it consists only from critical points. In this work we suppose that  $k(x, y) \not\equiv 0$ .

Let  $\bar{P}(x, y, Z), \bar{Q}(x, y, Z)$  are the homogenization of the polynomials  $P(x, y), Q(x, y)$  respectively, i.e.

$$\begin{aligned} \bar{P}(x, y, Z) &= yZ^2 + (ax^2 + cxy + fy^2)Z + kx^3 + mx^2y + pxy^2 + ry^3, \\ \bar{Q}(x, y, Z) &= -(xZ^2 + (gx^2 + dxy + by^2)Z + sx^3 + qx^2y + nxy^2 + ly^3), \\ \text{and } \bar{\mathbb{X}} &= \bar{P}(x, y, Z) \frac{\partial}{\partial x} + \bar{Q}(x, y, Z) \frac{\partial}{\partial y}. \end{aligned}$$

Assume that the line at infinity  $Z = 0$  is not full of critical points. We say that  $Z = 0$  has multiplicity  $m + 1$  if  $m$  is the greatest positive integer such that  $Z^m$  divides  $\mathbb{E}(\bar{\mathbb{X}}) = \bar{P} \cdot \bar{\mathbb{X}}(\bar{Q}) + \bar{Q} \cdot \bar{\mathbb{X}}(\bar{P})$ . The polynomial  $\mathbb{E}(\bar{\mathbb{X}})$  has the form

$$\mathbb{E}(\bar{\mathbb{X}}) = C_0(x, y) + C_1(x, y)Z + \dots + C_8(x, y)Z^8,$$

where  $C_j(x, y), j = \overline{1, 8}$  are polynomials in  $x$  and  $y$ . If  $C_j(x, y) \equiv 0, j = \overline{0, m}$ , then  $m + 2$  is the multiplicity of the line at infinity.

## II. Cubic systems (1) with the line at infinity of multiplicity two

**Theorem 1.** The line at infinity  $Z = 0$  has the multiplicity at least two for system (1) if and only if one of the following five sets of conditions holds:

$$n = k = m = s = p = q = 0, r \neq 0; \quad (2z1)$$

$$k = m = p = r = 0; \quad (2z2)$$

$$k = m = q = s = 0, l = nr/p; \quad (2z3)$$

$$k = s = 0, l = qr/m, n = pq/m; \quad (2z4)$$

$$l = rs/k, n = ps/k, q = ms/k. \quad (2z5)$$

**Proof.** We have  $C_0(x, y) = k(x, y)C_{01}(x, y)$ , where  
 $C_{01}(x, y) = (kq - ms)x^4 + 2(kn - ps)x^3y + (3kl + mn - pq - 3rs)x^2y^2 + 2(lm - qr)xy^3 + (lp - nr)y^4$ .

It is easy to show that the identity  $C_{01}(x, y) \equiv 0$  gives us the sets of conditions (2z1)-(2z5).

### III. Cubic systems (1) with the line at infinity of multiplicity three

**Remark 1.** The transformation  $x \rightarrow y, y \rightarrow x, t \rightarrow -t$  preserve the form of the system (1) and change the coefficients in the following way:  $a \leftrightarrow b, c \leftrightarrow d, \dots, r \leftrightarrow s$ .

Let  $\{\mathcal{F}(a, b, c, d, \dots, r, s)\}$  be a set of conditions. Denote

$$\{\mathcal{F}(a, b, c, d, \dots, r, s)\}^{\leftrightarrow} = \{\mathcal{F}(b, a, d, c, \dots, s, r)\}.$$

**Theorem 2.** Modulo the transformations  $x \rightarrow y, y \rightarrow x, t \rightarrow -t$ , the line at infinity  $Z = 0$  has the multiplicity at least three for system (1) if and only if one of the following ten sets of conditions holds:

$$a = c = f = k = m = p = r = 0; \quad (3z1)$$

$$c = aq/s, f = an/s, k = l = m = p = r = 0; \quad (3z2)$$

$$a = 0, c = fq/n, k = l = m = p = r = s = 0; \quad (3z3)$$

$$a = f = k = l = m = n = p = r = s = 0, q \neq 0; \quad (3z4)$$

$$a = gp/n, c = dp/n, k = 0, l = p, m = q = 0, r = p^2/n, s = 0; \quad (3z5)$$

$$b = fq/m, d = cq/m, g = aq/m, k = 0, l = qr/m, n = pq/m, s = 0, q \neq 0; \quad (3z6)$$

