

ISSN: 2221-1055
E-ISSN: 2413-2322

Національний науковий центр «Інститут аграрної економіки»
ТОВ «Наукові журнали»

ЕКОНОМІКА АПК

Науково-виробничий журнал

Заснований у 1994 році
Випускається 6 разів на рік

Том 29, № 3

Київ – 2022

ISSN: 2221-1055
E-ISSN: 2413-2322

Співзасновники:

Національний науковий центр «Інститут аграрної економіки»,
ТОВ «Наукові журнали»

Рік заснування: 1994

*Рекомендовано до друку та поширення
через мережу Інтернет Вченою радою
Національного наукового центру «Інститут аграрної економіки»
(протокол № 5 від 19 травня 2022 р.)*

**Свідectво про державну реєстрацію
друкованого засобу масової інформації**
серії KB № 25122-15062 ПР від 17 лютого 2022 р.

Журнал входить до Переліку наукових фахових видань України

Категорія «Б». Спеціальності: 051 «Економіка», 071 «Облік і оподаткування»,
072 «Фінанси, банківська справа та страхування», 073 «Менеджмент»,
076 «Підприємництво, торгівля та біржова діяльність»
(наказ Міністерства освіти і науки України від 11 липня 2019 р. № 975)

**Журнал представлено у міжнародних наукометричних базах даних,
репозитаріях та пошукових системах:** Google Scholar, Index Copernicus International,
Фахові видання України, Національна бібліотека України імені В. І. Вернадського, Crossref,
AGRIS, Econlit, ECONBIZ, Academic Resource Index ResearchBib, ZBW, WorldCat, JournalFinder,
EZB, SIS, GIF, InfoDase, PBN, CiteFactor, UBL, JIFACTOR, MIAR, TIB,
I2OR, General Impact Factor, BASE, ERIH PLUS, EBSCO

Адреса редакції:

Національний науковий центр «Інститут аграрної економіки»
вул. Героїв Оборони, 10, м. Київ, 03127, Україна
E-mail: info@eapk.com.ua
www: <https://eapk.com.ua/uk>

ISSN: 2221-1055
E-ISSN: 2413-2322

National Scientific Center "Institute of Agrarian Economics"
LLC "Scientific Journals"

EKONOMIKA APK

Scientific and Production Journal

Founded in 1994
Published six times per year

Volume 29, No. 3

Kyiv – 2022

ISSN: 2221-1055
E-ISSN: 2413-2322

Co-founders:

National Scientific Center "Institute of Agrarian Economics",
LLC "Scientific Journals"

Year of foundation: 1994

*Recommended for printing and distribution
via the Internet by the Academic Council
of National Scientific Center "Institute of Agrarian Economics"
(Minutes No. 5 of May 19, 2022)*

**Certificate of state registration
of the print media**

Series KV No. 25122-15062 PR of February 17, 2022

Journal is included in the List of Scientific professional publications of Ukraine

Category "B". Specialty's: 051 "Economics", 071 "Accounting and Taxation",
072 "Finance, Banking and Insurance", 073 "Management",
076 "Entrepreneurship, Trade and Stock Market Activity"
(order of the Ministry of Education and Science of Ukraine of July 11, 2019, No. 975)

Journal is presented international scientometric databases, repositories

and scientific systems: Google Scholar, Index Copernicus International, Professional Publications
of Ukraine, Vernadsky National Library of Ukraine, Crossref, AGRIS, Econlit, ECONBIZ, Academic Resource
Index ResearchBib, ZBW, WorldCat, JournalFinder, EZB, SIS, GIF, InfoDase, PBN, CiteFactor, UBL, JIFACTOR,
MIAR, TIB, I2OR, General Impact Factor, BASE, ERIH PLUS, EBSCO

Editors office address:

National Scientific Center "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
E-mail: info@eapk.com.ua
www: <https://eapk.com.ua/en>

Редакційна колегія

Головний редактор

Юрій Олексійович Лупенко – доктор економічних наук, професор, академік НААН, в.о. директора, Національний науковий центр «Інститут аграрної економіки», Україна

Заступники головного редактора

Петро Трохимович Саблук – доктор економічних наук, професор, академік НААН, радник дирекції, Національний науковий центр «Інститут аграрної економіки», Україна

Олександр Григорович Шпикуляк – доктор економічних наук, професор, член-кореспондент НААН, учений секретар, Національний науковий центр «Інститут аграрної економіки», Україна

Члени редакційної колегії

С. В. Андрос

докторка економічних наук, доцентка, провідна наукова співробітниця, Національний науковий центр «Інститут аграрної економіки», Україна

Ю. С. Бездушна

докторка економічних наук, старша наукова співробітниця, завідувачка відділу, Національний науковий центр «Інститут аграрної економіки», Україна

В. Л. Валентинов

доктор економічних наук, професор, Лейбніц Інститут аграрного розвитку в країнах з перехідною економікою, Німеччина

І. Ю. Гришова

докторка економічних наук, професорка, Цзянзуський педагогічний університет, Китай

А. О. Гуроров

доктор економічних наук, професор, головний науковий співробітник, Національний науковий центр «Інститут аграрної економіки», Україна

Ю. І. Данько

доктор економічних наук, професор, проректор, Сумський національний аграрний університет, Україна

В. М. Жук

доктор економічних наук, професор, академік НААН, головний науковий співробітник, Національний науковий центр «Інститут аграрної економіки», Україна

Л. В. Забуранна

докторка економічних наук, професорка, членкиня-кореспондентка НААН, професорка кафедри, Національний університет біоресурсів і природокористування України, Україна

О. В. Захарчук

доктор економічних наук, професор, завідувач відділу, Національний науковий центр «Інститут аграрної економіки», Україна

В. В. Зіновчук

доктор економічних наук, професор, завідувач кафедри, Поліський національний університет, Україна

М. Ф. Кропивко

доктор економічних наук, професор, академік НААН, головний науковий співробітник, Національний науковий центр «Інститут аграрної економіки», Україна

М. Й. Малік

доктор економічних наук, професор, академік НААН, головний науковий співробітник, Національний науковий центр «Інститут аграрної економіки», Україна

Р. Мелнікієне

докторка соціальних наук, директорка, Інститут економіки та розвитку сільських територій Литовського центру соціальних наук, заступниця директора, Литовський центр соціальних наук, Литва

Л. Г. Мельник

доктор економічних наук, професор, завідувач кафедри, Сумський державний університет, директор Науково-дослідного інституту економіки розвитку МОН України та НАН України, Україна

Я. Надь

доктор сільськогосподарських наук, професор, проректор, Дебреценський університет, президент, Центр аграрних наук, Угорщина

О.В. Орлова-Курилова

докторка економічних наук, доцентка, в.о. завідувачки кафедри, Луганський національний аграрний університет, Україна

Н. І. Патика

докторка економічних наук, професорка, завідувачка відділу, Національний науковий центр «Інститут аграрної економіки», Україна

М. І. Пугачов

доктор економічних наук, професор, академік НААН, заступник директора, Національний науковий центр «Інститут аграрної економіки», Україна

М. П. Сичевський

М. А. Хвесик

О. В. Ходаківська

Ц. Лерман

В. С. Шебанін

О. М. Шпичак

доктор економічних наук, професор, академік НААН, радник дирекції, Інститут продовольчих ресурсів Національної академії аграрних наук України, Україна
доктор економічних наук, професор, академік НААН, директор, Державна установа «Інститут економіки природокористування та сталого розвитку Національної академії наук України», Україна

докторка економічних наук, професорка, членкиня-кореспондентка НААН, заступниця директора, Національний науковий центр «Інститут аграрної економіки», Україна

доктор економічних наук, професор, Єврейський університет в Єрусалимі, Ізраїль

доктор технічних наук, професор, академік НААН, ректор, Миколаївський національний аграрний університет, Україна

доктор економічних наук, професор, академік НААН, головний науковий співробітник, Національний науковий центр «Інститут аграрної економіки», Україна

Editorial Board

Editor-in-Chief

Yurii Lupenko – Full Doctor in Economic Sciences, Professor, Academician of NAAS, Acting Director, National Scientific Center “Institute of Agrarian Economics”, Ukraine

Deputy Editors-in-Chief

Petro Sabluk – Full Doctor in Economic Sciences, Professor, Academician of NAAS, Adviser Directorate, National Scientific Center “Institute of Agrarian Economics”, Ukraine

Oleksandr Shpykuliak – Full Doctor in Economic Sciences, Professor, Corresponding Member of NAAS, Scientific Secretary, National Scientific Center “Institute of Agrarian Economics”, Ukraine

Editorial Board Members

S. Andros

Full Doctor in Economic Sciences, Associate Professor, Leading Research Fellow, National Scientific Center “Institute of Agrarian Economics”, Ukraine

Yu. Bezdushna

Full Doctor in Economic Sciences, Senior Research Fellow, Head of Department, National Scientific Center “Institute of Agrarian Economics”, Ukraine

V. Valentinov

Full Doctor in Economic Sciences, Professor, Leibniz Institute for Agrarian Development in Countries in Transition, Germany

I. Gryshova

Full Doctor in Economic Sciences, Professor, Jiangsu Pedagogical University, China

A. Hutorov

Full Doctor in Economic Sciences, Professor, Chief Research Fellow, National Scientific Center “Institute of Agrarian Economics”, Ukraine

Yu. Danko

Full Doctor in Economic Sciences, Professor, Vice-Rector, Sumy National Agrarian University, Ukraine

V. Zhuk

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Chief Research Fellow, National Scientific Center “Institute of Agrarian Economics”, Ukraine

L. Zaburanna

Full Doctor in Economic Sciences, Professor, Corresponding Member of NAAS, Professor of the Department, National University of Life and Environmental Sciences of Ukraine, Ukraine

O. Zakharchuk

Full Doctor in Economic Sciences, Professor, Head of Department, National Scientific Center “Institute of Agrarian Economics”, Ukraine

V. Zinovchuk

Full Doctor in Economic Sciences, Professor, Head of the Department, Polissia National University, Ukraine

M. Kropyvko

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Chief Research Fellow, National Scientific Center “Institute of Agrarian Economics”, Ukraine

M. Malik

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Chief Research Fellow, National Scientific Center “Institute of Agrarian Economics”, Ukraine

R. Melnikiene

Full Doctor in Social Sciences, Director, Institute of Economics and Rural Development of the Lithuanian Center for Social Sciences, Deputy Director, Lithuanian Center for Social Sciences, Lithuania

L. Melnyk

Full Doctor in Economic Sciences, Professor, Head of the Department, Sumy State University, Director of the Research Institute of Development Economics of the Ministry of Education and Science of Ukraine and the National Academy of Sciences of Ukraine, Ukraine

Ja. Nagy

Full Doctor in Agricultural Sciences, Professor, Vice-Rector, University of Debrecen, President, Center for Agricultural Sciences, Hungary

O. Orlova-Kurylova

Full Doctor in Economic Sciences, Associate Professor, Acting Head of the Department, Luhansk National Agrarian University, Ukraine

N. Patyka

Full Doctor in Economic Sciences, Professor, Head of Department, National Scientific Center “Institute of Agrarian Economics”, Ukraine

M. Pugachov

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Deputy Director, National Scientific Center “Institute of Agrarian Economics”, Ukraine

M. Sychevskyi

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Adviser to the Directorate, Institute of Food Resources of the National Academy of Agrarian Sciences of Ukraine, Ukraine

M. Khvesyk

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Director, State Institution "Institute of Environmental Economics and Sustainable Development of the National Academy of Sciences of Ukraine", Ukraine

O. Khodakivska

Full Doctor in Economic Sciences, Professor, Corresponding Member of NAAS, Deputy Director, National Scientific Center "Institute of Agrarian Economics", Ukraine

Z. Lerman

Full Doctor in Economic Sciences, Professor, Hebrew University of Jerusalem, Israel

V. Shebanin

Full Doctor in Technical Sciences, Professor, Academician of NAAS, Rector, Mykolaiv National Agrarian University, Ukraine

O. Shpychak

Full Doctor in Economic Sciences, Professor, Academician of NAAS, Chief Research Fellow, National Scientific Center "Institute of Agrarian Economics", Ukraine

ЗМІСТ / CONTENTS

М. Й. Малік, О. Г. Шпикуляк, С. А. Кравченко, Д. І. Шеленко, К. Ю. Ксенофонтова Побудова організаційно-економічного механізму інтеграції і кооперації в аграрній сфері: системний підхід.....	10
M. Malik, O. Shpykuliak, S. Kravchenko, D. Shelenko, K. Ksenofontova Establishment of an Organisational and Economic Mechanism for Integration and Cooperation in the Agricultural Sector: A Systemic Approach.....	10
А. Д. Діброва, Л. В. Діброва, А. С. Чміль, М. А. Діброва Прогнозування наслідків впливу вартості мінеральних добрив на розвиток ринку кукурудзи в Україні з використанням моделі AGMEMOD.....	23
A. Dibrova, L. Dibrova, A. Chmil, M. Dibrova Forecasting the Consequences of the Cost of Mineral Fertilisers on the Development of the Corn Market in Ukraine Using AGMEMOD Models	23
А. В. Кравцов Інноваційні фінансові методи оптимізації дебіторської заборгованості та їх вплив на ефективність діяльності підприємства.....	42
A. Kravtsov Innovative Financial Methods for Optimising the Solvency of Accounts Receivable and Their Impact on the Efficiency of a Company's Operations	42
С. В. Андрос, А. М. Білоченко Інституційні моделі управління розвитком сільських територій в економіці країн Європейського Союзу: специфіка, пріоритети, інструменти.....	51
S. Andros, A. Bilochenko Institutional Models for Managing Rural Development in the Economy of the European Union Countries: Specifics, Priorities, Tools	51
О. В. Риковська Державна підтримка агросектора в контексті інклюзивного сільського розвитку.....	62
O. Rykovska State Support for the Agricultural Sector in the Context of Inclusive Rural Development.....	62



UDC 338.436 (477)

Establishment of an Organisational and Economic Mechanism for Integration and Cooperation in the Agricultural Sector: A Systemic Approach

Mykola Malik¹, Oleksandr Shpykuliak^{*}, Svitlana Kravchenko¹,
Diana Shelenko², Kateryna Ksenofontova¹

¹National Scientific Center "Institute of Agrarian Economics"

03127, 10 Heroiv Oborony Str., Kyiv, Ukraine

²Vasyl Stefanyk Precarpathian National University

76018, 57 Shevchenko Str., Ivano-Frankivsk, Ukraine

► **Abstract.** The growth of production efficiency in the agricultural sector of the economy is based on the use of various factors – organisational, economic, labour, material, motivational, etc. Among them, organisational and economic ones are a priority, which can also include integration relations. The mechanism of action of organisational and economic foundations of integration relations in the context of a systematic approach is rather underinvestigated, which determined the topic of research. The purpose of the study is to substantiate the theoretical, methodological, and practical foundations of building an organisational and economic mechanism of integrated structures from the standpoint of a systematic approach. The methodological basis of the study was the provisions of institutional economic theory and system analysis. Monographic, normative, graphic, abstract and logical methods and approaches to generalising results are used. The economic essence of the organisational and economic mechanism of integrated structures in the agricultural sector of the economy is determined. The essence of integrated structures and integrative formations from the standpoint of consistency is substantiated. The concepts of "integrated structure" and "cooperative" have been clarified. The interdependence of dysfunctions is determined – an integrated structure and an agricultural cooperative. The study results can be taken into account in the development of programmes: determining priorities for the development of integration and cooperative structures, developing laws and regulations for the establishment and development of cooperation and integration in the agricultural sector of the economy

► **Keywords:** agricultural cooperative, integration and cooperative structures, integration associations, mechanism of integrated structures, agricultural holdings, business entity, integrative formations, clusters

► Introduction

Literature sources on the development of integration structures focus on the essence of integration and cooperation and economic efficiency in the development of the agricultural sector of the economy. The principles of their organisation and economic mechanisms of functioning are ignored. Despite certain advantages of these formations, in practice, due to insufficiently disclosed mechanisms of their activities, the creation of these structures does not meet the needs. Therefore, cooperatives and other integration associations remain in the minority and do not fully perform their functions in the development of the agricultural economy and solving a number of social issues.

Thus, out of the total number of agricultural enterprises, 47,760 cooperatives (production and

service) amounted to 2,200 (4.6%), while farms and private enterprises – 15,672 (32.8%), farms – 31,850 (62.7%) [1]. As evidenced by foreign experience, the development of integration cooperation is gaining popularity both in the agricultural sector and in other areas of agro-industrial production. Participation in agro-industrial integration formations is considered as a means of increasing the competitiveness of their production, and obtaining the effect of the cost economy. To activate integration processes in the agricultural sector, it is necessary to develop a functioning organisational and economic mechanism for the creation and functioning of integrated associations, agricultural cooperatives, which would ensure the effective functioning of such structures and avoid on-farm contradictions [2].

► **Suggested Citation:** Malik, M., Shpykuliak, O., Kravchenko, S., Shelenko, D., & Ksenofontova, K. (2022). Establishment of an organisational and economic mechanism for integration and cooperation in the agricultural sector: A systemic approach. *Ekonomika APK*, 29(3), 10-22.

*Corresponding author

World experience confirms the high economic efficiency of cooperative-integrated systems and their social orientation. However, in Ukraine, the advantages and positive aspects of cooperation and integration are not properly spread, because there are problems with the implementation of the national policy, insufficient understanding of the essence of integrated processes of business entities, and financial difficulties in organising cooperatives. Although each agricultural producer in the process of production activities has to overcome significant problems associated with shortcomings in material and technical support, the negative effect of competitors, intermediaries, and an increase in the price of goods, which entails the transition of the cooperative initiative to their side. Instead, cooperative members are more likely to receive a one-time benefit compared to the prospect of participating in a cooperative. Different approaches are used to reduce the impact of these and other problems. These include the establishment of optimal relationships with other business entities. The development of such relationships leads to the establishment of close integration ties, in particular, on the principles of cooperation. Integration processes are typical for all sectors of the economy, but in agriculture, based on the specifics of the industry, they are the most necessary. As Ukrainian and foreign practice shows, they provide positive results both for the associations themselves and for the overall society (balanced intra-economic relations, socio-economic mutually beneficial partnerships, etc.).

However, in Ukraine, as of the end of 2021, out of a total of 47,523, agricultural production cooperatives accounted for 950 (1.9%), and farms accounted for 31,851 (66.3%). In addition, 1,279 agricultural cooperatives produce 0.5% of gross production; 120 agricultural holdings produce 16% of gross output [1].

The study of problematic issues of the formation of integration structures is spread by public demand. The importance and role of integration structures and cooperatives in solving the problems of improving the efficiency of the agricultural sector of the economy and market competitiveness are quite thoroughly described in the papers of Ukrainian and foreign researchers.

The investigation of theoretical, methodological, and practical foundations of building an organisational and economic mechanism of integrated structures plays an important role in the development of agro-industrial integration and cooperation in the agricultural sector.

V. Andriychuk [3], proves that in the process of capitalisation, integrated organisational and legal forms have appeared in the form of integral enterprises that create the agricultural sector on the basis of separate or structural divisions. G. Hegel [4] revealed the concept of social cooperation in the ideas of the cooperative state of law. S. Prilipko [5] focuses his attention on the development of service cooperation in rural areas, G. Cherevko [6] notes that agricultural holdings are a new integration form of management organisation in the agricultural

business. M. Malik [2; 7; 8], focuses on the principles of development of agricultural cooperation. O. Sakovska investigates the role of cooperation in the development of the agricultural market [9-11].

O.A. Hryshchova, O.V. Vasilin [12] improved the organisational and economic mechanism for managing the intellectualisation of labour activity with the help of its features into elementary, functional, and process ones. The line of A. Hutorov's research [13] allowed investigating the features of the development of the agricultural sector of the economy based on the development of integration processes, by substantiating systemic shortcomings on the path of progress of the national economy, considering trends of inclusivity.

A.Yu. Ermakov, M.R. Sudomir [14], giving an assessment of the organisational and economic mechanism of growth of competitive stability of enterprises, expressed the opinion that it should be supplemented with such approaches as axiological, technological, structural and functional, system, synergetic, process, strategic, managerial, sociological, cybernetic, and communication.

O.V. Moroz, V.M. Semtsov, H.S. Kukel, N.F. Mindziuk [15, p. 163] note that the effective functioning of the agro-industrial complex system is not possible without the use of processes of specialisation and concentration of production in agriculture, integration mechanisms (corporatisation, clustering, cooperation).

Another vital area of solving this problem is the study by O.V. Khodakivska and O.M. Mohylnyi [16], which proposes to step up the implementation of solving the peasant question based on the institutional development of the agricultural sector of the economy. The implementation of modelling the impact of resource factors on agricultural products was also emphasised by A. Potapov [17].