$$d = \frac{bm^3 - fm^2q + cq^2r}{mqr}, g = \frac{aq}{m}, k = 0, l = \frac{qr}{m}, n = m + \frac{q^2r}{m^2}, p = \frac{m^3 + q^3r}{mq}, s = 0; \quad (3z7)$$

$$b = fq/m, g = aq/m, k = l = 0, n = m, p = m^2/q, r = s = 0; \quad (3z8)$$

$$b = fs/k, d = cs/k, g = as/k, l = rs/k, n = ps/k, q = ms/k; \quad (3z9)$$

$$b = \frac{fk^2s + gkrs - ars^2}{k^3}, d = \frac{s(ck^3 + gk^2p - akps - gkrs + ars^2)}{k^4},$$

$$l = \frac{rs}{k}, m = \frac{k^4 + kps^2 - rs^3}{k^2s}, n = \frac{ps}{k}, q = (k^4 + kps^2 - rs^3)/k^3. \quad (3z10)$$

**Proof.** In each of the conditions  $\{2z1, k(x, y) \neq 0\} - \{2z5, k(x, y) \neq 0\}$  we will solve the identity  $C_1(x, y) \equiv 0$ .

*Conditions (2z1).* Under these conditions the polynomial  $C_1(x, y)$  has the form  $C_1(x, y) = y^5[3l(al - gr)x^2 + 2(cl^2 + alr - dlr - gr^2)xy + (fl^2 - blr + clr - dr^2)y^2]$ . Taking into account that  $k(x, y) = -y^3(lx - ry) \neq 0$ , the identity  $C_1(x, y) \equiv 0$  yield:

$$f = br/l, a = gr/l, c = dr/l; \quad (2)$$

$$d = g = l = 0. \quad (3)$$

Using transformations  $x \rightarrow y, y \rightarrow x, t \rightarrow -t$ , we obtain that the conditions  $\{2z1, (2)\}$  (respectively,  $\{2z1, (3)\}$ ) are contained in  $(3z9)$  (respectively, in  $(3z2)$ ).

*Conditions (2z2).* In this case we have  $k(x, y) = -x(sx^3 + qx^2y + nxy^2 + ly^3)$  and  $C_1(x, y) = -\frac{k(x, y)}{x}[(aq - cs)x^4 + 2(an - fs)x^3y + (3al + cn - fq)x^2y^2 + 2clxy^3 + fly^4]$ .

The identity  $C_1(x, y) \equiv 0$  is realisable if one of the following four sets of conditions holds:

$$a = c = f = 0; \quad (4)$$

$$c = aq/s, f = an/s, l = 0; \quad (5)$$

$$a = 0, c = fq/n, l = s = 0; \quad (6)$$

$$a = f = l = n = s = 0, q \neq 0. \quad (7)$$

The conditions (4) – (7), together with (2z2), lead us to conditions (3z1)-(3z4), respectively.

*Conditions (2z3).* The polynomials  $k(x, y)$  and  $C_1(x, y)$  look as:

$$k(x, y) = y^2(py - nx)(px + ry)/p, C_1(x, y) = -y^3(px + ry)C_{11}(x, y)/p^2,$$

where

$$C_{11}(x, y) = 2np(gp - an)x^3 - (cn^2p + anp^2 - dnp^2 - gp^3 + 3an^2r - 3gnpr)x^2y - 2r(cn^2 + anp - dnp - gp^2)xy^2 + (fnp^2 - bp^3 - fn^2r + bnpr - cnpr + dp^2r)y^3, \text{ and } C_{11}(x, y) \equiv 0 \Rightarrow$$

$$a = gp/n, c = dp/n, r = p^2/n; \quad (8)$$

$$b = dr/p, g = n = 0; \quad (9)$$

$$a = gp/n, c = dp/n, f = bp/n. \quad (10)$$

We have  $\{(2z3), (8)\} \equiv (3z5)$ ,  $\{(2z3), (9), r = 0\}^{\leftrightarrow} \subset (3z4)$ ,  
 $\{(2z3), (9), r \neq 0\}^{\leftrightarrow} \subset (3z2)$ ,  $\{(2z3), (10), l = 0\}^{\leftrightarrow} \subset (3z6)$  and  
 $\{(2z3), (10), l \neq 0\}^{\leftrightarrow} \subset (3z9)$ .