R. Dymczyk et al. [18] proposed indicators using the hierarchy analysis method and conducted a comparative assessment of factors in the establishment of social capital on the example of agricultural holdings in Ukraine. O.G. Shpykuliak [11], Yu.A. Lupenko and M.I. Malik [7; 19] prove that despite the institutional essence of the coexistence of agricultural production, integration ties are an important factor in organisational and economic support for the implementation of the potential of integrated formations in ensuring stable development. C.A. Moreno-Hurtado, D.A. Ochoa-Jiménez, G.L. Izquierdo-Montoya [20] considered a simplified model of economic growth of social capital.

O. Odintsov, T. Yevtukhova, E. Vasytkonova, V. Kunchenko-Kharchenko [21] proved that optimisation of the tax burden on agricultural enterprises allowed directing the resource potential to increase production volumes and increase tax revenues from the industry. M. Humeniuk, D. Shelenko, N. Kovalchuk, I. Balaniuk, I. Kozak-Balaniuk [22] substantiated the impact of innovations on increasing sales of enterprises.

To develop a functioning organisational and economic mechanism, it is necessary to consider the opinions of various researchers regarding its essence.

Thus, O.A. Hryshchova, O.V. Vasilin suggest that the system of organisational and economic mechanism should be considered from the standpoint of the influence of its elements on management as a whole and on its objects, considering the components of the subsystems of motivation, stimulation, coordination, and regulation [12].

The authors of this study agree with the interpretation provided by O. Yu. Ermakov, M. R. Sudomir that the functioning of the organisational and economic mechanism reflects the integrity of the system of elements of competitive development of socio-economic formations [14]. The researchers distinguish three subsystems of stability of functioning of enterprises – provision, functioning, and target. The target subsystem includes market, production, financial, and social goals; in addition, it includes methods, levers, tools, and organisational and economic processes [14].

N.V. Surzhenko and I.V. Ahieieva [23] proposed to consider the mechanism of enterprise management considering the influence of organisational and economic levers on the efficiency of the enterprise. However, a number of issues related to the problems of a systematic approach to the establishment of an organisational and economic mechanism for the development of integrated structures remain insufficiently studied and require further consideration.

The purpose of the study is to evaluate and substantiate, from the standpoint of a systematic approach, the basis for building the organisational and economic mechanism of integrated structures in the agriculture sector of the economy of Ukraine.

► Materials and Methods

The information base of the study is the laws and regulations of Ukraine; materials of the Ministry of Agrarian Policy and Food of Ukraine, the Ministry of Economy of Ukraine, the Ministry of Finance of Ukraine, the State Statistics Service of Ukraine, financial statements of business entities, articles of national and international news agencies, studies by Ukrainian and foreign researchers on the development of the organisational and economic mechanism of integration and cooperation in the agrarian economy of Ukraine, the findings of previous studies by the authors, etc. The calculations were performed using modern computer technologies and analysis techniques. The research is implemented in 4 stages: analysis of statistical information and literature sources; investigation of historical Ukrainian and foreign experience; development of ways to build an organisational and economic mechanism for the functioning of integration structures and cooperative formations; formulation of conclusions and recommendations.

The main provisions of institutional economic theory and system analysis served as a theoretical and methodological platform of research. The system method of cognition is based on the historical experience of the development of integration processes in the agricultural sector of the economy, where the features of their functioning and economic

characteristics of separate integration structures and cooperatives are considered. Abstract and logical methods are widely used to determine the essence of the status of integration associations and cooperative formations, to consider identity and differences, and the features of cooperative formations as a special organisational and legal structure. To carry out empirical assessments and identify trends in the change and development of integration structures, monographic, graphical, and normative methods, approaches to generalising results were used to formulate conclusions and recommendations for establishing causal relationships when describing the development of certain groups of business entities. Trend analysis was used to build a forecast of annual changes in the number of agricultural cooperatives for 2030. The forecast for the establishment of cooperatives is based on the number of private farms producing marketable products. Provided that there is state support for such business entities, they can change their status and create integrated structures – simple societies and cooperatives.

► Results and Discussion

The agricultural sector is a component of the socio-economic diversity of economic relations and organisational and functional ties in society. Integrated economic structures from simple to complex can be used (attracted) in solving many existing problems (e.g.: shortcomings in the implementation of reforms and lack of social responsibility; deterioration of fixed assets; lack of professional management; lack of funds; lack of investment; unfavourable conditions for lending to business activities; raider seizures of enterprises and taking control of the most profitable types of agricultural business, etc.) of the agricultural economy. The simplest integrated structure can be an organisation based on a contract for joint activities of participants in a production contract, and others. More complex are integrated structures such as cooperatives, integrated associations with and without loss by participants of a legal entity. This includes agricultural holdings, agricultural firms, etc. [8].

In the process of research, scientists actively use multi-quantitative approaches and methods of complex analysis from the standpoint of a systematic approach to considering structures of various complexity. The essence of the system approach is a comprehensive study of both internal processes of the system and its external relations, dynamics of development and functioning. The systematic approach in economic processes (entrepreneurial activity) provides for the rational use of resources, the expediency of using which is aimed at achieving a single goal and therefore is considered as a single whole, as a system [13]. A qualitatively new structure can be a complex system as a set of interrelated subsystems that perform different functions, but are aimed at solving a common problem.

Cooperation and integration in the agricultural sector of the economy can be considered as a system that is aimed at improving the efficiency of industries

related to agricultural production – the production of grain, vegetables, milk, and their processing. Characteristic features of the functioning of the cooperative-integrated system in the agricultural sector of the economy are the mandatory participation of members of the association (enterprises or individual farms) in production and economic activities, achieving a common result – income, profit, and solving social problems.

To reveal the essence of the functioning of the “organisational and economic mechanism”, a systematic approach is used through the disclosure of the components of the mechanism. The study of the development of integrated structures and cooperatives shows that the organisational and economic mechanism of integration and cooperative enterprises should be considered both as a structure and as a process. The structure of the mechanism consists of its constituent elements (contracts, business plans, norms of conduct, legislative and legal standards, prices, investments, taxes), which are necessary for the creation and functioning of an organisational and legal structure. The organisational and economic mechanism as a process is characterised by methods and actions that are used in the organisation (creation) of an integration structure. Moreover, the components that form the mechanism differ in different organisational and legal structures. Integration structures are characterised by the development of production activities, while cooperatives are mainly aimed at the development of social capital.

To consider the features of building an organisational and economic mechanism, the authors of this study consider the features of the activities of individual business enterprises and cooperatives, in particular, the economic basis for the creation and operation of agro-industrial associations of the holding type. In Ukraine, the formation of holding companies was approved in 1994, according to Presidential Decree No. 224/94 “On Holding Companies...” [24]. This decree provided for their creation in the process of corporatisation and privatisation.

The organisational and economic mechanism of cooperation and integration is considered as a system of organisational, managerial, economic, and legal regulators of the existence and creation of new cooperative integrated structures and their effective functioning. To ensure the production activities of cooperatives and integrated structures, a system of resource and financial support, a marketing system, a system of economic regulation, management of distribution relations, and a system of labour motivation are necessary. Considering the multiplicity of systems, the construction of an organisational and economic mechanism includes an integral system of organisational, legal, and economic components. The functioning of the components of the economic mechanism while creating an appropriate institutional business environment would ensure the effective operation of cooperative and integrated structures.

Analysis of trends in integration processes in the agricultural sector of the economy shows that agro-industrial integration develops in the following

main areas: based on contracts with different validity periods; mergers and acquisitions of business entities; in the form of various independent structures that are created by combining the capital of individual business entities. The simplest form of integration is structures organised on the basis of contracts of process subjects with the integrator. However, this form does not affect the development of all integration participants equally. Individual participants (founders) try to build their relationships with other participants, especially for agricultural producers (integrators) not on an equivalent basis, but on the assignment of most of the created surplus value. In the process of developing integration, depending on the conditions, various organisational and legal structures are created (clusters, cooperatives, agricultural holdings, simple societies, associations, etc.). At the same time, the integrator is mainly an economically strong enterprise with sufficient investment potential [19].

The algorithm for building an integration and cooperative association includes components that form a system of organisational and economic structures. Each of these structures performs the corresponding functions in the operation of a mechanism that includes the organisational structure of enterprises, the system of functioning, the system of management and control, the system of property distribution relations [2]. For the rational operation of such a structure, measures are needed for state institutional and economic support for the development of cooperation in rural areas to strengthen the integration ties of small forms of management; the establishment of an effective mechanism for institutionalising industry associations; the introduction of programme measures to solve the production and sales problems of small agricultural producers, etc. This approach ensures effective interaction of all structural components that are aimed at maintaining the balance of on-farm relations, equivalence of exchange, and improving the effective activities of the association.

However, the organisational and economic mechanism depends on the organisational and legal form of the enterprise defined by the legislation. Different organisational and legal forms of management also provide for different mechanisms of distribution relations, the level of participation of subjects in the economic activities of the association. These can be cooperative forms of management – cooperatives and their associations, and corporate structures – agricultural holdings, agricultural firms, financial and industrial groups. Therefore, the choice of the organisational and legal form of management is carried out taking into account the purpose, available funds and the available production potential of the association's participants. Specific feature is the availability of financial support and sources of financing. A significant part of them do not register subsidiaries in the locations of leased land, but turn them into structural divisions [14].

The basis of the agricultural holding “Astarta-Kyiv” is made up of agricultural firms, holdings “Nibulon”, “Prodekame”, “Kyiv-Atlantic Ukraine” – subsidiaries.

“Mironovsky khliboproduct” and “Avangard” are private joint-stock companies [25]. The establishment and functioning of the organisational and economic mechanism of integrated associations is significantly influenced by the management system, which would ensure sustainable development and respect for the economic interests of all participants. Changing or choosing a new management structure involves changing the elements of the management structure, since each integration association establishes its own management system, which should have characteristic features of correspondence between

the structural organisation and the environment. Thus, the agricultural holding “Astarta-Kyiv” uses a hierarchical management structure. General scheme of the organisational structure of the agricultural holding: shareholders – management company – industry directions – enterprises.

The Law of Ukraine “On Holding Companies” [26] defines a holding company as a joint-stock company that owns, uses, and disposes of a corporate block of shares in two or more corporate enterprises. At the beginning of 2022, 160 such structures operated in Ukraine. The land bank was 3.5 million hectares (Table 1).

Table 1. Size of land banks of the Top-20 agricultural holding formations

Agricultural holdings	2018		2019		2020		2021		2022*		2022* / 2018
	thsd ha	No.	thsd ha	No.	thsd ha	No.	thsd ha	No.	thsd ha	No.	thsd ha
Kernel Holding Sa	550.0	2	530.0	1	530.0	1	506.0	1	506.0	1	-44
Ukr Land Farming	570.0	1	500.0	2	500.0	2	475.0	2	475.0	2	-95
Mhp Se	370.0	4	370.0	4	370.0	3	370.0	3	370.0	3	0
NCH Agroprosperis	400.0	3	396.0	3	300.0	4	300.0	4	300.0	4	-100
Astarta-Kyiv	250.0	5	250.0	5	235.0	5	220.0	5	220.0	5	-30
Continental Farmers Group	165.0	6	195.0	6	195.0	6	195.0	6	195.0	6	30
Epizentr Agro	111.0	10	121.4	9	160.0	7	160.0	7	160.0	7	49
Harv East Holding	102.0	14	127.0	7	127.0	8	127.0	9	127.0	9	25
Imc Sa	129.6	7	123.9	8	123.9	9	120.0	10	120.0	10	-9.6
Ukrprominvest-Agro	116.5	9	120.0	10	120.0	10	120.0	11	120.0	11	3.5
Agroton Public	110.0	11	110.0	11	110.0	11	120.0	12	120.0	12	10
A Grein	110.0	12	110.0	12	110.0	12	110.0	13	110.0	13	0
Agricultural system technologies	110.0	13	110.0	13	110.0	13	150.0	8	150.0	8	40
Vit Agro	80.0	21	85.0	14	530.0	14	85.0	14	85.0	14	5
Privat Adgo Holding	85.0	16	85.0	15	500.0	15	85.0	16	85.0	16	0
Tas Agro	88.0	15	83.0	16	83.0	16	83.0	16	83.0	16	-5
Nibulon	82.5	17	82.5	17	82.5	17	82.5	17	82.5	17	0
Adgo Vista	82.0	18	82.0	18	82.0	18	80.0	18	80.0	18	-2
Svitanok	80.0	20	80.0	19	80.0	19	80.0	19	80.0	19	0
LNZ	70.0	23	80.0	20	80.0	20	80.0	20	80.0	20	10
Total Top-20	3,661.6	x	3,640.8	x	4,428.4	x	3,548.5	x	3,548.5	x	-113.1

Source: based on data from latifundist.com [27]

Explanation: *as of January 1, 2022

Such agricultural structures are also characterised by the efficiency of their labour. Average value of EBIDTA indicators (Earning Before Interest, Depreciation, Taxes and Amortisation – financial coefficient; performance indicator functioning of business entities in one industry; profit before taxes, depreciation charges, interest) among the largest in 2016-2020 was in “Mhp Se” (Myronivsky khliboproduct, private joint-stock company, agro-industrial

company) – UAH 1,107 per hectare in 2016. It is established that the leaders in revenue are Kernel Holding Sa and Mhp Se – USD 4.1 and USD 2.06 billion, respectively, the weakest – Agroton Public (USD 54.4 million) (Figs. 1-3). The financial success of Kernel Holding Sa and Mhp Se can be explained by the action of organisational and economic mechanisms and the scale of investment and innovation activity, and overall cost savings.

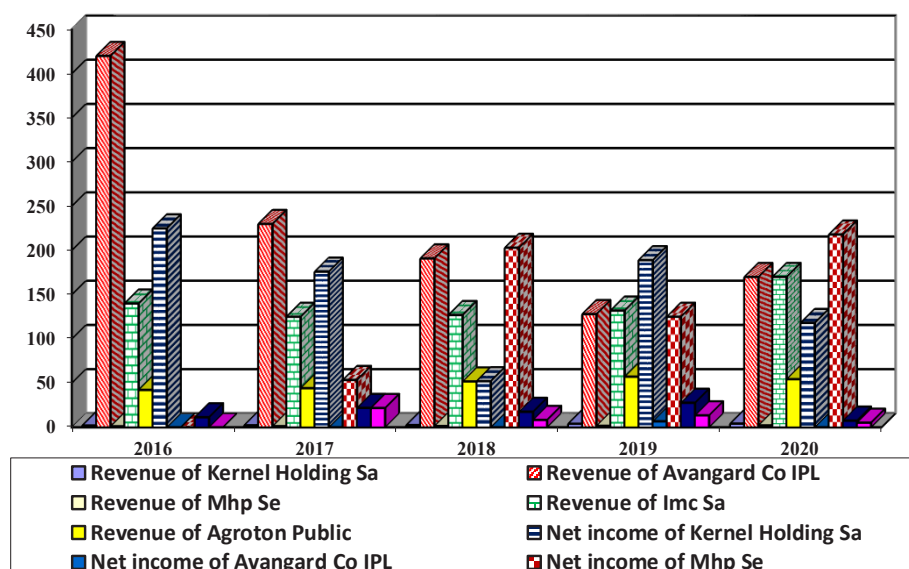


Figure 1. Revenue (turnover), net profit (loss) of agricultural holdings in 2016-2020, million USD

Source: based on data from latifundist.com [27]

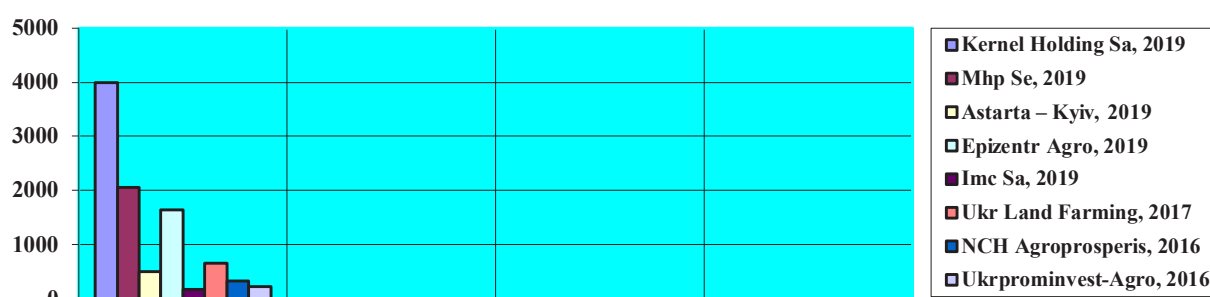


Figure 2. Income (revenue) of the largest agricultural holdings, million USD

Source: based on the infographic reference book “Agrosector of Ukraine” [28]

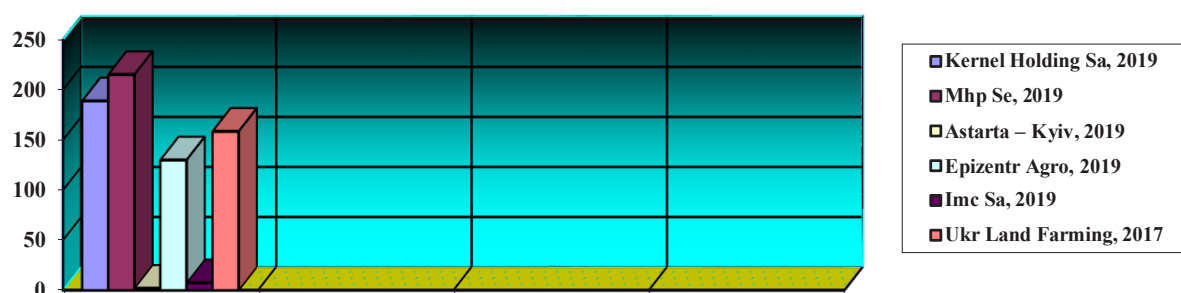


Figure 3. Net profit of the largest agricultural holdings, million USD

Source: based on the infographic reference book “Agrosector of Ukraine” [28]

Agricultural holdings include controlled (absorbed) agricultural enterprises. Subsidiaries specialise in the storage or processing of agricultural products. Marketing activities are implemented by a specialised division. The parent company conducts and controls planned, investment, financial and credit activities [16].

Studying integration processes among organisational and legal forms (simple societies, agricultural holdings, clusters, etc.), the authors found that cooperation occupies a special place.

The need for farmers to jointly solve existing problems of functioning and life activity reflects the essence of the socio-economic foundations of cooperation. The vast majority of farms where areas of up to 2 hectares of land are under cultivation need financial support. The level of production efficiency

and their material and technical support remain significantly lower compared to medium and large economic structures. For example, the largest financial losses were incurred by micro- and small-sized business entities that are focused on the production of niche products. Almost half of the output (45.6% in 2019) is produced by family-operated farms and small producers (44.1% of crop production and 51.0% of livestock production in 2019). In 2020, due to the pandemic (COVID-19), retail and wholesale markets, public catering establishments that are the main sales channels for products, especially fruit and vegetable, greens and meat and dairy products, were closed. In fact, the products of Ukrainian producers were forced out of the domestic market by import supplies. Farmers suffered significant losses. The state did not offer appropriate compensation for them.

Cooperation can contribute to the correction and improvement of functioning indicators. However, the share of agricultural cooperatives' products in the structure of the country's gross agricultural output is less than 1%. The potential of agricultural cooperation in Ukraine is still not realised. Despite the traditions of cooperation that existed in the development of Ukrainian society at the end of the 19th century, nowadays, the motivation to socialise this phenomenon remains destructive [7].

Qualifying the characteristics of agricultural cooperatives in Ukraine, there was a small number of them – about 1,350 units at the beginning of 2021, and only half of them are active. The processes of development of cooperative structures in agriculture are characterised by the variability of their availability and the instability of social capital as an institutional basis for broad expansion. The reasons for the unsatisfactory development of cooperation were the lack of a comprehensive national policy aimed at supporting agricultural cooperatives, low competitiveness of products produced in family-operated farms, cooperatives, sales markets, and a low level of opportunities for financial support of cooperatives' activities [9].

An increase in the number of farms contributes to the growth of a critical mass of potential participants in agricultural cooperatives. The interest of farmers in the development of agricultural cooperation is associated with an increase in the efficiency of functioning (minimal maintenance costs for their own production; an increase in the volume of agricultural production; the possibility of obtaining additional income based on the results of the sale of processed agricultural products; ensuring a high level of quality of their own products (with a greater share of added value, saving labour costs for preparatory, marketing, repair, transport, and other auxiliary work, etc.).

Rural households specialising in the production of fruit and vegetable products or milk can actively participate in the development of agricultural cooperatives. Additional incentives for this are the introduction and compliance with European quality standards. According to the estimates, the resumption of state support for the development of cooperatives from 2023 would significantly increase their number, which may reach almost 3,000 units by 2030 subject to appropriate funding and timely overcoming of the consequences of martial law (Figs. 4–7).