Conditions (2z4). In this case we find that

$$k(x, y) = y(my - qx)(mx^2 + pxy + ry^2)/m$$

and

$$C_1(x, y) = (k(x, y) C_{12}(x, y))/(m^2 (my - qx)),$$

where

$$C_{12}(x, y) = -mq(gm - aq)x^4 - 2pq(gm - aq)x^3y + (dm^3 - gm^2p + bm^2q - cm^2q + ampq - dmpq - fmq^2 + cpq^2 - 3gmqr + 3aq^2r)x^2y^2 + 2(bm^3 - fm^2q - gm^2r + amqr - dmqr + cq^2r)xy^3 + (bm^2p - fmpq - dm^2r - bmqr + cmqr + fq^2r)y^4.$$

The identity  $C_{13}(x, y) \equiv 0$  gives us the following six sets of conditions:

$$b = fq/m, d = cq/m, g = aq/m, q \neq 0; \quad (11)$$

$$d = cq/m + m(bm - fq)/qr, g = aq/m, p = m^2/q + qr/m; \quad (12)$$

$$b = fq/m, g = aq/m, p = m^2/q, r = 0; \quad (13)$$

$$d = bp/r, g = bm/r, q = 0; \quad (14)$$

$$b = 0, g = dm/p, q = r = 0; \quad (15)$$

$$b = d = p = q = r = 0. \quad (16)$$

It is easy to show that  $\{(2z4), (j+5)\} \equiv (3zj), j = 6, 7, 8$  and  $\{(2z4), (14)\}^{\leftrightarrow} \subset (3z2)$ ,  
 $\{(2z4), (15), m = 0\}^{\leftrightarrow} \subset (3z4)$ ,  $\{(2z4), (15), m \neq 0\}^{\leftrightarrow} \subset (3z3)$ ,  $\{(2z4), (16)\}^{\leftrightarrow} \subset (3z3)$ .

Conditions (2z5). Under this conditions the polynomials  $k(x, y)$  and  $C_1(x, y)$  look as:

$$k(x, y) = (sx + ky)(kx^3 + mx^2y + pxy^2 + ry^3)/k, \quad C_1(x, y) = \frac{k(x, y)}{k(sx + ky)} C_{13}(x, y),$$

where

$$C_{13}(x, y) = (gk^3 - ak^2s + dk^2s - gkms - cks^2 + ams^2)x^4 + 2(dk^3 + bk^2s - ck^2s - gkps - fks^2 + aps^2)x^3y + (3bk^3 + dk^2m - gk^2p - 3fk^2s + bkms - ckms + akps - dkps - 3gkrs - fms^2 + cps^2 + 3ars^2)x^2y^2 + 2(bk^2m - gk^2r - fkms + akrs - dkrs + crs^2)xy^3 + (bk^2p - dk^2r - fkps - bkrs + ckrs + frs^2)y^4.$$

If  $k(x, y) \not\equiv 0$  and  $C_{13}(x, y) \equiv 0$ , then one of the following two sets of equalities holds:

$$b = fs/k, d = cs/k, g = as/k; \quad (17)$$

$$d = (bk^2p - fkps - bkrs + ckrs + frk^2)/(k^2r), \\ g = (bk^3 - fk^2s + ars^2)/(krs), \quad m = (k^4 + kps^2 - rs^3)/(k^2s). \quad (18)$$

The conditions (17) and (18) together with (2z5) give us the conditions (3z9) and (3z10), respectively.

#### IV. Cubic systems (1) with the line at infinity of multiplicity four

**Theorem 3.** Modulo the transformations  $x \rightarrow y, y \rightarrow x, t \rightarrow -t$ , the line at infinity  $Z = 0$  has the multiplicity at least four for system (1) if and only if one of the following six sets of conditions holds:

$$a = 0, c = b, f = g = k = l = m = n = p = r = s = 0, q \neq 0; \quad (4z1)$$

$$a = c = f = k = l = m = n = p = r = s = 0, q \neq 0; \quad (4z2)$$

$$b = \frac{aq}{s}, c = \frac{aq}{s}, f = 0, d = \frac{agq + a^2s + s^2}{as}, k = l = m = n = p = r = 0; \quad (4z3)$$

$$a = \frac{m^3}{q(bm - fq)}, c = \frac{m^4 + b^2mq^2 - bfq^3}{q^2(bm - fq)}, g = \frac{m^2}{bm - fq}, k = 0, l = \frac{m^2}{q}, \\ d = \frac{m^5 + 2b^2m^2q^2 - 3bfmq^3 + f^2q^4}{m^2q(bm - fq)}, n = 2m, p = \frac{2m^2}{q}, r = \frac{m^3}{q^2}, s = 0; \quad (4z4)$$