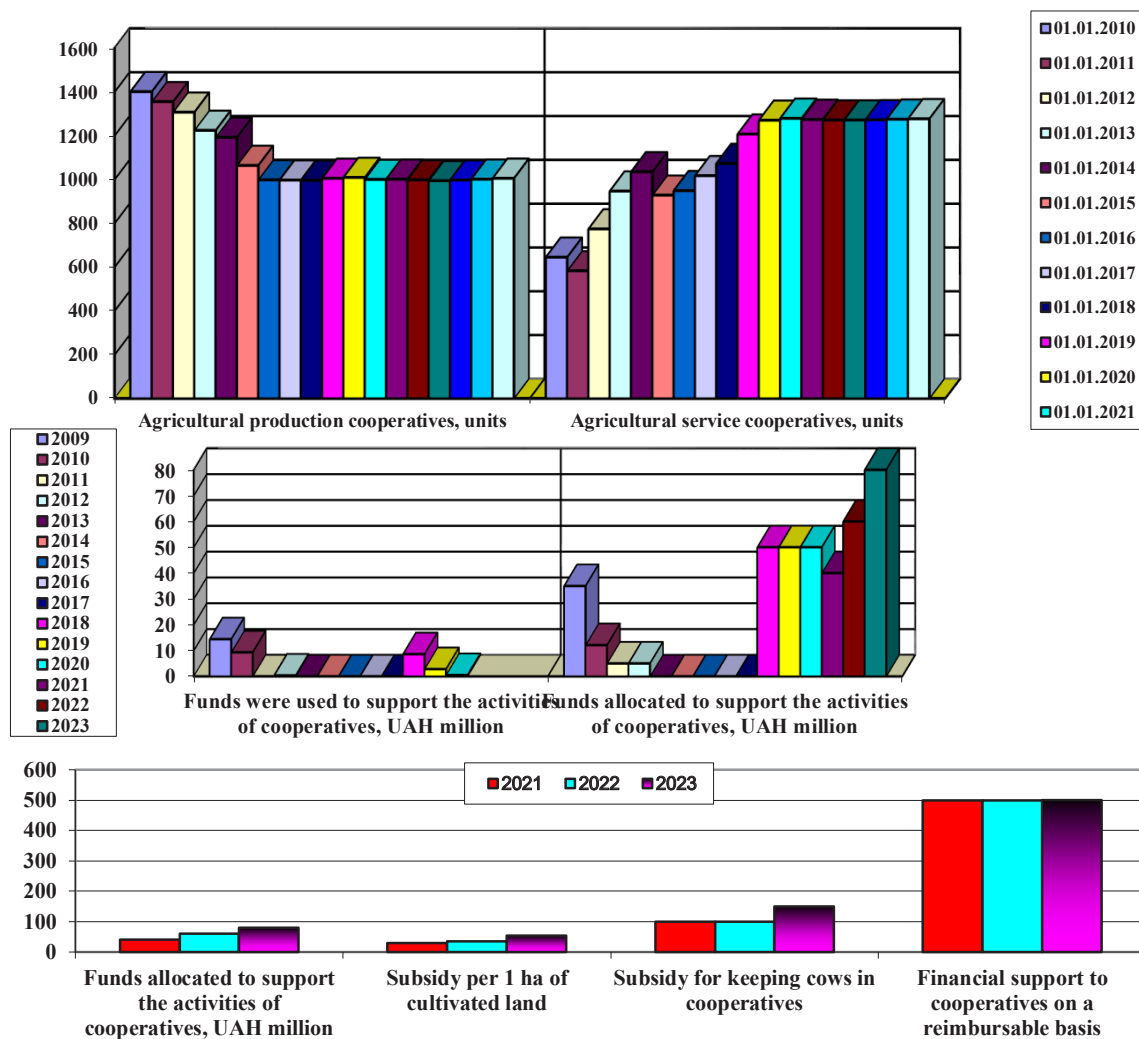


Figure 4-6. Dynamics of development of agricultural cooperatives at the appropriate level of state funding for the period up to 2025

Source: calculated using data from the Ministry of Agrarian Policy, the State Statistics Service of Ukraine, Food of Ukraine, and materials of the concept of development of farms and agricultural cooperation for 2021-2025 [29; 1; 31]

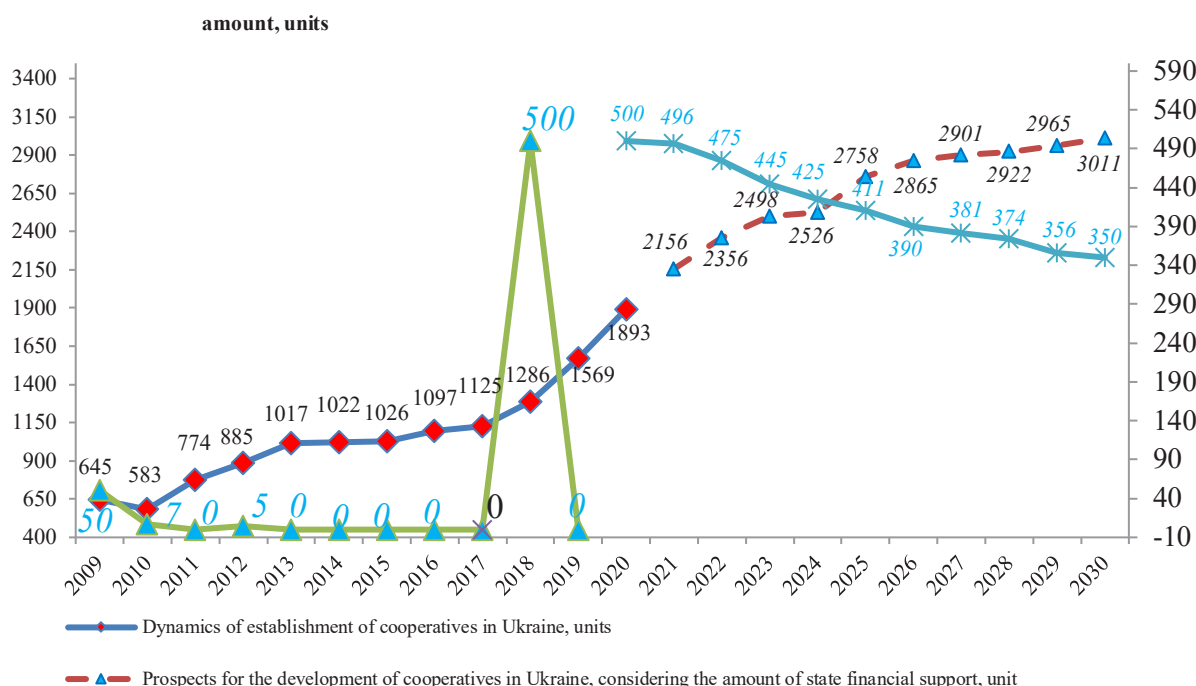


Figure 7. Dynamics of development of agricultural cooperatives at the appropriate level of state funding for the period up to 2030

Source: calculated using data from the Ministry of Agrarian Policy, the State Statistics Service of Ukraine, Food of Ukraine, and materials of the concept of development of farms and agricultural cooperation for 2018-2020 [29; 1; 31]

At the same time, the necessary amount of financial resources (from UAH 200 thousand to 2.5 million) and the average number of members (30-150 people) for creating a cooperative are taken into account. When constructing a forecast of changes in the number of agricultural cooperatives for 2030 using trend analysis, a possible annual increase in the number of agricultural cooperatives within 150 units was established. Based on the calculations made, the annual growth of the number of agricultural cooperatives is projected within 150 units.

In the process of strategic planning, it is established that for the development of agricultural cooperation, it is necessary to implement the following measures: to carry out state support for small forms of management through agricultural cooperatives; to activate the development and functioning of dairy procurement cooperatives with the participation of small enterprises (for packaging or processing dairy products) and using direct communication from the farm to the consumer; to increase by 20% in food markets the number of jobs for the sale of agricultural products and provide laboratory analysis of the quality (safety) of products, technical and technological service; to ensure by 2030 up to 5% growth in the share of products for sale from agricultural cooperatives; activate through existing cooperatives state support in the construction of retail and wholesale markets; conduct state support for the creation of cooperative mini machine-tractor stations at the rate

of at least 1 cooperative machine-tractor station in each amalgamated community; by the end of 2030, to increase the volume of sales of products without the involvement of intermediary business entities to 40% in crop production and to 30% in livestock production through the expansion of wholesale and retail markets and the network of agricultural cooperatives; to create 9-10 multifunctional cooperatives in each amalgamated community by 2030 using direct communication between the cooperative and branches in the villages [31].

Cooperation is a logical stage of further economic development, which became possible with the emergence of business entities with common socio-economic interests in a market environment. This provides an additional opportunity to activate the development and functioning of integration-type organisational structures built "from bottom to top": on the principles of material interest, the implementation of economic choice opportunities to ensure rural development. In 2019, out of 1,207 agricultural cooperatives in Ukraine, 735 operating cooperatives carry out economic activities. As of 01/01 of the corresponding year, agricultural cooperatives for land cultivation, dairy, fruit and vegetable, meat, grain and others were active in the areas of activity in 2015-2019. In 2019, the most active cooperatives were dairy (186 units), land cultivation (162 units), other cooperatives (198 units), fruit and vegetable (115 units), grain (41 units), meat (35 units) cooperatives (Figs. 8-9; Table 2).

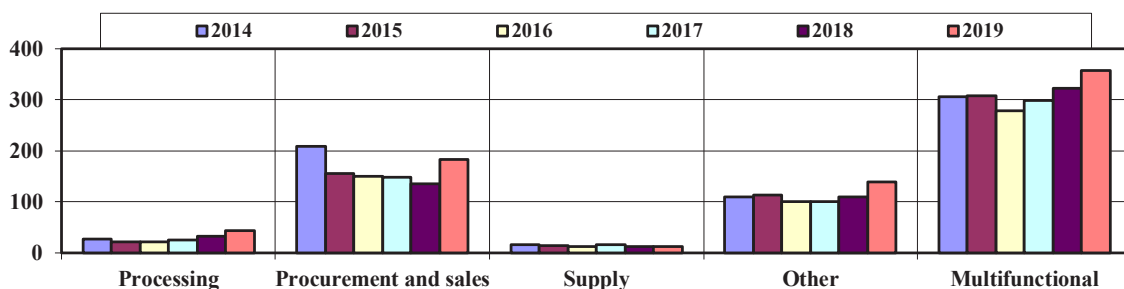


Figure 8. Number of operating agricultural cooperatives by type of activity as of 01.01 of 2014-2019

Source: compiled based on [29; 1]

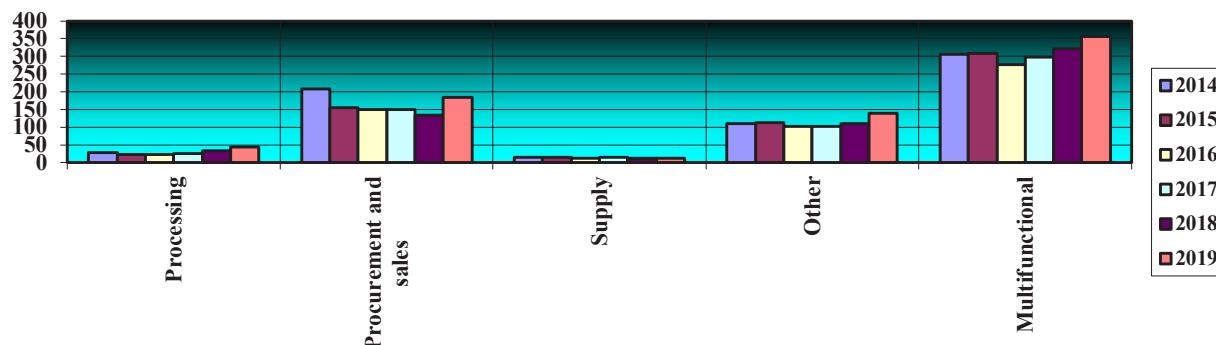


Figure 9. Number of operating agricultural cooperatives by type of activity as of 01.01 of 2014-2019

Source: compiled based on [29; 1]

Table 2. Activities of agricultural cooperatives in Ukraine

Year	Number of cooperatives	Number of cooperative members, persons	Number of employees in agricultural cooperative, persons	Received financial support from the local budget for the year, thsd UAH	Amount of taxes and fees paid, thsd UAH	Size of the mutual fund, thsd UAH	Availability of fixed assets, thsd UAH	Availability of assets at the beginning of the year, thsd UAH	Received funds from the sale of products, thsd UAH
2015	928	29,998	2,401	1,814	21,168.9	41,600.4	114,339	44,789.2	196,238
2016	949	26,515	1,497	1,274.5	16,174.5	36,008.6	77,198.8	37,444.8	87,113.6
2017	1,017	23,520	1,519	995.2	5,952.6	87,627.9	74,939.5	38,563.1	81,694.1
2018	1,073	24,818	1,636	3,438.7	13,981.5	26,263.3	91,449.2	54,498.4	109,624.2
2019	1,207	25,736	1,742	-	14,635.5	28,936.5	91,896.3	54,689.3	122,896.1

Source: compiled based on [29; 1]

Each cooperative provides three or four new jobs. At the same time, cooperatives are economic enterprises that own property in the form of means of production and exchange. In particular, the "Ratay" cooperative (Ternopil Oblast) by type is multifunctional and serving mixed type. The local area is covered. The founders are existing producers. The functioning of various types of cooperatives raises some questions in the system of evaluating processes and results of activities. At the same time, it remains unchanged that they work according to the principles approved by the international cooperative alliance and are present in the legislative acts on cooperation of Ukraine. In different countries, the principles are fundamental rules that characterise cooperatives as specific institutions that differ from other forms of economic activity. Performing social functions and ensuring the effective activities of its members

distinguishes cooperatives from other subjects of agricultural entrepreneurship [8].

In each country, cooperatives as institutions, if there are generally recognised principles, have certain characteristic features related to the translation of individual terms from a foreign language, and traditions and institutional memory regarding cooperative construction.

The goals of functioning of cooperatives are reflected in the system of cooperative principles [5]. The choice of a rational form of management of the organisational and legal structure when developing its organisational and economic mechanism should be preceded by a systematic analysis of the state of development of the industry and rural territory. At the same time, certain requirements should be met – voluntary and economic feasibility of partnership, optimisation of the composition of participants,

organisational unity in determining goals and objectives, equal economic conditions for all. The organisational component of the formation of an integration association includes the coordination council for organising activities and coordinating the interests of participants, conducting marketing research, forming the management apparatus and management services

(accounting, economic, engineering), attracting labour resources, financial resources, and infrastructure. In addition, a service is required for informational presentation, development of statutory documents, business plans, investment, innovation funds, and consumption funds. The mechanism of social capital activation (intangible assets) is also important (Fig. 10).

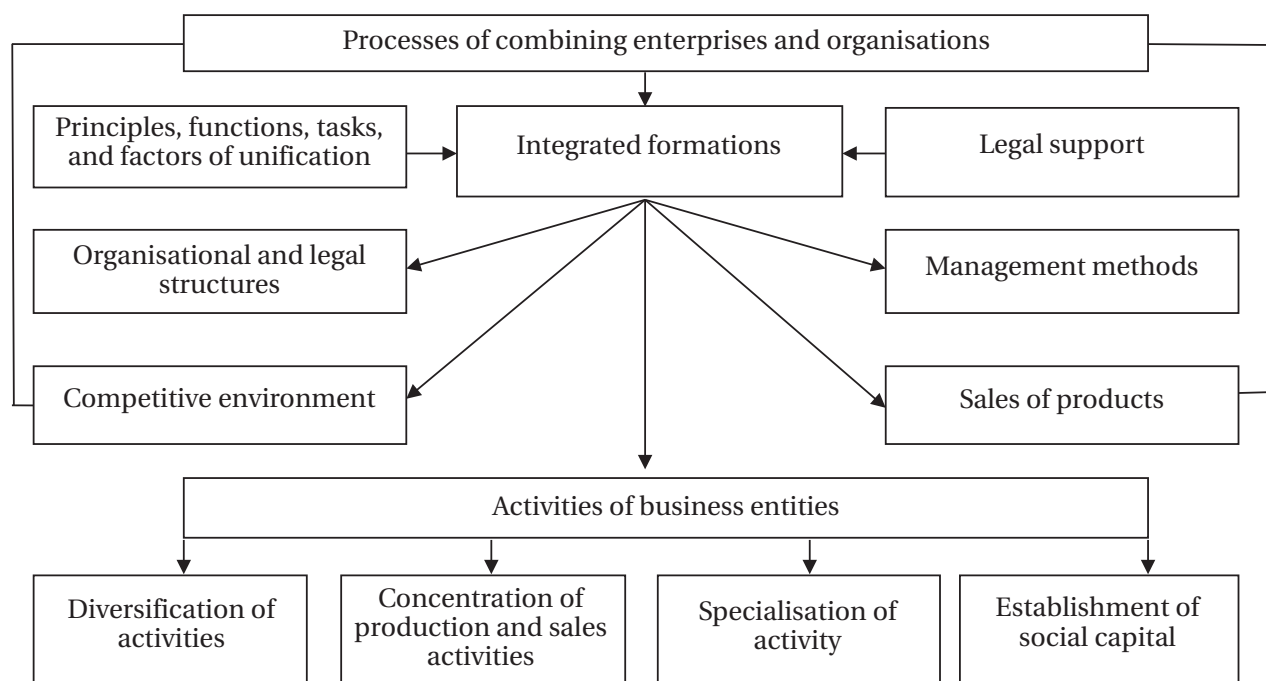


Figure 10: Components of the organisational and economic mechanism of development of cooperation and integration of enterprises and organisations

Source: proposed by the authors based on the systematisation of literary sources [2; 3; 5-8; 15; 16; 19; 31].

The defining component of the organisational and economic mechanism of integrated structures and cooperatives is the establishment of distribution relations – the exchange of intermediate and final results of activities between participants (distribution of income from the sale of products). The task is to ensure compliance with the economic and social interests of partners, to establish parity economic relations. Practically existing variants (forms) of existing integrated associations of the agro-industrial complex can be grouped into the following groups in the areas of relations: procurement of products (storage, transport operations, etc.) through the conditionality of the conditions and procedure for its implementation; providing assistance to producers of products directly without intermediaries in a certain area of integration to improve the quality of products (veterinary medicines, farm detergents, refrigerator maintenance, etc.).

And finally, as one of the most important civilised options, it is a proportional distribution of the final product received by the founder, based on the costs incurred by each participant [2]. The broad aspect of the conceptual vision and coverage of the practices of building an organisational and economic mechanism for integration and cooperation in the agricultural sector, which is associated with the

application of a systematic approach to the study of this phenomenon. This methodological construction is most clearly traced in the best practices of various authors regarding the presentation of methodological provisions for assessing the interaction of various economic factors in the “production-distribution-exchange-consumption” system. In particular, according to A. Potapov [17], the modern model of management in the agricultural sector requires a constant search for ways to organise the effective use of resources – labour, land, and capital [17], that is, strengthening the institutional capabilities of structures to meet the needs of stakeholders competitively. It is advisable to strengthen cooperation and integration processes, because they structurally ensure the achievement of synergy. Accordingly, in methodological terms, it stands on the position of prioritising the approach to improving the organisational and economic mechanism of management in the agricultural sector of Ukraine by expanding cooperation and integration.

More precisely, in terms of improving the quality of such construction, various researchers, with which the authors of this study largely agree, consider the following aspects: the establishment of social capital [18] as an institution for increasing the level of responsibility and trust between the participants

of cooperative and integration structures; the focus of agribusiness on the necessity of transition from a resource-based to a sustainable management model [32], and to achieve this result, a functional organisational and economic mechanism with an orientation towards innovation is needed; the expediency of creating specialised cooperatives [9] for the consolidated representation of the interests of small producers to organise their access to product sales channels; presentation of cooperative structures as an effective mechanism of self-regulation of the market [11], which in aggregate will quantitatively decrease due to the activation of concentration processes, which will be facilitated, among other things, by the mechanism of integration, and strengthening the motivation to cooperate to ensure the sustainable development of rural areas [11], preservation of the village as an environment for life and business, etc.

► Conclusions

In the course of the study, it was found that solving the problems of sustainable development of rural areas and the agricultural sector of the economy requires a systematic approach to the development of integration processes in general and cooperation in particular. The essence of organisational and economic mechanisms of integration and cooperation, the interdependence of the functions of mechanisms of integration associations and cooperatives are substantiated. The organisational and economic mechanism of an integration association should be considered as a structure and as a process. The structure of the mechanism includes components that are necessary for the establishment of an association – legislative acts, resources and facilities, financial support, plans, norms, regulations, contractual and property relations. The organisational and economic mechanism as a process is characterised by the methods and actions used in the organisation of an integrated structure.

Applying a systematic approach to the establishment of new business structures will ensure income, profit, and production volumes. It is proved that the organisational and economic mechanism of functioning should ensure effective interaction of all structures that are part of the integration formation – equivalence of exchange between participants, the

balance of on-farm relations, and growth of economic efficiency of the entire integration system, mutual benefit of partnership relations. It is revealed that the existing sectoral structure of the organisation of the development of agro-industrial production in Ukraine directs it to the development of vertical agro-industrial integration towards the establishment of agricultural holdings. As a result, large agro-industrial associations are formed in rural areas, but rural development remains ignored.

Elimination of monopolisation by agricultural holdings in the land lease market, support for the development of small and medium-sized agribusiness, and measures to increase the competitiveness of agricultural production in the market are required. Their organisational and economic mechanisms can be very diverse, but it remains mandatory to be voluntary for such activities and ensure the mutual benefit of their participation in the integration process. At the same time, all integration levers can work for the final result of production: territorial, technological, economic, technical, managerial, etc.

The study of the organisational and economic mechanism of integration structures revealed: unwillingness of agricultural formations and individual farms to integrate; underestimation of the essence and advantages of the cooperative model of agricultural entrepreneurship against the background of the functioning of agricultural holdings; ineffective political and informational state support for the cooperative idea; lack of systematic training and selection of cooperative leaders, and lack of top-level managers. The task of adopting laws and regulations on the functioning of integrated structures in the agricultural sector of the economy, which would ensure the interest of business entities in creating cooperative integrated associations and optimising the structure of financial support, is becoming urgent. There is no regulatory framework for the functioning of agricultural holdings (which have already been operating for more than ten years – the association of food companies, agricultural producers, and other structures). In order to form an organisational and economic mechanism for the functioning of integration structures, it is necessary to solve the issues of their personnel and financial support, improving distribution relations and state support.

► References

- [1] Official website of the State Statistics Service of Ukraine. (n.d.). Retrieved from <https://www.ukrstat.gov.ua/>.
- [2] Malik, M.Yo., Fedienko, F.M., & Orlaty, M.K. (2000). *Integration as a factor in improving the efficiency of reforming agricultural enterprises*. Kyiv: NNTs IAE.
- [3] Andriychuk, V., & Colangelo, G. (2020). Agricultural the formation of a new type in the context of the development strategy of domestic agriculture. *Ekonomika APK*, 1, 3-15.
- [4] Hegel, G. (1994). *Encyclopedia of philosophical sciences. Science of logic*. Moscow: Dumka.
- [5] Prilipko, S., & Smilka, M. (2020). *The development of the attendant cooperation of the country territories: theory and practice*. Kyiv: LLC "Avgust Treid".
- [6] Fouad, H. (1980). Agrohholdings as new organizational forms of large-scale business in agribusiness in Ukraine. *Ahrarna Ekonomika*, 5, 1-2, 36-42.
- [7] Lupenko, Yu.O., Malik, M.Yo., & Shpykuliak, O.H. (2021). Theoretical and methodological foundations of the development of agricultural cooperation in Ukraine. *Ekonomika APK*, 8, 31-39.
- [8] Malik, M. (2021). The role business, cooperation and integration in stabilized development economics. *Ekonomika APK*, 7, 50-62.

- [9] Sakovska, O., & Shpykuliak, O. (2019). State regulation of the functioning and development of agricultural cooperatives in the grain market. In Kh.S. Soliman (Ed.), *Education excellence and innovation management through vision 2020: Proceedings of the 33rd international business information management association conference* (pp. 8316-8321). Granada. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-85074096591&partnerID=MN8TOARS>.
- [10] Shpychak, O., Varchenko, O., Svytnous, N., Semysal, A., Ostapenko, S., & Prystemskyi, O. (2022). Foreign economic priorities for the development of agro-food enterprises in European integration business partnership. *Scientific Horizons*, 25(4), 75-88. doi: 10.48077/scihor.25(4).2022.75-88.
- [11] Shpykuliak, O., & Sakovska, O. (2020). Agricultural cooperation as an innovation for rural development. *Baltic Journal of Economic Studies*, 6(3), 183-189.
- [12] Hryshchova, O.A., & Vasilin, O.V. (2009). Organizational and economic mechanism of management of intellectualisation of labour activity. *Bulletin of the Carpathian University*, 6, 22-27.
- [13] Hutorov, A.O. (2019). *Inclusive development of economy and agrarian sphere (theory, methods, analysis)*. Kharkiv: Publishing House "Tochka".
- [14] Yermakov, O.Yu., & Sudomir, M.R. (2019). *Organizational and economic mechanism of increasing the competitiveness of agricultural enterprises*. Kyiv: FOP Ianchinsky O.V.
- [15] Moroz, O.V., Semtsov, V.M., Kukel, H.S., & Mindziuk, N.F. (2015). Some assessments of the activities of agricultural holdings against the background of other types of agricultural enterprises. *Economic Analysis*, 21(2), 163-168.
- [16] Khodakivska, O.V., & Mohylnyi, O.M. (2020). *The peasant question – from communal land ownership to the expansion of agricultural holdings*. Kyiv: NNTs "IAE".
- [17] Potapov, A., & Zayika, P. (2006). Modeling the impact of resource factors on agricultural output. *Economic and Social Changes: Facts, Trends, Forecast*, 13(4), 154-168.
- [18] Dymczyk, R., Shpykuliak, O., Hrytsaienko, M., Sakovska, O., & Hrytsaienko, H. (2021). Social capital of the agricultural sphere: Indicators of measurement for conditions of formation and results of use. *Agricultural and Resource Economics*, 7(4), 115-137.
- [19] Lupenko, Yu.O., Malik, M.Yo., & Zaiats, V.M. (2016). *Development of entrepreneurship and cooperation: Institutional aspect*. Kyiv: NNTs "IAE".
- [20] Moreno-Hurtado, C.A., Ochoa-Jiménez, D.A., Izquierdo-Montoya, L., & Schmidt, G. (2007). A simplified endogenous economic growth model with social capital: Evidence for Ecuador. *Business and Economic Horizons*, 14(2), 168-184.
- [21] Odintsov, O., Yevtukhova, T., Vasylykonova, E., & Kunchenko-Kharchenko, V. (2020). Influence of tax burden on economic development of agricultural enterprises in Ukraine. *Journal of Eastern European and Central Asian Research*, 7(1), 150-162. doi: 10.15549/jeecar.v7i1.328.
- [22] Klok, O. (2022). The problem of comparing financial reporting indicators in international rating systems for enterprises. *Economics of Development*, 21(2), 28-34. doi: 10.57111/econ.21(2).2022.28-34.
- [23] Surzhenko, N.V., & Ahieieva, I.V. (2014). Organizational and economic mechanism of competitiveness management. *Scientific Papers of Tauria State Agrotechnological University (Economic Sciences)*, 25(1), 232-235.
- [24] Decree of the President of Ukraine No. 224/94 "On Holding Companies that are Created in the Process of Coporatization and Privatization" (1994, May). Retrieved from <https://zakon.rada.gov.ua/laws/show/224/94#Text>.
- [25] "Astarta-Kyiv". (n.d.) Retrieved from <https://www.inagro.com.ua/project/astarta/>.
- [26] Law of Ukraine No. 9528-IV "On Holding Companies in Ukraine". (2016, January). Retrieved from <https://zakon.rada.gov.ua/laws/show/3528-15#Text>.
- [27] Top-100 latifundists of Ukraine. (2014). Retrieved from <https://www.latifundist.com/rating/top100#323>.
- [28] Infographic guide agribusiness of Ukraine. (n.d.). Retrieved from <https://www.kurkul.com/news/28376-vyshov-noviy-vipusk-infografichnogo-dovidnika-agrobiznes-ukrayini-2020-21>.
- [29] Official webcite of the Ministry of Agrarian Policy and Food of Ukraine. (n.d.). Retrieved from <https://minagro.gov.ua/>.
- [30] Lupenko, Yu.O., Malik, M.Yo., Shpykuliak, O.H., Mamchur, V.A., & Korinets R.Ya., (2021). *The concept of development of family farms for the period up to 2030: A project*. Kyiv: NNTs "IAE".
- [31] Ministry of Agrarian Policy and Food of Ukraine. (n.d.). *The conception of stimulation of the development business in the country territories prior to 2030*. Retrieved from <https://minagro.gov.ua/npa/pro-shvalennya-koncepciyi-stimulyuvannya-rozvitku-pidpriyemnictva-na-silskih-teritoriyah-do-2030-roku>.
- [32] Malik, M., Shpykuliak, O., Nepochatenko, O., Ptashnyk, S., Tretiakova, S. (Eds.). (2020). Formation of effective organizational and economic environment of innovative support of enterprise competitiveness in Ukraine. In Kh.S. Soliman (Ed.), *Education excellence and innovation management through vision 2020: Proceedings of the 33rd international business information management association conference* (pp. 332-342). Granada: International Business Information Management Association.

Побудова організаційно-економічного механізму інтеграції і кооперації в аграрній сфері: системний підхід

Микола Йосипович Малік¹, Олександр Григорович Шпикуляк¹,
Світлана Анатоліївна Кравченко¹, Діана Іванівна Шеленко²,
Катерина Юріївна Ксенофонтова¹

¹Національний науковий центр «Інститут аграрної економіки»

03127, вул. Героїв Оборони, 10, м. Київ, Україна

²Прикарпатський національний університет імені Василя Стефаника

76018, вул. Шевченка, 57, м. Івано-Франківськ, Україна

► **Анотація.** Зростання ефективності виробництва в аграрному секторі економіки базується на використанні різних чинників – організаційних, економічних, трудових, матеріальних, мотиваційних та інших. Серед них пріоритетним виступають організаційні та економічні, до яких можна віднести і інтеграційні відносини. Механізм дії організаційних та економічних засад інтеграційних відносин в умовах системного підходу є недостатньо дослідженим, що і визначило тему дослідження. Мета статті – обґрунтувати теоретичні, методичні і практичні засади побудови організаційно-економічного механізму інтегрованих структур з точки зору системного підходу. За методологічну основу дослідження слугували положення інституційної економічної теорії та системний аналіз. Використано монографічний, нормативний, графічний, абстрактно-логічні методи та підходи узагальнення результатів. Визначено економічну сутність організаційно-економічного механізму інтегрованих структур в аграрному секторі економіки. Обґрунтовано сутність інтегрованих структур та інтегративних формувань з точки зору системності. Уточнено поняття «інтегрована структура» і «кооператив». Визначена взаємообумовленість дисфункцій – інтегрована структура і сільськогосподарський кооператив. Результати дослідження можуть бути враховані при розробленні програм: визначення пріоритетів розвитку інтеграційно-кооперативних структур, розробці нормативно-правових актів для формування і розвитку кооперації і інтеграції в аграрній сфері економіки

► **Ключові слова:** сільськогосподарський кооператив, інтеграційно-кооперативні структури, інтеграційні об'єднання, механізм інтегрованих структур, агрохолдинги, суб'єкт підприємницької діяльності, інтегративні формування, кластери



UDC 343.98

Forecasting the Consequences of the Cost of Mineral Fertilisers on the Development of the Corn Market in Ukraine Using AGMEMOD Models

Anatolii Dibrova*, Larysa Dibrova, Alla Chmil, Maksym Dibrova

National University of Life and Environmental Sciences of Ukraine

03041, 15 Heroiv Oborony Str., Kyiv, Ukraine

► **Abstract.** In the past decade, from 2012 to 2021, Ukraine has doubled its maize production. The increase in gross corn yields is associated with the use of modern cultivation technologies by farmers, which increase the resistance of plants to adverse environmental factors and adjust the mineral nutrition of plants with regard to weather conditions. One of the most important components of such technologies is the use of mineral fertilisers, the optimal amount of application of which depends not only on the level of grain yield, but also on the efficiency of production and grain quality. However, the rapid increase in world natural gas prices during 2021 has created new challenges and threats for the further development of the grain market in Ukraine. After all, world prices for mineral fertilisers have increased by 110% since 2021, according to the World Bank. Under these conditions, a radical increase in the cost of mineral fertilisers threatens to ensure the competitiveness of Ukrainian corn in the domestic and foreign markets, which would eventually lead to higher food prices and deterioration in the level of food security in the country. This may negatively affect the gross yields and export potential of the grain industry. The purpose of the study is to assess the current state of supply and demand in the corn market in Ukraine and predict the consequences of the impact of changes in the cost of mineral fertilisers on the main parameters of its development according to probable scenarios, using the AGMEMOD econometric partial equilibrium model for the period up to 2025, which creates prerequisites for improving the efficiency of making and implementing management decisions and contributes to achieving the goals of national agrarian policy. The following methods were applied: monographic, abstract and logical, comparative analysis and expert assessments, tabular, statistical and economic, factor analysis, economic and mathematical modelling. The result of the study is an assessment of the current state and identification of the main factors influencing supply and demand in the corn market. Using multiple linear regression, the influence of the main factors on the yield of corn for grain in agricultural enterprises of Ukraine for 2001-2020 is determined. The dynamics of the balance of supply and demand in the corn grain market in Ukraine is analysed. The consequences of changes in the cost of mineral fertilisers on the main parameters of the corn market development in Ukraine are predicted according to probable scenarios using the AGMEMOD econometric partial equilibrium model for the period up to 2025. Based on the calculations made, it is proved that the high yield of corn and the favourable current price environment for grain will ensure a sufficient level of profitability of this grain crop. Methods for improving the mechanism of reducing the cost or compensation of expenses for the purchase of mineral fertilisers for commodity producers are proposed. Methodological and practical aspects of forecasting the consequences of changes in the cost of mineral fertilisers on the main parameters of corn market development in Ukraine using the AGMEMOD econometric partial equilibrium model for the period up to 2025 have been further developed. The proposed methodological approaches and findings can be used by state and industry management bodies in the development of priority areas for improving the effectiveness of the grain industry in Ukraine

► **Keywords:** agricultural policy, grain market, energy crisis, econometric modelling

► Introduction

In recent years, Ukraine has significantly increased the volume of corn grain production, entering the group of some of the world's largest exporting countries, such as the United States, Argentina, and Brazil [1]. According to the Ukrainian Business and Trade Association [2], in 2020, the share of Ukraine in the world market of corn accounted for more

than 15%, and in terms of revenue received from its exports, it ranked 4th in the world, selling 27.9 million tonnes of grain worth USD 4.9 billion to foreign markets [3]. This was largely conditioned by the use of industrial technologies of agricultural production, which require, among other things, significant amounts of mineral fertilisers.

► **Suggested Citation:** Dibrova, A., & Dibrova, L., Chmil, A., & Dibrova, M. (2022). Forecasting the consequences of the cost of mineral fertilisers on the development of the corn market in Ukraine using AGMEMOD models. *Ekonomika APK*, 29(3), 23-41.

*Corresponding author

However, the rapid increase in world natural gas prices during 2021 has created new challenges and threats for the further development of the grain market in Ukraine. Thus, according to the World Bank, global prices for mineral fertilisers, in the prime cost of which natural gas accounts for up to 80%, have increased by 80% in 2021, and by another 30% in the first quarter of 2022 [4]. All these problems are aggravated by two factors: a significant amount of mineral fertilisers (38% nitrogen, 50% phosphorus, and 80% potash [5]) are the object of purchase and sale on international markets, and a big part of this trade comes only from a few countries of the world, such as the Russian Federation, China, Canada, the USA, Belarus, Qatar, which have competitive advantages in the production of fertilisers through their own production of natural gas, coal, or other raw materials.

Economic sanctions imposed on Russia and Belarus for Russia's full-scale invasion of Ukraine, and export restrictions on fertilisers imposed by China and some other countries, pose a threat to further growth in world prices for mineral fertilisers. Such an increase in prices, combined with the availability of mineral fertilisers on the market, can stimulate both an increase in consumer prices for food and a potential decrease in corn yields for grain. An additional factor that can potentially influence the price increase may be a reduction in the gross yield of corn for grain due to the projected application of less than the technological need for mineral fertilisers. But the worst thing is that not only the gross yield will decrease, but also the quality of Ukrainian grain.

Under these conditions, the issue of forecasting the consequences of the increase in the cost of mineral fertilisers on the further development of the corn market in Ukraine, ensuring food security and its competitiveness in the world and domestic markets is becoming increasingly relevant.

Thus, in the context of rapid growth in prices for mineral fertilisers, there is an urgent need to introduce a balanced and systematic approach to the development and implementation of state agricultural policy aimed at balancing the interests of all participants in the corn market. Achievement of this goal will largely depend on the effectiveness of the mechanism for reducing the cost or compensating the cost of purchasing mineral fertilisers for grain producers in Ukraine in the face of global challenges.

The issues of developing the grain market, ensuring competitiveness, economic efficiency of its production and food and energy security, and forming the export potential of the grain industry occupy a major place in scientific research and are widely represented in the specialised literature. In particular, A. Skrypnyk, N. Klymenko, K. Tuzhyk, L. Galaieva and K. Rohoza [6], having analysed the prerequisites and prospects for stabilising grain production volumes, determined the impact of production resources, in particular, mineral fertilisers and plant protection products, on the efficiency of winter wheat production. Based on the developed econometric model of reducing the marginal utility of production resources, it is proved that maximisation

of yield is achieved at a lower cost than maximising profit.

Issues of ensuring the efficiency of grain production have become relevant in the last decade among the scientific community. Thus, S. Cheremisina and V. Rossokha [7] proved that the decrease in the level of profitability indicator is conditioned by a significant increase in the costs of labour, mineral fertilisers and plant protection products, fuel and lubricants, and an unjustified increase in other direct and general production costs. At the same time, a successful solution to the problem of increasing the economic efficiency of grain farming involves the implementation of a comprehensive system of actions to increase production and improve the quality of grain crops, while simultaneously reducing labour costs and material costs per unit of production.

The team of researchers consisting of D. Shiyan, N. Lialina, and K. Honcharova [8], studying the influence of the level of dependence of wheat yield on individual items of expenditure, proved that the relationship of the latter with the level of costs for mineral fertilisers and depreciation was the closest. This means that with an increase in the yield, the share of these items in the cost structure also increases. All this develops prerequisites for ensuring the effective development of grain farming.

Chinese researchers J. Wang and X. Hu [9] analysed the efficiency of corn grain production and identified factors influencing its increase in the main producing and exporting countries in the period from 2012 to 2019. The researchers concluded that with the growing cost of production resources in Argentina, the United States, Ukraine, and other countries has prompted producers to constantly improve corn production technologies to increase its efficiency.

Separately, it is necessary to highlight the study by S. Bereziuk and I. Zubar [10], who investigated modern economic and ecological aspects of fertiliser application in crop production. Based on the analysis, it is concluded that in recent years, the increase in grain yields in Ukraine was accompanied by an increase in the imbalance between the volume of NPK application (N – Nitrogen, P – Phosphorus, K – Potassium) and their removal by plants. The solution of the identified problems is proposed to be carried out through a system of measures, in particular, increasing the level of state support for the production of mineral fertilisers in Ukraine and scientifically based agricultural technology.

The ecological and economic efficiency of growing corn for grain was also studied by the author's team consisting of O. Stasiv, O. Kachmar, O. Vavrynovych, E. Arabska [11], who proved that the complex use of mineral ($N_{120}P_{100}K_{100}$) and organic fertilisers contribute to obtaining high productivity of corn grain with a yield of 6.10-6.87 t/ha of grain and ensure its high conditional level of profitability at the level of 72-104%.

The issue of increasing profits from corn exports to the world market has become relevant among Ukrainian researchers. In particular, D. Lialko [12],

comprehensively analysed the global corn market and substantiated the main areas of development of the domestic market, which would ensure the receipt of economic benefits by Ukrainian producers.

N. Tanklevska, V. Petrenko, A. Karnaushenko, K. Melnykova [13] conducted a comprehensive analysis and identified the main trends in the development of the world corn market, and based on the calculations made, substantiated the economic feasibility of deep processing of corn in Ukraine. I.V. Vashchenko substantiated the theoretical foundations of the establishment and operation of the corn market from the standpoint of the generation of supply and demand, world market conditions, and price fluctuations in the domestic and foreign markets [14].

A team of Romanian researchers E. Soare, I.A. Chiurciu, A.V. Bălan, L. David [15], after analysing the main indicators of the development of the world corn market, created forecasts of its development for the period up to 2025 and identified the main factors that would have the greatest impact in the future, in particular, these are natural and climatic conditions in the main producing and exporting countries.

M. Palamarchuk's study [16] is devoted to the assessment of corn competitiveness and factors influencing its formation in Ukraine. In particular, the influence of the size of agricultural enterprises on the efficiency of corn production for grain in Ukraine is determined. The impact of world prices on the level of corn competitiveness in Ukraine is assessed and a system of measures to increase it is proposed. Among the main areas of increasing competitiveness, the researcher suggests the use of scientifically based cultivation technologies, including the optimal application of mineral fertilisers and the use of high-yielding corn hybrids of various ripeness groups.

Italian researchers F. Santeramo, E. Lamonaca, F. Contò, G. Nardone, A. Stasi [17] have stated that the determinants of price volatility are a significant step to preventing the potential negative consequences of uncertainty in the corn grain market. The authors proposed a new category of drivers of grain price volatility – endogenous and exogenous, and also substantiated the potential consequences that each of them can affect price dynamics.