$$b = fs/k, d = cs/k, g = as/k, l = -k, m = (2k^2 - s^2)/s, r = -k^2/s, \\ p = \frac{(gk^4 - agkrs + k^2rs + a^2rs^2)/(k^3(gk - as))}{m + r}, n = \frac{(2k^4 + k^2s^2 - s^2)k^4 + 2rs^3}{k^2s}, \quad (4z5)$$

$$c = -\frac{g^2k^6 - 3agk^5s + 2a^2k^4s^2 + k^4s^3 - agkrs^4 + k^2rs^4 + a^2rs^5}{k^3s^2(gk - as)}, \\ d = \frac{agk^4 - a^2k^3s - k^3s^2 + g^2krs^2 - agrs^3 - krs^3}{k^3(gk - as)}, p = \frac{k^4 + 2rs^3}{ks^2}, \\ f = -\frac{k^4 + g^2k^2r - 3agkrs + k^2rs + 2a^2rs^2}{k^2(gk - as)}, l = \frac{rs}{k}, q = \frac{2k^4 + rs^3}{k^3}. \quad (4z6)$$

## V. Cubic systems (1) with the line at infinity of multiplicity five

**Theorem 4.** In the class of cubic systems of the form (1) the maximal multiplicity of the line at infinity  $Z = 0$  is 5. Modulo the transformations  $x \rightarrow y, y \rightarrow x, t \rightarrow -t$ , the line  $Z = 0$  has the multiplicity five for (1) if and only if one of the following six sets of conditions holds:

$$\begin{aligned} a=0, \quad b=0, \quad c=0, \quad f=0, \quad g=0, \quad k=0, \quad l=0, \\ m=0, \quad n=0, \quad p=0, \quad r=0, \quad s=0, \quad q \neq 0; \end{aligned} \quad (5z1)$$

$$\begin{aligned} b=0, \quad c=0, \quad d=2a, \quad f=0, \quad k=0, \quad l=0, \quad m=0, \\ b=-\frac{as}{k}, \quad c=\frac{a(k^2-s^2)}{ks}, \quad d=\frac{a(k^2-s^2)}{k^2}, \quad f=-a, \quad g=\frac{as}{k}, \quad m=\frac{2k^2-s^2}{s}, \end{aligned} \quad (5z2)$$

$$l=-k, \quad n=\frac{k^2-2s^2}{s}, \quad p=\frac{k(k^2-2s^2)}{s^2}, \quad q=\frac{2k^2-s^2}{k}, \quad r=-\frac{k^2}{s}; \quad (5z3)$$

$$\begin{aligned} a=0, \quad b=-\frac{gk^2}{s^2}, \quad c=-\frac{2gk^2}{s^2}, \quad d=0, \quad f=-\frac{2gk^3}{s^3}, \quad l=\frac{k^3}{s^2}, \\ m=\frac{3k^2}{s}, \quad n=\frac{3k^2}{s}, \quad p=\frac{3k^3}{s^2}, \quad q=3k, \quad r=\frac{k^4}{s^3}, \quad g^2k^2-k^2s-s^3=0; \end{aligned} \quad (5z4)$$

$$\begin{aligned} b=-\frac{as}{k}, \quad c=-\frac{2as}{k}, \quad d=2a, \quad f=-\frac{a(k^2+2s^2)}{s^2}, \quad g=\frac{k^2+a^2s}{ak}, \quad l=\frac{k^3}{s^2}, \\ m=\frac{3k^2}{s}, \quad n=\frac{3k^2}{s}, \quad p=\frac{3k^3}{s^2}, \quad q=3k, \quad r=\frac{k^4}{s^3}, \quad k^4-a^2k^2s-a^2s^3=0; \end{aligned} \quad (5z5)$$

$$\begin{aligned} b=-\frac{k(-agk+k^2+a^2s+s^2)}{s(gk-as)}, \quad c=-\frac{2k(gk-2as)}{s^2}, \quad d=2a, \\ f=-\frac{k^2(2gk-3as)}{s^3}, \quad l=\frac{k^3}{s^2}, \quad m=\frac{3k^2}{s}, \quad n=\frac{3k^2}{s}, \quad p=\frac{3k^3}{s^2}, \\ q=3k, \quad r=\frac{k^4}{s^3}, \quad g^2k^2-2agks-k^2s+a^2s^2-s^3=0. \end{aligned} \quad (5z6)$$

Theorems 3 and 4 from Sections IV and V can be proved similarly as Theorem 2.

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