A team of Ukrainian and foreign researchers consisting of A. Nykolyuk, P. Pyvovar, A. Chmil, M. Bogonos, P. Topolnycky, I. Cheban, and T. Fellmann [18] analysed the current situation and created forecasts for the development of the main agricultural markets of Ukraine for the period up to 2030 based on the AGMEMOD model. It is concluded that despite a slight increase in the gross wheat harvest, corn will become the dominant grain crop in Ukraine. The main driving force behind this trend is adaptation to climate change.

However, despite a significant number of papers on this issue, there are still a number of issues that require further study, substantiation, and improvement. In particular, it is the forecasting of the economic consequences of changes in the cost of mineral fertilisers on the main parameters of grain market development in Ukraine using the AGMEMOD econometric partial

equilibrium model. *The purpose of the study* is to analyse supply and demand in the corn market in Ukraine and develop forecasts of the impact of changes in the cost of mineral fertilisers on the main parameters of its development according to probable scenarios, using the AGMEMOD econometric partial equilibrium model for the period up to 2025, which creates prerequisites for increasing the competitiveness of Ukrainian grain and ensuring food security of the country.

► Materials and Methods

In the course of the study, the following methods were used: monographic – to detail the current level of efficiency of corn grain production; abstract and logical – to formulate conclusions; comparative analysis – to analyse the state and determine trends in yield, gross yields, and harvested area of corn for grain in the context of regions of Ukraine; tabular – to summarise and visually display analytical data and findings; statistical and economic – to collect and process analytical data on the main parameters of corn market development in Ukraine; factor analysis – to determine the influence of the main factors on the efficiency of corn grain production; econometric modelling – to assess the impact of changes in the cost of mineral fertilisers on the main parameters of corn market development in Ukraine.

The initial information during the study was the data from the Ministry of Economy of Ukraine, Ministry of Finance of Ukraine, Ministry of Agrarian Policy and Food of Ukraine, State Statistics Service of Ukraine, National Bank of Ukraine, the World Bank, the International Monetary Fund, the US Department of Agriculture, the Food and Agriculture Organization of the United Nations (FAO), the Organization for Economic Cooperation and Development (OECD), the Joint Research Centre (JRC) of the European Commission, foreign and Ukrainian research papers, as well as personal research and practical observations of the authors of this study.

To assess the impact of changes in the cost of mineral fertilisers on the main parameters of the corn market development in Ukraine, an econometric dynamic model of partial market equilibrium – AGMEMOD (Agricultural Member State Modelling) – was used. This model was developed to analyse the impact of the Common Agricultural Policy (CAP) on the development of agriculture in the European Union countries. The AGMEMOD model as an integrated system combines national partial equilibrium models for each EU country, possible candidate countries, and important neighbours. It includes about 50 types of agricultural products (for example, crop production includes such crops as wheat, corn, barley, rye, oats, rapeseed, soy, sunflower, sugar beet, legumes, potatoes, fruits, and vegetables) and more than 30 countries (including some non-EU countries, in particular – Ukraine, Turkey, Kazakhstan, the Russian Federation, North Macedonia) that which allows assessing the impact of agricultural policy decisions on agricultural production and predicting the development of agricultural markets in

the short, medium, and long term. The AGMEMOD partnership develops and maintains the model and is a consortium consisting of universities, research institutes, and government agencies in Europe and beyond. The main group of the AGMEMOD partnership is located in the Netherlands (Wageningen Economic Research) and Germany (Thünen Institute of Market Analysis).

Each common AGMEMOD model of the country consists of a system of submodels of the main types of agricultural products. The variables included in

each submodel represent consecutive positions in the balance sheet of each agricultural market. Supply is modelled on initial inventory, production, and imports, while demand is modelled on domestic consumption, exports, and final inventory. In each country, the corresponding domestic prices are also modelled for each product. A prerequisite for solving the model is to maintain equality between supply and demand in each market in each country. Figure 1 illustrates the general structure of the agricultural market model at the country level.

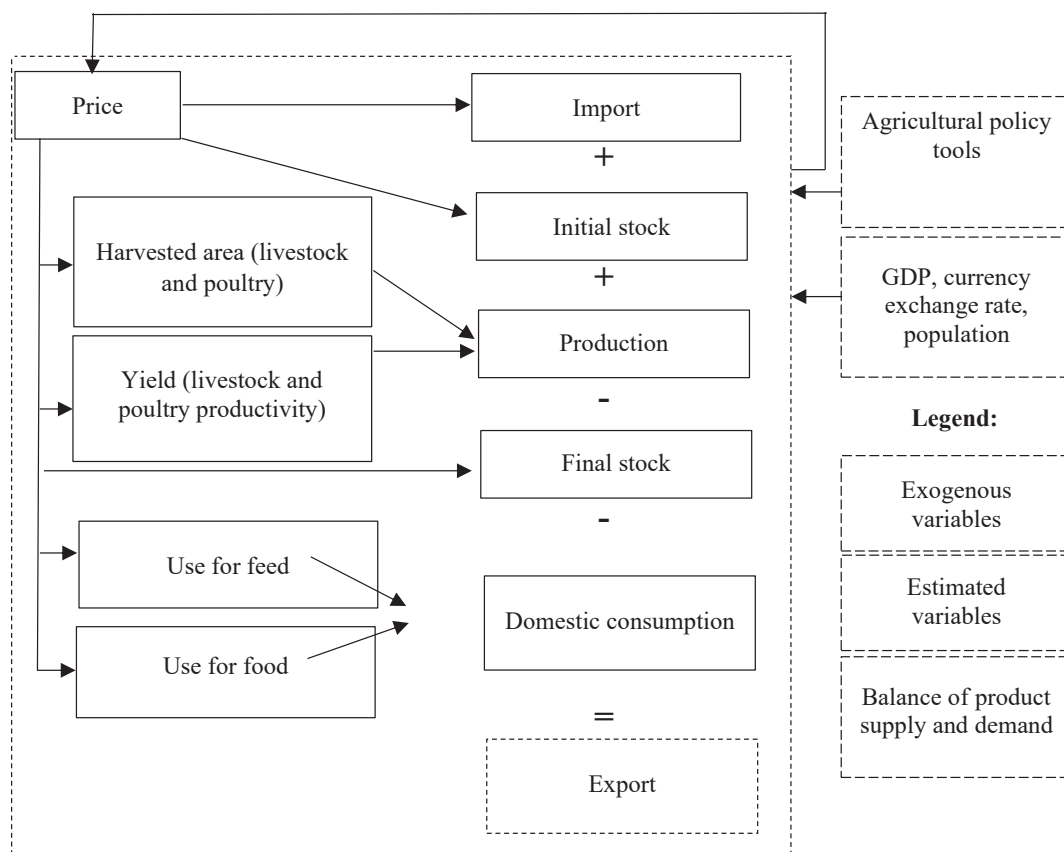


Figure 1. Country-level structure of the AGMEMOD model

Source: [19]

Agricultural markets in AGMEMOD are represented by supply and demand equations, stocks, international trade, and market prices. They represent the behavioural responses of economic agents to changes in prices and external variables, such as agricultural policy instruments, currency exchange rates, tariff quotas, etc. The parameters of equations are usually estimated as time series regressions with AGMEMOD databases [18].

The model uses a combination of exogenous and endogenous data to predict the development parameters of the agricultural market. The values of exogenous variables are estimated not by the model, but by other organisations. For example, using the forecasts of the United States Department of Agriculture (USDA) regarding world prices for major types of agricultural products.

Exogenous variables in AGMEMOD at the national level, such as GDP, GDP deflator, exchange rate, and population, are not calculated or predicted by the model. These data and their forecast estimates for the period up to 2030 were taken from data from the World Bank, the International Monetary Fund (IMF), and the United States Department of Agriculture (USDA). The inclusion of exogenous variables in the model allows for better visualisation of the processes and relationships in agricultural production. At the same time, each of the exogenous variables affects the variables that are estimated by the AGMEMOD model [20].

The model for grain crops develops forecasts of harvested area, yield per hectare, gross yield as a product of harvested area and yield, domestic consumption, import and export volumes, stocks, and

domestic market price [21]. Submodels of certain types of agricultural products are closely related to each other. For example, crop production models are linked to livestock production models using livestock production cost indices, which are functions of grain, oilseeds, and oil cake.

The regression equation for modelling the main parameters of the corn market in Ukraine in the AGMEMOD model was developed by Ukrainian and foreign researchers for "Agricultural markets in Ukraine: current situation and market outlook until 2030" [18].

For this study, the model uses data from the State Statistics Service of Ukraine from 2000 to 2019 [22; 23]. To conduct the analysis, a panel database was created, based on which the linear regression equation was evaluated in the R software version 4.0.2. To estimate regression in R, the "pooling" model is used, this is when the same weight is given to relationships between years and between regions.

The estimated equations are entered in one of the main model files, which is responsible for the equations. In the model, the gross grain harvest is defined as the product of the average yield and the harvested area of corn. The distribution of agricultural land between different grain crops is based on the group substitution approach and is expressed in proportions. The substitute product for corn in the model is wheat.

Equations that reflect the specific weight of acreage of specific grain crops in these groups include

the gross income variable, which serves as an indicator of the level of profitability of their production and, thus, plays an important role in determining replacement coefficients.

Behavioural functions for grain acreage estimated from panel data are entered into the AGMEMOD model along with the multiplication factor. This coefficient represents the number of administrative regions and allows adjusting the average values per region obtained by regressions of panel data to the level of the entire country, as required by the model. Per capita consumption, feed use, losses, non-food processing, domestic market prices, export, import volumes, and changes in corn stocks were estimated based on time series data using the least squares method.

The coefficient of determination, which determines the proportion of variation in one of the variables that is explained by variation in other variables, was $R^2=0.0861$. This indicates that the regression equation only 8.61% of the variation of the effective feature is conditioned upon the variation of the independent (factor) feature. However, for such complex models with limited databases, the value of the coefficient of determination may be sufficient to assess its validity.

p – the value of the regression equation amounting to 0.00199. This means that in the regression model all variables were statistically significant because value is less than 0.05. All other results of regression estimation using the R packages are shown in Figure 2.

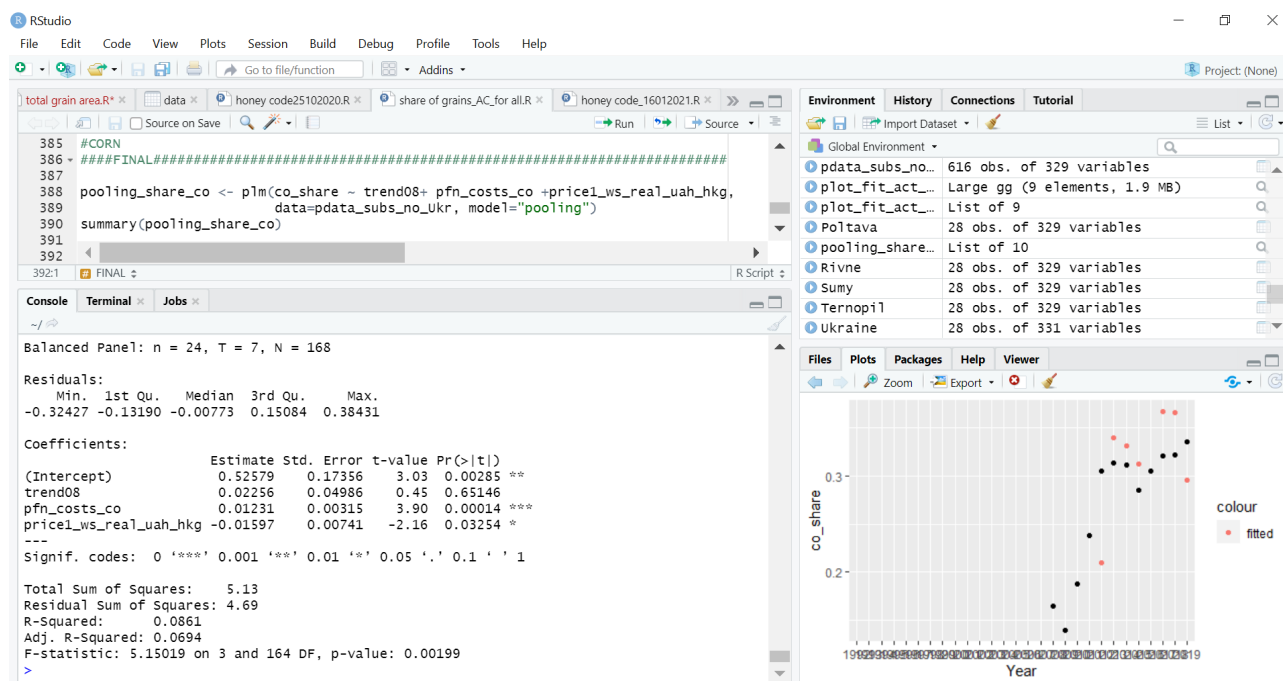


Figure 2. Results of regression estimation using R packages

Source: calculated by the author based on [18]

Equations for modelling and forecasting the main parameters of supply and demand in the corn market in Ukraine:

1. The area from which corn is harvested for grain, thsd. ha. (equation (1)):

$$COAHAUA=COASHUA*GRAHAUA \quad (1)$$

2. Corn yield, tonne per 1 hectare (equation (2)):

$$COYHAUA = 1.1475 + 1.0745 * TREND08 + 0.1421 * COEGUUA \quad (2)$$

3. Gross corn yield, thsd. t. (equation (3)):

$$COSPRUA = COYHAUA * COAHAUA \quad (3)$$

4. Corn import volume, thsd. t. (equation (4)):

$$COSMTUA = 21.86825 + 0.1017958 * COPFNU \quad (4)$$

5. Corn export volume, thsd. t. (equation (5)):

$$SOUXTUA = COSPRUA + COCCTUA (-1) + COSMTUA - COUDCUA - COCCTUA \quad (5)$$

6. Domestic consumption, thsd. t. (equation (6)):

$$COUDCUA = COUFOUA + COUFEUA + COUDLUA \quad (6)$$

7. Final residues, thsd. t. (equation (7)):

$$COCCTUA = -507 + 0.4560418 * COSSRUA + 116.0461 * (COPFNUA / COPMDUS * EXRDUA) \quad (7)$$

8. Feed usage, thsd. t. (equation (8)):

$$COUFEUA = 992.2123 - 33.98611 * COPFNUA / GDPDUA + 3.365268 * (PKSPRUA + POSPRUA) \quad (8)$$

9. Use for food purposes, thsd. t. (equation (9)):

$$COUFDUA = COUPCUA * POPUA \quad (9)$$

10. Use for sowing, thsd. t. (equation (10)):

$$COUFSUA = 0.01 * COAHAUA \quad (10)$$

11. Processing for non-food purposes, thsd. t. (equation (11)):

$$COUOTUA = COXFAUA + COUDPUA \quad (11)$$

12. Share of corn in the total grain area, % (equation (12)):

$$COASHUA = 0.52579 + 0.02256 * TREND08 + 0.01231 * COEGUUA - 0.01597 * WSPFNUA (-1) / GDPDUA (-1) \quad (12)$$

13. Profitability of corn production, thousand UAH (equation (13)):

$$COEGUUA = COPFNUA (-1) / GDPDUA (-1) - COCGUUA / GDPDUA \quad (13)$$

Designation:

COAHAUA – the area from which corn is harvested for grain;

COASHUA – share of corn in the total grain area;

GRAHAUA – total grain area;

COYHAUA – corn yield;

COEGUUA – corn profitability;

COCGUUA – corn production costs per 1 ha of acreage;

COSPRUA – gross corn yield;

COSMTUA – corn import volume;

SOUXTUA – corn export volume;

COPFNUA – price of 1 tonne of corn;

COUDCUA – volume of domestic consumption;

COCCTUA – final leftovers;

COUFEUA – use for feed;

COUDLUA – losses;

COUFDUA – use for food purposes;

COUFSUA – use for sowing;

COUOTUA – processing for non-food purposes;

WSPFNUA (-1) – price of wheat in the previous period, as a substitute product of corn;

GDPDUA – GDP deflator;

GDPDUA (-1) – GDP deflator of the previous period;

TREND08 – logarithmic trend;

COPMDUS – FOB corn import price, USD;

PKSPRUA – pork production volume;

POSPRUA – chicken production volume;

COXFAUA – other factory uses;

POPUA – population of Ukraine;

EXRDUA – the exchange rate of USD to UAH.

► Results and Discussion

Since 2016, there is an increase in acreage and gross corn yields in Ukraine. In particular, the average harvest of corn for grain in Ukraine in 2016-2020 amounted to 30,943.0 thsd. tonnes, which increased more than 5 times compared to 2001-2005. The increase in gross corn yields occurred both due to a 1.78-fold increase in yield and due to an increase in harvested areas by more than 2.8 times. On average, in 2016-2020, the harvested area of corn for grain in Ukraine was 4,735.2 thsd. ha. with an average yield of 65.5 c/ha (Table 1).

Table 1. Dynamics of gross yields, harvested areas, and yields of grain corn in Ukraine

Indicators	2001-2005	2006-2010	2011-2015	2016-2020	2016-2020 to 2001-2005
Gross yield, thsd. t.	6,145.9	9,546.6	25,314.6	30,943.0	503.5
Harvested areas, thsd. ha.	1,651.9	2,160.0	4,290.6	4,735.2	286.7
Yield, c/ha	36.8	43.7	59.0	65.5	178.0

Source: calculated based on: [22, p. 73-75]

At the same time, in 2021 in Ukraine, the gross yield and yield of corn for grain amounted to 42,109.9 thsd. t. and 76.8 c/ha, which, respectively, is 136.1% and 116.9% higher than the average values for 2016-2020 [22].

As evidenced by the data in Table 2, in the central region (Vinnytsia, Kirovohrad, Dnipropetrovsk, Poltava, and Cherkasy oblasts), the gross yield of corn grain in 2021, compared to 2018, increased from 15,640.6 thsd. t. to 16,334.3 thsd. t. or by 104.4% mainly due to the expansion of the harvested area by 106.8%, as the grain yield decreased by 1.1%. The share of the central region

in the gross grain yield of Ukraine for the period under study decreased from 43.7% to 38.8%.

But in 2021, compared to 2018, the share of the northern region (Kyiv, Zhytomyr, Sumy, and Chernihiv oblasts) in the gross yield of corn grain in Ukraine decreased from 32.0% to 31.4%, and the western region (Volyn, Zakarpattia, Lviv, Ivano-Frankivsk, Rivne, Ternopil, Khmelnytskyi, Chernivtsi oblasts), respectively, increased from 14.4% to 19.9%. At the same time, gross yields in the western region in the period from 2018 to 2021 increased by 162.5%.

Table 2. Gross yield, harvested area, and yield of corn for grain by regions of Ukraine, 2018-2021

Oblast	2018	2019	2020	2021	2020 to 2018, %
Gross yield, thsd. t.					
<i>Ukraine, incl.:</i>	35,801.1	35,880.1	30,290.3	42,109.9	117.6
North	11,453.6	11,689.8	11,355.8	13,232.6	115.5
Centre	15,640.6	15,336.9	9,410.9	16,334.3	104.4
West	5,159.6	5,197.1	6,472.5	8,383.9	162.5
South	1,709.8	1,681.7	1,274.2	2,284.3	133.6
East	1,837.5	1,974.6	1,776.9	1,874.8	102.0
Harvested area, thsd. ha.					
<i>Ukraine, incl.:</i>	4,564.2	4,986.9	5,392.1	5,481.8	120.1
North	1,233.6	1,442.3	1,631.7	1,647.5	133.6
Centre	2,024.9	2,187.6	2,263.1	2,162.6	106.8
West	589.3	625.4	762.1	918.2	155.8
South	336.0	335.4	333.8	354.7	105.6
East	380.4	396.2	401.4	398.8	104.8
Yield, c/ha					
<i>Ukraine, incl.:</i>	78.4	71.9	56.2	76.8	98.0
North	92.8	81.6	67.7	80.6	86.9
Centre	75.5	69.0	38.8	74.7	98.9
West	82.8	78.8	80.1	84.3	101.8
South	51.4	56.5	48.2	69.8	135.8
East	40.1	45.1	36.4	40.9	102.0

Source: calculated and compiled based on [22]

Note: (North – Kyiv, Zhytomyr, Sumy, and Chernihiv oblasts; Centre – Vinnytsia, Kirovohrad, Dnipropetrovsk, Poltava, and Cherkasy oblasts; West – Volyn, Zakarpattia, Lviv, Ivano-Frankivsk, Rivne, Ternopil, Khmelnytskyi, and Chernivtsi oblasts; South – Odesa, Mykolaiv, Kherson, and Zaporizhzhia oblasts; East – Kharkiv, Luhansk, and Donetsk oblasts)

The analysis shows that during the period under study, the most significant expansion of the harvested area of corn for grain occurred in the western and northern regions by 155.8% and 133.6%, respectively. The yield of corn in these regions for the period under study exceeds the average values in Ukraine. The analysis allows for the conclusion that during the period from 2018 to 2021, the corn belt expanded to the north and west of Ukraine. Such an extension is primarily associated with a lack of moisture, especially during the growing season of corn in the south-eastern regions of Ukraine.

Under these conditions, a significant task is to solve the problem of increasing the efficiency of using mineral fertilisers, which, along with ensuring an increase in the gross yield of corn grain, should help preserve soil fertility and have a high level of

payback. Difficulties often arise when solving these problems, primarily due to the rapid increase in prices for mineral fertilisers.

According to the State Statistics Service of Ukraine [22], in the structure of corn production for grain in Ukraine in 2018-2020, the share of agricultural enterprises was 73.8%, farming enterprises – 12.2%, and private households – 14.0% of the total volume. This distribution is conditioned by the fact that large and medium-sized agricultural enterprises are mainly focused on the export of corn, the production of which has a high marginality and, accordingly, requires significant costs per 1 hectare of crops. At the same time, in the structure of corn production costs of agricultural enterprises in Ukraine for 2018-2020, the key element of intensification were mineral fertilisers (Table 3).

Table 3. Costs of corn production for grain in agricultural enterprises of Ukraine per 1 ha of sown area

Items of expenditure	2018		2019		2020	
	UAH	%	UAH	%	UAH	%
Direct material costs, including:	9,365.2	50.3	9,476.5	51.5	7,816.3	48.2
seeds and planting material	2,546.5	13.7	2,505.4	13.6	2,114.4	13.0
mineral fertilisers	2,814.0	15.1	3,185.3	17.3	2,498.5	15.4
fuel and lubricants	1,731.2	9.3	1,638.9	8.9	1,214.5	7.5
other costs	2,273.4	12.2	2,146.9	11.7	1,988.9	12.3
Labour costs, (%)	810.6	4.4	877.3	4.8	899.4	5.5
Other direct expenses and general production expenses, incl.:	8,431.5	45.3	8,037.4	43.7	7,516.1	46.3
deductions for social measures	179.3	1.0	195.7	1.1	197.4	1.2
depreciation	1,088.3	5.8	1,288.9	7.0	1,426.3	8.8
payment for third-party organisations	2,583.0	13.9	2,276.0	12.4	1,836.6	11.3
other direct and general production costs	4,580.9	24.6	4,276.9	23.3	4,055.8	25.0
Total expenses	18,607.3	100.0	18,391.3	100.0	16,231.8	100.0

Source: calculated based on [24]

In particular, one of the most significant items in the structure of the cost of corn production for grain is the cost of mineral fertilisers, the share of which for 2018-2020 was in the range from 15.1% to 17.3%, or in absolute terms from UAH 2,814 in

2018 to UAH 2,498.5 in 2020 per 1 ha of crops. At the same time, the share of fertilised corn acreage for grain during the period under study tends to increase, in particular, from 94.7% in 2018 to 95.6% in 2020 (Table 4).

Table 4. Volumes of mineral fertilisers applied for corn for grain in agricultural enterprises of Ukraine

	2018	2019	2020	2020 to 2018, %
Share of fertilised area, %	94.7	95.0	95.6	101.0 p.p.*
Volume of mineral fertilisers applied, thsd. t. (in nutrients)	482.5	528	659.9	136.8
Cost of purchased mineral fertilisers, million UAH	4,074.6	4,762.7	4,429.3	108.7
Volume of mineral fertilisers applied per 1 hectare of sown area, kg	147	145	172	117.0

Note: * percentage point

Source: [25; 26]

The amount of mineral fertilisers applied when growing corn for grain in agricultural enterprises of Ukraine in 2020 increased from 482.5 thsd. t. in 2018 to 659 thsd. t. (in nutrients) in 2020, or by 136.8%. Per 1 ha of sown area, the volume of fertilisers applied also tends to grow from 147 kg in 2018 to 172 kg in 2020, or by 117%, over the period under study. According to the results of 2021, the volume of mineral fertilisers applied during corn cultivation increased to 683 thsd. t. (in nutrients), and per 1 ha – amounted to 171 kg, which is 1 kg less compared to 2020 [25].

In general, as evidenced by the data in Table 4, agricultural enterprises of Ukraine annually from 2018 to 2020 purchased mineral fertilisers for growing corn for grain in the amount of more than UAH 4 billion per year. Under these conditions, it is

important to determine from a scientific and practical standpoint how increasing the volume of mineral fertiliser application affects the yield of corn for grain in agricultural enterprises of Ukraine. Since the value of economic variables is usually determined not by one, but by several factors, multiple linear regression is used to measure their quantitative impact on performance.

The proposed model is based on the influence of the following factors on the yield of corn for grain (y), in particular, the share of the fertilised area with mineral fertilisers, the volume of application of mineral and organic fertilisers per 1 hectare of crops, and the level of profitability of production of this grain crop in agricultural enterprises of Ukraine for the period from 2001 to 2020 (Table 5).

Table 5. Source data for correlation and regression analysis of the influence of factors on the yield of corn for grain in agricultural enterprises of Ukraine

Year	Yield, c/ha	Share of the fertilised area with mineral fertilisers, %	Volume of fertiliser application per 1 hectare of sown area, kg		Level of profitability (unprofitability), %
			Mineral	Organic	
2001	26.9	32.0	27	887.6	38.0
2002	32.7	42.4	39	922.7	25.6
2003	32.3	42.3	34	778.2	50.3
2004	37.6	56.6	52	630.3	12.7
2005	45.9	59.0	65	660.8	-6.30
2006	38.1	71.7	68	729.5	10.9
2007	41.9	77.9	87	764.0	47.9
2008	49.5	84.4	99	932.0	10.6
2009	54.6	73.6	81	1,179.7	21.5
2010	47.0	81.0	92	749.0	29.9
2011	68.6	83.1	93	649.0	38.6
2012	51.5	86.5	96	612.3	19.8
2013	68.1	90.2	115	677.7	1.50
2014	66.6	89.8	113	683.3	26.2
2015	61.1	89.7	112	762.4	50.3
2016	72.4	93.6	130	725.6	45.7
2017	59.5	93.6	143	744.5	23.7
2018	87.0	94.7	147	834.0	67.6
2019	77.7	95.0	145	798.0	38.9
2020	60.9	95.6	172	785.0	42.2

Source: [22; 24; 26]

Using the source data of Table 4 and the MS Office Excel-2010 software suite, the following regression equation was obtained:

$y = 4.72831 + 0.41008x_1 + 0.14641x_2 + 0.00037x_3 + 0.11970x_4$
 where y – yield of corn for grain in agricultural enterprises of Ukraine, c/ha; x_1 – share of the fertilised area

with mineral fertilisers, %; x_2 – the volume of application of mineral fertilisers per 1 ha of sown area, kg; x_3 – the volume of application of organic fertilisers per 1 ha of sown area, kg; x_4 – level of profitability, %.

This equation shows that the greatest influences of all four factors on the performance indicator have:

1) the share of the fertilised area of crops – if the weight of the indicator increases by 1%, the yield of corn for grain will increase by 0.41 c/ha;

2) the volume of application of mineral fertilisers – if this factor increases by 1 kg per unit of sown area, the yield will increase by 0.14 c/ha;

3) the level of profitability – if the weight of the indicator of the level of profitability increases by 1%, the yield of corn for grain will increase by 0.12 c/ha.

The results of the regression equation showed that the volume of organic fertiliser application (x_3) does not significantly affect the increase in yield due to small amounts of application. In particular, if this factor is increased by 1 kg per unit of sown area, the yield will increase by only 0.00037 c/ha.

The multiple correlation coefficient is 0.87429, which indicates that there is a close correlation between the estimated level of the yield of corn for grain and the linear combination of the above parameters. Coefficient of determination $R^2=0.76438$, indicates that regression explains 76.4% of the variance in the

value of corn yield generation for grain in agricultural enterprises of Ukraine.

Thus, the analysis showed that the yield of corn for grain has a close and direct correlation with the volume of mineral fertilisers applied per 1 hectare of crops. Therefore, further increase in the effectiveness of grain production would also largely depend on the application of optimal volumes of mineral fertilisers in accordance with agrotechnological requirements and the region of their use.

If the gross yield of corn in Ukraine has increased significantly since 2016 (Table 1), then domestic consumption remains fairly stable. Therefore, changes in the gross yield of corn are not critical from the standpoint of ensuring domestic consumption, since if in 2010 its share was 52.8%, then in 2020 it decreased to 21.5%. On average, about 6.0 million tonnes of corn are used for feed purposes per year, while in relative terms – there is a tendency to decrease. In particular, if in 2010 the share of feed costs to production volumes was 44.8%, then in 2020 it decreased to 18.9% (Table 6).

Table 6. Dynamics of corn balance in Ukraine, thsd. t.

	2010	2018	2019	2020
Production	11,953	35,801	35,880	30,290
Inventory changes (at the end of the year)	997	6,580	-4,076	-4,821
Import	30	41	36	25
Total resources	12,980	29,262	39,992	35,136
Export	4,057	21,440	32,346	27,916
Feed costs	5,359	6,318	6,018	5,735
Sowing costs	155	151	199	197
Losses	469	641	642	500
Processing for non-food purposes	831	545	628	632
Consumption fund	117	167	159	156
<i>domestic consumption/production</i>	52.8%	19.6%	19.0%	21.5%
<i>feed/production costs</i>	44.8%	17.6%	16.8%	18.9%
<i>export/production</i>	33.9%	59.9%	90.2%	92.2%

Source: [23, p. 38]

The analysis shows that the domestic market is not able to meet the demand for existing volumes of corn grain production. Therefore, according to V. Rozhko, "... the growth of corn grain production in Ukraine is accompanied by an increase in its export opportunities, while domestic consumption remains

relatively stable" [27]. Over the past decade, Ukraine has significantly increased the volume of corn grain exports. In 2021, 24.7 million tonnes of Ukrainian grain were exported to foreign markets, which accounted for 48.6% of grain exports from Ukraine and is 6 times higher than the corresponding indicator in 2010 (Table 7).

Table 7. Dynamics of volumes, prices, and revenue from grain exports from Ukraine

Year	Total grain		Incl. corn		
	Export volumes, million tonnes	Export revenue, billion USD	Export volumes, million tonnes	Weighted average export price, USD	Export revenue, billion USD
2010	13.9	2.40	4.05	194	0.79
2011	14.1	3.60	7.80	254	1.98
2012	27.08	6.98	15.60	249	3.88

Table 7, Continued

Year	Total grain		Incl. corn		
	Export volumes, million tonnes	Export revenue, billion USD	Export volumes, million tonnes	Weighted average export price, USD	Export revenue, billion USD
2013	27.07	6.36	16.70	229	3.82
2014	32.5	6.48	17.50	191	3.34
2015	37.4	6.05	19.04	158	3.01
2016	40.2	6.08	17.29	153	2.65
2017	41.9	6.50	19.30	154	2.97
2018	42.9	7.24	21.40	164	3.50
2019	57.9	9.60	32.30	161	5.21
2020	52.2	9.55	27.92	175	4.88
2021	50.8	12.35	24.70	239	5.89

Source: [28; 29]

Despite the fact that in 2021 the physical volume of corn exports from Ukraine is slightly lower compared to 2019 and 2020, however, foreign exchange earnings from grain sales to foreign markets amounted to USD 5.89 billion. This is an absolute record for Ukraine in its entire history.

According to APK-Inform, in 2021, China occupies the largest share in the geographical structure of corn exports – 36.0% (8.5 million tonnes), the Netherlands – 11.0% (2.5 million tonnes), Egypt – 10% (2.4 million tonnes), and Spain – 8% (2.0 million tonnes) [27]. Difficulties in logistics and transportation caused by

the coronavirus epidemic, which created obstacles in the supply chains of grain, contributed to an increase in demand for it from the main traditional importers, in particular China. In addition, due to the poor corn harvest in major producing and exporting countries, the revision of US stocks, uncertainty and instability in the world related to COVID-19, exchange rate fluctuations, and the situation in the oil market contributed to increased price volatility in the global grain market. The current situation has led to a trend toward further growth in prices for corn grain, which began in May 2020 (Fig. 3).

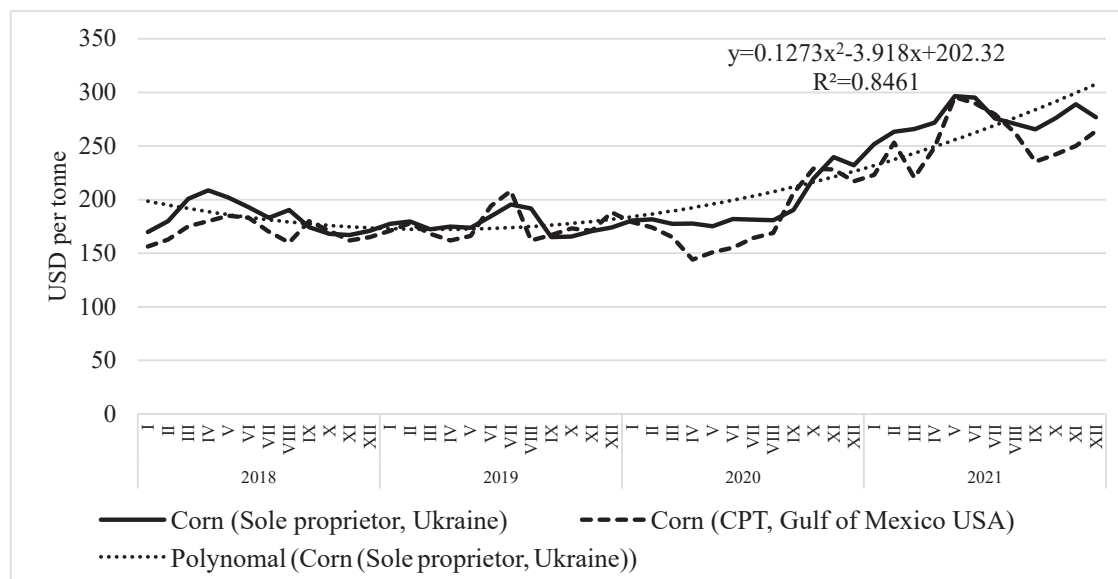


Figure 3. Dynamics of average monthly prices for corn grain, USD per tonne

Source: calculated and compiled based on [30]

The equation of the aligned dynamic series of average monthly prices for corn grain (Sole proprietor Ukraine) for 2018-2021 is a second-order polynomial trend, which is also called a quadratic trend: $y=0.1273x^2-3.918x+202.32$

The coefficient of determination is $R^2=0.8461$, which indicates a high reliability of the function, because it shows how close the trend is to the data

series (Fig. 3). As shown in Figure 3, "... export prices for corn grain (Sole proprietor Ukraine) are closely dependent on the dynamics of world prices and, to a lesser extent, on internal factors. Ukrainian export prices for grain are formed on the US market (on the Chicago Mercantile Exchange, CME), which is considered the world's largest producer and exporter of this product" [31, p. 20].

In Figure 4, based on the dynamics of the average monthly global spot price of corn (USA, Gulf of Mexico) and prices in Ukraine based on FOB from January 2019 to December 2021, their volatility is calculated as a percentage of changes compared to prices from month to month.

The analysis showed that fluctuations in the average monthly price changes in USD. The US dollar

peaked in 2019 compared to the previous month from -22.1% to +16.9%, in 2020 – from -12.7% to +21.9%, in 2021 – from -12.9% to +18.8%. On the FOB basis for Ukraine, price fluctuations ranged from -14.0% to +6.2% in 2019 compared to the previous month, from -2.3% to +15.4% in 2020, and from -6.5% to +8.5% in 2021.

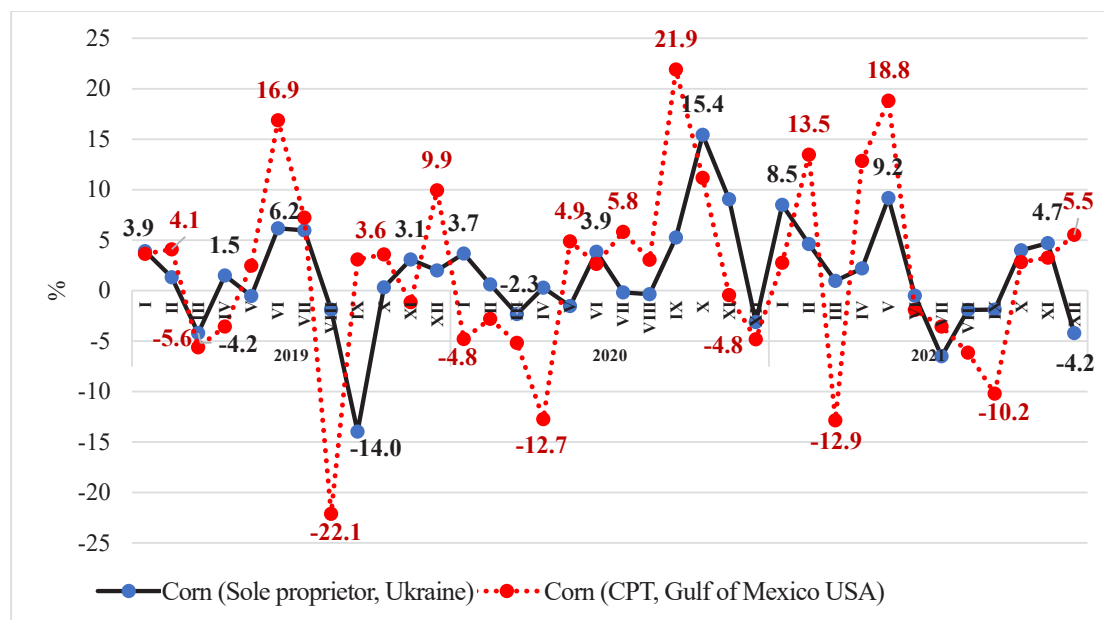


Figure 4. Corn grain price volatility in Ukraine on Sole proprietor and global market terms (CPT, Gulf of Mexico, USA) for 2019-2021

Source: calculated based on [30]

Usually, price volatility increased during the sowing campaign is quite high during the growing season, and any information about the weather and gross yield forecast affects forward corn prices. As a rule, volatility begins to decline in September, when the expected

harvest becomes clear [31]. However, in September 2020, unlike in previous years, price volatility significantly increased in the corn grain market. Corn price volatility in Ukraine is estimated using the standard deviation of average monthly prices during 2019-2021 (Table 8).

Table 8. Standard deviation of monthly average Sole proprietor price of corn in Ukraine

	2019	2020	2021
Average annual FOB price of corn grain (Ukraine), USD per tonne	177.1	193.1	274.8
Standard deviation interval of the average monthly corn price on Sole proprietor terms (Ukraine):			
– USD per tonne	9.5	23.2	13.3
– %	5.4	12.0	4.9

Source: calculated based on [30]

Calculations showed that in average annual terms, the monthly volatility of corn grain Sole proprietor prices in Ukraine was the highest in 2020 and amounted to 12% (or USD 23.2 per tonne). At the same time, the average annual price in 2021, compared to 2019, increased by almost USD 100 per tonne, or 1.6 times.

As evidenced by foreign and domestic experience, price volatility is a common phenomenon for

commodity markets. At the same time, significant price fluctuations pose a threat to economic entities. A sharp increase in prices for agri-food products can potentially both negatively affect the provision of food security for the population, and limit the indicators of economic efficiency of production in those industries that use agricultural raw materials as input resources [32, p. 1]. According to the Food and Agriculture Organization of the United Nations (FAO),

global food prices reached a ten-year high in September 2021. In particular, the FAO Food Price Index it showed that they grew by 32.8% over the year. At the same time, at the end of 2021, the average value of the FAO grain price index was 131.2 points, which is 28.0 points (27.2%) higher than in 2020 and is the highest annual average since 2012. And the average prices for corn in 2021, compared to 2020, increased by 44.1%, which is primarily conditioned by an increase in demand and limited supply from the main grain exporters [33].

The increase in corn prices in Ukraine provoked an increase in mixed feed prices by 40-45% in 2020 compared to 2019. According to the Association "Union of poultry breeders of Ukraine", "Pig breeders of Ukraine" and "Union of feed producers of Ukraine", starting from October 2020, the production of certain types of livestock products in Ukraine has become

unprofitable. In particular, the level of profitability (unprofitability) of poultry meat was minus 12%, eggs – minus 17%, and pork – minus 3%. Such a situation may negatively affect the further development of the livestock industry in Ukraine, in particular, reduction of livestock and poultry with all the negative social consequences [34].

Moreover, the rapid increase in world prices for natural gas in 2021 provoked an increase in prices for mineral fertilisers, because it is natural gas that accounts for up to 80% of the cost of fertiliser production. According to the World Bank, prices for mineral fertilisers increased by an average of 80% during 2021. In the first quarter of 2022, prices increased by almost 30% [4]. As the data in Figure 5 show, carbamide prices in March 2022 exceeded the maximum values of 2008, while prices for phosphates and potassium are heading towards the level of 2008.

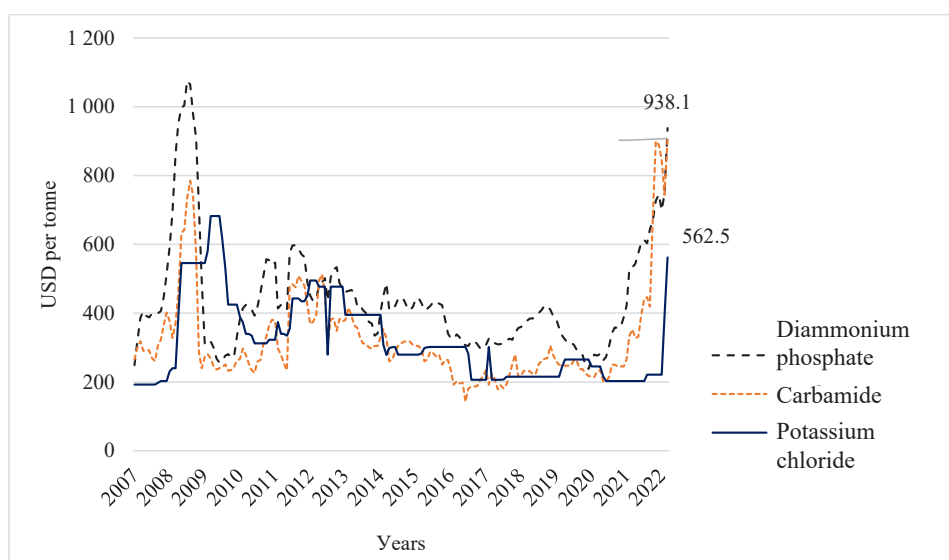


Figure 5. Dynamics of world prices for mineral fertilisers, USD per tonne

Source: compiled based on [4, p. 43]

Further growth in world prices for mineral fertilisers in 2022 is conditioned by the introduction of economic sanctions against Russia and Belarus for Russia's full-scale invasion of Ukraine, and due to export restrictions on the export of fertilisers imposed by China [4].

According to the newspaper "Uryadovy Kuryer", in Ukraine ammonium nitrate (nitrogen fertilisers), the most popular Ukrainian fertiliser, in February-March 2021 cost UAH 9 thousand per tonne with delivery, then in February 2022 – more than twice as expensive: UAH 18-19 thousand per tonne. Carbamide (concentrated nitrogen fertilisers) with delivery as of February 2022 was sold at UAH 27.7 thousand per tonne, or almost three times more expensive than at the beginning of the year. Prices for imported products are higher by another 2-3 thousand UAH per tonne [35].

In turn, the increase in prices for mineral fertilisers will affect the cost of corn production for grain. According to the calculations of the Institute of Agrarian Economics, the production cost of agricultural

products may increase by 10-12% due to the rise in the price of fertilisers. Small and medium-sized, family-owned farms with small land areas – up to 400-500 hectares and insignificant working capital for the purchase of fertilisers – will be the first to suffer. Therefore, farmers will be forced to reduce the use of fertilisers, since the additional effect of their use does not compensate for the purchase costs [34].

Thus, from a scientific and practical standpoint, it is important to determine the economic consequences of the impact of changes in the cost of mineral fertilisers on the effectiveness of corn production and export from Ukraine. Such calculations can only be estimated since there is not enough information for analytical calculations. In particular, some agricultural producers were able to buy mineral fertilisers earlier, some are buying now, and the other part is saving for spring in the hope of reducing market prices or compensating expenses from the state budget.

To assess the impact of changes in the cost of mineral fertilisers on the efficiency of corn production

and export, in particular – yield, gross yield, harvested areas, and the main parameters of corn supply and demand formation in Ukraine, an econometric dynamic model of partial market equilibrium was used – AGMEMOD.

As is known from economic theory, the markets of agricultural products and factors of production are closely related and influence each other. For example, an increase in the volume of gross grain harvesting leads to an increase in demand for mineral fertilisers. Such an increase stimulates an increase in domestic prices for these fertilisers, which in turn affects market prices for cereals [36-38].

To assess the impact of factors of production on the development of the corn market, the AGMEMOD model includes the costs of its production, in particular: rent for property and land, labour remuneration, fuel and lubricants, seeds, mineral fertilisers in the calculation per 1 hectare of harvested area for the period from 2000 to 2019:

$$\text{COCGUUA} = \text{RP} + \text{R} + \text{S} + \text{SPM} + \text{FL} + \text{MF} * K_n \quad (14)$$

where COCGUUA – corn production costs per 1 ha of acreage; RP – rent for property per 1 ha, UAH; R – rent for 1 ha of agricultural land, UAH; S – labour costs per 1 ha, UAH; SPM – expenses for seeds and planting material per 1 ha, UAH; FL – fuel and lubricants costs per 1 ha, UAH; MF – costs of mineral fertilisers per 1 ha, UAH; K_n – coefficient of change in mineral fertiliser costs.

The authors of this study suggest that the influence of the cost of mineral fertilisers on the effectiveness and export of corn is carried out through changes in their costs per 1 ha of crops. To assess the

impact of changes in the cost of mineral fertilisers on the performance of corn production and export, 4 scenarios were modelled.

Baseline scenario – it is expected that the cost of mineral fertilisers per 1 ha would be determined in 2019 prices. Scenarios “+50%”, “+75%”, and “+100%” – provide that the cost of mineral fertilisers per 1 ha would grow by 50%, 75%, and 100%, respectively, compared to the baseline scenario. To introduce scenarios into the model, the coefficient of change in the cost of mineral fertilisers (K_n) (equation 14). For scenarios “+50%”, “+75%”, and “+100%” K_n it would be 1.5, 1.75, and 2.0, respectively.

As evidenced by the data in Table 9, the simulation results confirm that domestic consumption will remain stable at 8,304 million tonnes in all possible scenarios. This is primarily conditioned by problems in the development of the livestock industry in Ukraine. After all, the share of feed costs in domestic corn consumption in Ukraine over the past 10 years, according to the State Statistics Service of Ukraine [25], was about 77%. According to the simulation results, an increase in the cost of mineral fertilisers compared to the baseline scenario would lead to a decrease in gross yields and corn exports from Ukraine. In particular, the gross yield of corn grain in Ukraine, according to the likely scenarios of increasing the cost of mineral fertilisers, compared to the baseline scenario of 2020 by 50%, 75%, and 100%, will decrease by 3,037 thsd. tonnes, 4,474 thsd. tonnes, and 5,875 thsd. tonnes, respectively. At the same time, export volumes under the above-mentioned scenarios will decrease by 2,898 thsd. tonnes, 4,269 thsd. tonnes, or 5,606 thsd. tonnes, respectively.

Table 9. Modelling of scenarios of the impact of changes in the cost of mineral fertilisers on production efficiency and the main parameters of the corn balance in Ukraine using the model AGMEMOD

	Baseline scenario 2020	Scenarios for changes in the cost of mineral fertilisers to the baseline scenario of 2020		
		“+50%”	“+75%”	“+100%”
Average yield, t/ha	5.54	5.30	5.18	5.06
Harvested area, thsd. ha.	5,954	5,653	5,508	5,362
Share of corn in the total area of grain crops, %	39.9	39.4	38.4	37.4
Gross yield, thsd. t.	32,997	29,960	28,523	27,122
Import, thsd. t.	58.4	58.4	58.4	58.4
Change in inventory at the end of the year, thsd. t.	-35.0	-35.1	-35.1	-35.1
Total resources	33,090	30,053	28,617	27,215
Export, thsd. t.	22,839	19,941	18,570	17,233
Feed costs, thsd. t.	7,600	7,600	7,600	7,600
Sowing costs, thsd. t.	59.5	56.5	55.1	53.6
Losses, thsd. t.	1,473	1,338	1,274	1,211
Processing for non-food purposes, thsd. t.	354	354	354	354

Table 9, Continued

	Baseline scenario 2020	Scenarios for changes in the cost of mineral fertilisers to the baseline scenario of 2020		
		“+50%”	“+75%”	“+100%”
Consumption fund, thsd. t.	349	349	349	349
Other uses, thsd. t.	414	414	414	414
Total resources	33,090	30,053	28,617	27,215
Domestic consumption	8,304	8,304	8,304	8,304
domestic consumption/ production	25.2	27.7	29.1	30.6
feed/production costs	23.0	25.4	26.6	28.0
export/production	69.2	66.6	65.1	63.5

Source: calculated by the author based on [22; 25]

Thus, the results of the modelling allowed quantifying the impact of changes in the cost of mineral fertilisers under probable scenarios on the performance indicators of corn production and export from Ukraine. Table 10 shows the obtained relative values of the impact of changes in the cost of mineral fertilisers on the average yield, harvesting areas, gross yields, and corn exports relative to the baseline scenario. For example, if the cost of mineral

fertilisers increases by 100% compared to the baseline scenario of 2020, this would lead to a decrease in the gross yield of corn for grain by 17.8% and its exports from Ukraine by 24.5%. Under these conditions, if not for the high gross yields of corn and favourable prices for it, it would be possible to predict a gradual rejection of its cultivation in favour of other more profitable crops, in particular soybeans.

Table 10. Impact of changes in the cost of mineral fertilisers on the performance of corn production and export from Ukraine in comparison with the baseline scenario, %

Indicators	Scenarios for changes in the cost of mineral fertilisers to prices in 2020		
	“+50%”	“+75%”	“+100%”
Average yield, %	-4.3	-6.5	-8.7
Harvested area, %	-5.1	-7.5	-9.9
Gross yield, %	-9.2	-13.6	-17.8
Export	-12.7	-18.7	-24.5

Source: calculated by the author

To ensure profitability at the level of previous years, producers will also have to review technological operations, deliberately reducing productivity per hectare in favour of ensuring economic efficiency. Calculations show that from an economic standpoint, it is better for producers to save on expensive mineral fertilisers and get a yield of 4 tonnes of corn per hectare, providing themselves with USD 200. By doubling the yield to 8 tonnes per hectare in compliance

with intensive agricultural technologies, it is possible to get a financial result of USD 250 per hectare.

Using the AGMEMOD model, a forecast of the medium-term consequences of the increase in the cost of mineral fertilisers (scenario “+100%” of the cost of mineral fertilisers in comparison with the actual data of 2020) for the development of the corn market in Ukraine for the period 2025 was developed (Table 11).

Table 11. Forecasting the consequences of changes in the cost of mineral fertilisers on the main parameters of corn market development in Ukraine using the AGMEMOD model (scenario “+100%” to the cost of mineral fertilisers compared to 2020)

	Actual data for 2020	Forecast data for the period up to:			
		2022	2023	2024	2025
Average yield, t/ha	5.62	5.06	5.00	5.00	5.06
Harvested area, thsd. ha.	5,392	5,362	5,442	5,453	5,481

Table 11, Continued

	Actual data for 2020	Forecast data for the period up to:			
		2022	2023	2024	2025
Import, thsd. t.	25.0	58.4	59.5	61.2	62.2
Export, thsd. t.	27,9e16	17,233	17,235	17,216	17,554
Feed costs, thsd. t.	5,735	7,600	7,670	7,737	7,827
Sowing costs, thsd. t.	197	53.6	54.4	54.5	54.8
Losses, thsd. t.	500	1,211	1,216	1,218	1,238
Processing for non-food purposes, thsd. t.	632	354	354	354	354
Consumption fund, thsd. t.	156	349	347	345	344
Domestic consumption/production, %	21.5	30.6	30.7	30.9	30.8
Feed/ production costs, %	18.9	28.0	28.2	28.4	28.2
Export/production, %	92.2	63.5	63.3	63.1	63.3

Source: calculated by the author using the AGMEMOD model based on [22; 25]

The forecast results show that under the scenario of “+100%” to the cost of mineral fertilisers, the main parameters of the corn grain balance in Ukraine, in comparison with the actual data of 2020, will reach the following indicators in 2025:

- the average yield will decrease to 5 t/ha;
- the area from which corn is collected for grain will increase by 1.65%;
- gross tax will decrease by an average of more than 3 million tonnes, or 10.5 %;
- the volume of exports will decrease by more than 10.4 million tonnes, or 37.1%. This is conditioned by a potential decrease in the level of competitiveness of Ukrainian corn on the world market in comparison with the largest competitors, in particular, from the United States;
- grain costs for livestock feed will increase by more than 2 million tonnes, or by 36.5%, which is primarily conditioned by the increase in livestock in animal husbandry;
- grain losses will increase by more than 2.5 times, which is primarily due to a decrease in the use of mineral fertilisers and a violation of agricultural technologies for growing corn;
- the ratio of domestic consumption to production will increase from 21.5% to 30.8%;
- the feed-to-production cost ratio will increase from 18.9% to 28.8%;
- the export-to-production ratio will decrease from 92.2% to 63.3%.

Thus, according to the results of forecasting for the period up to 2025, an increase in the cost of mineral fertilisers by 100% compared to 2020 will have a significant impact on the development of the grain market in Ukraine.

In 2021, due to the rapid increase in prices for mineral fertilisers, a task was set for the national governments of many countries to ensure food security. After all, providing their farmers with mineral fertilisers and keeping food prices low are new global challenges for many countries. Therefore, the prospect for further study within the framework of Ukrainian state agricultural policy should be to substantiate an effective mechanism to protect

Ukrainian farmers from sharp fluctuations in the price of mineral fertilisers.

► Conclusions

As a result of the study, the following conclusions were made:

1. In Ukraine, over the past 10 years, the gross corn yield has increased 2-fold – from 20.9 million tonnes in 2012 to a record 42.1 in 2021. Such a significant increase in gross yield is conditioned by both an increase in the yield of corn for grain, respectively, from 47.9 c/ha to 76.8 c/ha due to the use of modern industrial technologies by farmers, and an increase in the harvested area by 125.4%. If the gross yield has tended to increase in recent years, then the volume of domestic consumption of corn has systematically decreased in favour of exports. Based on the results of 2021, Ukraine exported 24.7 million tonnes of corn worth USD 5.89 billion.

2. In recent years, the increase in corn production and exports from Ukraine has been accompanied by trends towards an increase in world grain prices. This was facilitated by the COVID-19 pandemic, which significantly increased the demand for grain from the main importers to increase their reserves.

3. Modern developed agriculture is impossible without the use of sufficient mineral fertilisers. Currently, almost half as many mineral fertilisers are applied in Ukraine as in the United States and EU countries, which leads to soil degradation. Therefore, a radical increase in the cost and shortage of mineral fertilisers can lead to a decrease in their application compared to previous years, increase the dependence of the crop on weather conditions, contribute to the deterioration of grain quality, and also worsen the soil fertility.

4. The quantitative influence of production factors on the yield of corn for grain in agricultural enterprises of Ukraine is determined using the developed econometric model for the period from 2001 to 2020. The results of multiple linear regression showed that the yield of corn for grain has a close and direct correlation with the volume of mineral fertilisers applied per 1 ha of sown area, the share

of the fertilised area of crops and the level of profitability of its production in agricultural enterprises of Ukraine. The statistical value of the result obtained is confirmed by a high coefficient of determination which is $R^2=0.764$.

5. Based on the findings of the study, the influence of changes in the cost of mineral fertilisers on the main parameters of demand (domestic consumption, export) and supply (yield level, harvested area, gross yields) in the corn market is quantitatively substantiated according to probable scenarios using the AGMEMOD econometric partial equilibrium model. Calculations showed that under the “+100%” scenario (an increase in the cost of mineral fertilisers compared to 2020), the gross yield of corn in Ukraine would decrease by 17.8%, and the export of this grain – by 24.5%, or USD 1,513.6 million.

6. The forecast results for the period up to 2025 showed that under the “+100%” scenario (an increase in the cost of mineral fertilisers compared to 2020), it would lead to a significant reduction in the supply of corn and the export potential of the grain industry. In particular, the gross corn harvest will be reduced by more than 3 million tonnes by reducing its average yield to 5.0 tonnes per 1 ha. At the same time, the volume of exports of this grain crop would decrease by more than 10.4 million tonnes, or by 37.1%, which is conditioned not only by a reduction in production volumes, but also by a potential decrease in the competitiveness of Ukrainian corn on the world market due to an increase in its production cost. As a result, this would lead to a shortfall in Ukraine's foreign exchange earnings of about USD 2.5-3.0 billion per year at the current level of the world price of corn grain.

7. It is proved that the high yield of corn and the favourable current price environment for grain will ensure a sufficient level of profitability of this grain crop. However, a radical increase in the cost of mineral fertilisers threatens to ensure the competitiveness of Ukrainian corn in the domestic and

foreign markets, which would eventually lead to higher food prices and a deterioration of the country's food security and a decrease in the export potential of the grain industry.

8. To ensure profitability at the level of previous years, agricultural producers will be forced to deliberately review technological operations, reducing productivity per hectare in favour of ensuring economic efficiency.

9. In order to optimise costs, agricultural producers need to diversify their mineral nutrition systems. In particular, invest in fertilisers in advance, without which the production of agricultural products is impossible. And the second factor is that it is necessary to buy those forms of fertilisers that reduce the cost of technology, for example, anhydrous ammonia.

10. Improvement of the efficiency of corn grain production in Ukraine can be achieved through the introduction of scientifically based doses of mineral fertilisers, transformation of the cost policy for the purchase of effective fertilisers, and substantiation and implementation of effective measures to stimulate and support grain production adapted to market conditions.

11. Government agencies need to develop an effective mechanism for reducing the cost or compensating the cost of purchasing mineral fertilisers for agricultural producers. In particular, at the expense of forward purchases of mineral fertilisers through PJSC “Agrarian Fund”, which would provide them with fertilisers for the sowing campaign.

12. In the context of export-oriented grain production, which brings the main revenues of the industry, a decrease in gross yield may lead to a decrease in foreign exchange earnings in the country. In addition, it is necessary to maintain a sufficient level of soil enrichment to further ensure both high performance indicators of corn grain production, and to preserve the ecological parameters of soil fertility.

► References

- [1] The Observatory of Economic Complexity. (2022). *Corn*. Retrieved from <https://oec.world/en/profile/hs/corn>.
- [2] The Ukrainian business association of exporters (UBTA). (2022). *Agrifood export portfolios-2021*. Retrieved from <https://ubta.com.ua/uk/analytics>.
- [3] Khoroshun, V. (2021). *Grain market overview 2021: Export, production, trends*. Retrieved from <https://latifundist.com/analytics/23-obzor-rynka-zernovyh-kultur-2021-eksport-proizvodstvo-tendentsii>.
- [4] World Bank Group. (2022). *Commodity markets outlook: The impact of the war in Ukraine on commodity markets*. Retrieved from <https://openknowledge.worldbank.org/bitstream/handle/10986/37223/CMO-April-2022.pdf>.
- [5] Hebebrand, C., & Laborde, D. (2022). *High fertilizer prices contribute to rising global food security concerns*. Retrieved from <https://www.ifpri.org/blog/high-fertilizer-prices-contribute-rising-global-food-security-concerns>.
- [6] Skrypnyk, A., Klymenko, N., Tuzhyk, K., Galaieva, L., & Rohoza, K. (2021). Prerequisites and prospects for sustainable development of grain production in Ukraine. *Agricultural and Resource Economics: International Scientific E-Journal*, 7(3), 90-106. doi: 10.51599/are.2021.07.03.06.
- [7] Cheremisina, S., & Rossokha, V. (2021). Efficiency of grain production in Ukraine: Analysis of the current state and prospects for improvement. *Ekonomika APK*, 6, 54-67. doi: 10.32317/2221-1055.202106054.
- [8] Shyian, D., Lialina, N., & Honcharova, K. (2020). The influence of the level of production intensity on the formation of an effective cost structure in crop production. *Ekonomika APK*, 6, 27-36. doi: 10.32317/2221-1055.202006027.
- [9] Wang, J., & Hu, X. (2021). Research on corn production efficiency and influencing factors of typical farms: Based on data from 12 corn-producing countries from 2012 to 2019. *PLOS ONE*, 16(7). doi: 10.1371/journal.pone.0254423.
- [10] Bereziuk, S., & Zubar, I. (2019). Modern economic and ecological aspects of fertilizer application in the crop production. *Ekonomika APK*, 10, 34-43. doi: 10.32317/2221-1055.201910034.

- [11] Stasiv, O., Kachmar, O., Vavrynovych, O., & Arabska, E. (2021). Ecological and economic efficiency of growing maize for grain in short-rotation cultivation of the Western region. *Agricultural and Resource Economics: International Scientific E-Journal*, 7(2), 182-199. doi: 10.51599/are.2021.07.02.10.
- [12] Lialko, D. (2021). Ways to increase profits from the export of Ukrainian corn on the world market. *Ekonomika APK*, 10, 90-97. doi: 10.32317/2221-1055.202110090.
- [13] Tanklevska, N., Petrenko, V., Karnaushenko, A., & Melnykova, K. (2020). World corn market: Analysis, trends and prospects of its deep processing. *Agricultural and Resource Economics: International Scientific E-Journal*, 6(3), 96-111. doi: 10.51599/are.2020.06.03.06.
- [14] Vashchenko, I. (2017). Theoretical foundations and current state of the corn market. *Ekonomika APK*, 2, 88-92. Retrieved from http://www.eapk.org.ua/sites/default/files/eapk/2017/2/e_apk_2017_2_15.pdf.
- [15] Soare, E., Chiurciu, I., Bălan, A., & David, L. (2018). World market research on maize for Life, Life for Agriculture" *Conference Proceedings*, 1(1), 216-222. doi: 10.2478/alife-2018-0032.
- [16] Palamarchuk, M. (2014). Ways of domestic maize competitive ability increasement under present-day conditions. *Ekonomika APK*, 6, 91-96.
- [17] Santeramo, F., Lamonaca, E., Contò, E., Nardone, G., & Stasi, A. (2018). Drivers of grain price volatility: A cursory review. *Agricultural Economics (Zemědělská ekonomika)*, 64(8), 347-356. doi: 10.17221/55/2017-agricecon.
- [18] Dzhulai, M. (2022). Development of an employer's value proposition for young professionals. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 9(3), 40-47. doi: 10.52566/msu-econ.9(3).2022.40-47.
- [19] Chantreuil, F., & Barbenchon, M.-D. (2009). *AGMEMOD 2020 project final reports: Final activity report Part I*. Retrieved from https://cordis.europa.eu/docs/results/21/21543/121790321-6_en.pdf.
- [20] Lupenko, Yu., Khodakivska, O., Nechyporenko, O., & Shpykuliak, O. (2022). The state and trends of agricultural development in the structure of the national economy of Ukraine. *Scientific Horizons*, 25(6), 121-128. doi: 10.48077/scihor.25(6).2022.121-128.
- [21] Cheban, I., & Dibrova, A. (2020). Development of liquid biofuel market: Impact assessment of the new support system in Ukraine. *Journal of International Studies*, 13(1), 262-278. doi: 10.14254/2071-8330.2020/13-1/17.
- [22] State Statistics Service of Ukraine. (2022). *Plant growing in Ukraine 2021*. Retrieved from https://ukrstat.gov.ua/druk/publicat/Arhiv_u/07/Arch_rosl_zb.htm.
- [23] State Statistics Service of Ukraine. (2021). *Balances and consumption of the main food products by population of Ukraine 2020*. Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/07/Zb_Bsph_2020.pdf.
- [24] State Statistics Service of Ukraine. (2021). *Costs of agricultural production in agricultural enterprises in 2018-2020*. Retrieved from <https://ukrstat.gov.ua/>.
- [25] State Statistics Service of Ukraine (2022). *Use of inorganic and organic fertilizers (1990-2021)*. Retrieved from <https://ukrstat.gov.ua/>.
- [26] State Statistics Service of Ukraine (2022). *Use of fertilizers and pesticides for the harvest of agricultural crops in 2018-2021*. Retrieved from <https://ukrstat.gov.ua/>.
- [27] Rozhko, V. (2022). *Wartime food balance in Ukraine. Part 3.1. Export of grains*. Retrieved from <https://www.apk-inform.com/en/exclusive/topic/1526929>.
- [28] State Statistics Service of Ukraine. (2021). *Ukraine's foreign trade 2020*. Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/06/ztu_20_ue.pdf.
- [29] State Statistics Service of Ukraine. (2022). *Ukraine's foreign trade in goods 2021*. Retrieved from <https://ukrstat.gov.ua/>.
- [30] APK-Inform Analytic and Information Agency. (2021). *Prices*. Retrieved from <https://www.apk-inform.com/uk/prices>.
- [31] USAID Financial Sector Transformation Project. (2020). *Prospects of using derivatives in the grain market of Ukraine. Grain market research*. Retrieved from http://www.fst-ua.info/wp-content/uploads/2020/04/Grain-Market-Research_27.4.2020.ukr.pdf.
- [32] Martyshev, P. (2020). *Regulation of the development of agri-food production increaser world price volatility* (Abstract of PhD thesis, State Organization «Institute for Economics and Forecasting of NAS of Ukraine», Kyiv, Ukraine). Retrieved from <http://ief.org.ua/wp-content/uploads/2020/09/>.
- [33] FAO. (2022). *FAO food price index*. Retrieved from <https://www.fao.org/worldfoodsituation/foodpricesindex/en>.
- [34] SuperAgronom. (2020). *Ukraine may introduce state regulation on corn: the situation needs to be stabilized*. Retrieved from <https://superagronom.com/news/12125-v-ukrayini-mojut-vvesti-derjregulyuvannya-na-kukurudzu-neobhidno-stabilizuvati-situatsiyu>.
- [35] Gromov, O. (2022). *Who can afford expensive fertilizers?* Retrieved from <https://ukurier.gov.ua/uk/articles/komu-po-kisheni-dorogi-dobryva>.
- [36] Kucher, O., Hutsol, T., Glowacki, S., Andreitseva, I., Dibrova, A., Muzychenko, A., Szeląg-Sikora, A., & Kocira, S. (2022). Energy potential of biogas production in Ukraine. *Energies*, 15(5), article number 1710. doi: 10.3390/en15051710.
- [37] Dibrova, A., Dibrova, L., & Dibrova, M. (2016). Priority directions of development of export agrofood productions of Ukraine. In *International scientific days 2016. The agri-food value chain: Challenges for natural resources management and society* (pp. 39-46). Nitra: Slovak University of Agriculture in Nitra. doi: 10.15414/isd2016.s1.02.
- [38] Dibrova, A.D., Krylov, Y.O., Dibrova, L.V., & Dibrova, M.A. (2020). *Regulation of the grain market of Ukraine in the context of global challenges*. Nizhyn: Publishing PP Lysenko M.M.

Прогнозування наслідків впливу вартості мінеральних добрив на розвиток ринку кукурудзи в Україні з використанням моделі AGMEMOD

Анатолій Дмитрович Діброва, Лариса Василівна Діброва,
Алла Сергіївна Чміль, Максим Анатолійович Діброва

Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна

► **Анотація.** За останнє десятиріччя з 2012 по 2021 рр. Україна подвоїла обсяги виробництва кукурудзи. Збільшення валових зборів кукурудзи пов'язують із застосуванням аграріями сучасних технологій вирощування, що підвищують стійкість рослин до несприятливих факторів середовища, коригують мінеральне живлення рослин з урахуванням погодних умов. Однією із найважливіших складових таких технологій є застосування мінеральних добрив, від оптимального обсягу внесення яких залежить не лише рівень урожайності зернових культур, але й ефективність виробництва та якість зерна. Проте стрімке зростання світових цін на природний газ протягом 2021 р. сформувало нові виклики та загрози для подальшого розвитку ринку зерна в Україні. Адже світові ціни на мінеральні добрива зросли з 2021 р., за даними Світового банку, на 110 %. За цих умов радикальне зростання вартості мінеральних добрив створює загрозу забезпечення конкурентоспроможності української кукурудзи на внутрішньому та зовнішньому ринках, що в підсумку призведе до підвищення цін на продовольство та погіршення рівня продовольчої безпеки країни. Це може негативно вплинути на валові збори та експортний потенціал зернової галузі. Метою дослідження є оцінка сучасного стану попиту і пропозиції на ринку кукурудзи в Україні та прогнозування наслідків впливу зміни вартості мінеральних добрив на основні параметри його розвитку за ймовірними сценаріями, з використанням економетричної моделі часткової рівноваги AGMEMOD на період до 2025 року, що створює передумови для підвищення ефективності прийняття і реалізації управлінських рішень і сприяє досягненню цілей державної аграрної політики. У процесі дослідження використовувалися наступні методи: монографічний, абстрактно-логічний, порівняльного аналізу та експертних оцінок, табличний, статистико-економічний, факторного аналізу, економіко-математичного моделювання. Результатом роботи є оцінка сучасного стану та визначення основних чинників, що впливають на формування попиту і пропозиції на ринку кукурудзи. За допомогою множинної лінійної регресії визначено вплив основних факторів на врожайність кукурудзи на зерно в сільськогосподарських підприємствах України за 2001–2020 рр. Проаналізовано динаміку балансу попиту і пропозиції на ринку зерна кукурудзи в Україні. Здійснено прогнозування наслідків впливу зміни вартості мінеральних добрив на основні параметри розвитку ринку кукурудзи в Україні за ймовірними сценаріями з використанням економетричної моделі часткової рівноваги AGMEMOD на період до 2025 року. На підставі проведених розрахунків доведено, що висока врожайність кукурудзи та сприятлива нинішня цінова кон'юнктура на зерно забезпечать достатній рівень прибутковості цієї зернової культури. Запропоновано напрями удосконалення механізму здешевлення або компенсації витрат на купівлю мінеральних добрив для товаровиробників. Набули подальшого розвитку методико-практичні аспекти прогнозування наслідків впливу зміни вартості мінеральних добрив на основні параметри розвитку ринку кукурудзи в Україні з використанням економетричної моделі часткової рівноваги AGMEMOD на період до 2025 року. Запропоновані методичні підходи та результати дослідження можуть бути використані органами державного і галузевого управління при розробці пріоритетних напрямів щодо підвищення результативності вітчизняної зернової галузі

► **Ключові слова:** аграрна політика, ринок зерна, енергетична криза, економетричне моделювання



UDC 658.153

Innovative Financial Methods for Optimising the Solvency of Accounts Receivable and Their Impact on the Efficiency of a Company's Operations

Andrii Kravtsov*

National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine

► **Abstract.** Timely optimisation of accounts receivable is important for the development of business and the overall economy, because it actively contributes to reducing the “frozen” debt funds, reducing the need for additional sources of financing, and, accordingly, increases the company's liquidity, which, in turn, improves its reputation as a reliable partner. Due to the imperfection of the financial system and the unpopularity of modern debt optimisation measures at Ukrainian enterprises, it is particularly relevant to analyse the real problems of forming accounts receivable and investigate promising areas for its reduction. The purpose of the study is to consider and test innovative financial methods for optimising counterparty debt to the enterprise in Ukraine, including factoring and insurance of accounts receivable. The practical significance of the study is as follows: based on the analysis of the current state of accounts receivable, the use of factoring services for its optimisation is proposed; using the modelling method, key forecast indicators of liquidity at the enterprise under study are determined, the areas of insurance of accounts receivable are formed, the effectiveness of the proposed measures is substantiated. The study summarises the theoretical foundations of optimising accounts receivable in the system of ensuring the efficiency of an enterprise. The analysis of the financial and economic state of the business is carried out. The analytical support of a system of indicators and assessment of the quality of accounts receivable generation is investigated. Forecasting and optimisation of the level of accounts receivable based on innovative financial methods was performed to ensure effective business operations. Ways to improve the management of accounts receivable of the enterprise are provided. The positive impact of measures on the efficiency of the enterprise based on financial indicators – liquidity and turnover ratios – is proved. The problems of widespread use of the proposed methodology are indicated, and suggestions for solving these problems are given. The practical significance of the results obtained lies in the applied orientation of innovative financial methods described in the paper, the use of which will improve the process of optimising accounts receivable at the enterprise level, improve the process of managing accounts receivable, increase the level of liquidity and profitability of the business. The materials of the study would be useful for researchers who deal with the management and optimisation of accounts receivable, and can be comprehensively used in the business activities of “Energo Zbut Trans” LLC

► **Keywords:** factoring, insurance, management, business, liquidity, forecast indicators

► Introduction

At the present stage, during the period of business globalisation, increased risks of financial losses, and increased competitiveness, which significantly affect the activities of organisations, financial stability is an essential condition for their survival. The company needs not only to survive, but also to improve its financial results. Modern business conditions require progressive, scientifically based, and innovative approaches and methods for optimising accounts receivable at the enterprise, which is inextricably linked with the need to reduce the threat to the economic security of the organisation. It is effective to use methods

of structural and logical analysis and economic and mathematical modelling to develop a holistic conceptual approach to the object under study [1; 2].

Mutual obligations with counterparties constantly arise in the process of carrying out any economic activity of the organisation. Contractors can be both suppliers and contractors, as well as buyers and customers. Optimisation of financial relations between them is one of the conditions for ensuring the financial stability of an enterprise.

Methodological approaches to determining financial stability are the basis for substantiating

► **Suggested Citation:** Kravtsov, A. (2022). Innovative financial methods for optimising the solvency of accounts receivable and their impact on the efficiency of a company's operations. *Ekonomika APK*, 29(3), 42-50.

*Corresponding author

factors influencing the financial stability of an enterprise, including in modern conditions of instability of the economic situation. The type of financial stability of an enterprise can be absolute, satisfactory, unstable, and crisis [3].

An alternative method is to analyse relative indicators of financial stability. In the event of a crisis, it is extremely important to quickly look for ways to improve the financial stability of the enterprise. For example, it is possible to achieve a sharp increase in the financial stability of a business entity based on an increase in the level of capitalisation [4], or by reducing accounts receivable. Moreover, the debt is affected by various factors. O. Ugwuodiora and L. Onmonya developed a model and proved a direct relationship between the repayment period of accounts receivable, the time of the company's existence, and the tools for ensuring financial stability: gross profit and financial leverage [5].

Along with traditional methods of optimising accounts receivable, such as assessing the financial condition of customers, timely invoicing and monitoring their movement, there are a number of innovative methods, for example, resale of debt collection rights (forfeiting, factoring), insurance of accounts receivable.

Of the innovative accounts receivable management tools considered, factoring is the most popular and in demand. It was investigated by such Ukrainian and foreign researchers as S. I. Derevianko [6], O. V. Smyrna and O. A. Bereslavets [7], W. Jin, and C. Wang [8]. As noted by O. V. Smyrna and O. A. Bereslavets, "to solve the problem of accounts receivable, enterprises, organisations, and corporations from developed countries began to use new unique financial security tools 20-30 years ago. One of such services is a factoring service as a way to increase the speed of capital turnover and improve the management of financial flows" [7]. According to the researchers, in European countries, the turnover of factoring is approximately 6% of GDP [7]. However, for Ukraine, this method is innovative, since it is only at the stage of development and is almost not used by Ukrainian enterprises. The study by Bi Keran, Hua Zheng et al. is devoted to the analysis of accounts receivable insurance [8]. For Ukraine, this method is completely new, since Ukrainian insurers do not currently provide such a service, although in developed countries it is mentioned in the absolute majority of calculations for optimising trade debt.

Optimisation of accounts receivable directly affects the profitability of the company, increases financial stability, and, accordingly, reduces threats to the economic security of the organisation. In addition, optimisation of accounts receivable determines the discount and credit policy for inefficient buyers, ways to speed up the repayment of debt amounts and reduce bad debts.

Thus, the state of accounts receivable, its volume, and quality have a direct impact on the financial situation of the business, and therefore, on the level of its economic and financial security.

Accordingly, the relevance of the study is conditioned by the fact that insufficient attention to the

management of accounts receivable at the enterprise can lead, first of all, to the loss of funds and a decrease in the level of financial stability. This is proved by M. I. Ivanova et al. [9], V. Ya. Havran et al. [10]. This issue is especially important for energy sales companies, since the growth of debt dependence on debtors leads to a decrease in revenue growth and a decrease in the level of liquidity of the organisation.

V. Ya. Havran et al. prove that "accounts receivable has a positive and negative impact on the company's activities; positive – stimulating sales growth, establishing stable and long-term relationships with the consumer, forming a competitive assortment, and others. The negative impact of accounts receivable on the company's activities is caused by the following factors: withdrawal of funds from circulation, additional costs for managing accounts receivable; the risk of non-repayment, losses caused by inflation and a decrease in profit, etc." [10]. Optimisation of accounts receivable involves the search for new solutions that can help debt and its changes have a positive impact on doing business.

Modern theoretical, methodological, and practical aspects of managing the company's accounts receivable were investigated by Ukrainian and foreign researchers, who, in particular, considered the development of the theory of financial factoring as a method of debt management [11], the company's trade and credit policy [12], the relationship of accounts receivable and such financial categories as profit, margin, liquidity, etc. [13], monitoring the company's operations with cash flow analysis [14], etc.

The purpose of the study is to work out methods for optimising accounts receivable, identify innovative financial methods, and substantiate their impact on the efficiency of the enterprise.

► Materials and Methods

The following research methods were used when writing the paper: experiment (an attempt to use factoring to optimise debt at the enterprise under real business conditions), comparison (determining the effectiveness of the research object before and after the implementation of the proposed measures), generalisation (proving specific theses based on basic financial categories and concepts), forecasting (predicting numerical values of reporting items for the forecast period), graphical and tabular methods, modelling (imitation of the situation in which the debt insurance service is provided under the conditions established by the author). To reveal the essence and content of categories, methods of theoretical generalisation were used – synthesis and analysis, deduction and induction, a systematic approach, analogy, comparison, and abstraction.

The information base was scientific and periodical sources for 2018-2022 [1-2; 4-14; 15], laws and regulations [16], Internet resources [3; 17-19], financial statements of "Energo Zbut Trans" LLC [20].

The relevance of using the proposed methods is proved by their popularity and effectiveness in developed European countries, which may become one of the stages of Ukraine's integration into the European Economic Area.

The initial stage of the study was the analysis of accounts receivable of the enterprise under study, namely, its share in the total amount of assets. The result of the analysis proved the need for further optimisation of the specified balance sheet item. To fulfil the purpose of the study, the use of a factoring scheme based on the conditions of the Ukrainian bank Radabank was modelled, and its effectiveness in reducing the amount of debt was established.

Accounts receivable insurance as one of the potential financial methods of debt optimisation was modelled in such a way that a pre-issued insurance policy covers part of the trade accounts receivable, and the one that was overdue during the policy's validity period is reimbursed by the insurer. Planned revenue values are calculated using the average growth over the past three years, and accounts receivable – using the average turnover ratio over the past three years. The values found varied depending on the financial methods used. The effectiveness of the proposed methodology for improving the efficiency of the enterprise's activities based on liquidity and turnover indicators is substantiated.

In modern business conditions, it is necessary to quickly and effectively respond to changes in the asset management policy, because the stability of the enterprise's functioning and profit maximisation depend on it. The level of liquidity, solvency, and financial sustainability depends on the right way of development and the further use of assets by modern business entities. To avoid a shortage or surplus of assets that causes either losses or loss of profit, it is necessary to improve their management system. That is why it is necessary to combine existing methods and introduce qualitatively new ones in the process of using assets in a modern enterprise, which in the future would increase its potential, and affect the final result of all its work [3].

► Results and Discussion

Accounts receivable is the amount of debt owed by debtors to an enterprise as of a certain date, where debtors are legal entities and individuals who, as a result of past events, owe the enterprise certain amounts of money, their equivalents or other assets [16]. That is, it is the result of settlements between two business entities, for example, a sales company and a customer company, which result in a debt obligation of one party (accounts payable) and

a monetary claim for the other (accounts receivable). Accounts receivable are “frozen” resources reflected in the balance sheet of the creditor company's accounting records. An increase in its size negatively affects the financial condition of the latter. Firstly, it should be borne in mind that the amount of money received in the future has a different value than the amount received at the present time, that is, there is a process of “depreciation” of money over time. This means that a lender that delays payment to its customers carries the risk of losing the benefit. Secondly, in addition to the risk of lost profits, the company has a risk of non-payment from debtors, that is, bad accounts receivable may arise. Thirdly, in practice, an economic organisation often faces another difficulty – the need for financial resources. In this case, it is forced to resort to borrowing money, that is, an increase in accounts payable, which violates the ratio between the source of financing (accounts payable) and accounts receivable, which, according to I.P. Soboleva et al., “must be at least 1” [14]. On the other hand, M. Madaleno and her co-authors argue that “there is no fixed level of accounts receivable and payable that an enterprise should have. This level is influenced by many factors: the desire of suppliers to differentiate prices, the disparity of information between suppliers and customers, the market structure, the stages of economic cycles, and the creditworthiness of customers” [13]. Thus, a paradoxical situation is formed when money is accounted for on the balance sheet, but in fact, it is not. Separately, it is necessary to focus on the importance of the indicator of turnover of accounts receivable: in the research of A. A. Lemishko, it is proved that an increase in asset turnover, among other things, encourages an increase in the efficiency of total capital and reproduction processes at the enterprise [2].

According to M.I. Ivanova, “the level of accounts receivable has a direct impact on the level of economic security” [9], so the testing of innovative methods of managing accounts receivable is an important factor in the effective operation of business.

The most popular tool for optimising accounts receivable in developed countries is factoring – the acquisition by a bank from a supplier of the right to claim customers' accounts receivable for products shipped by it, considering the risk of fulfilling such a requirement [7]. The main advantages of factoring for the supplier company are shown in Figure 1.

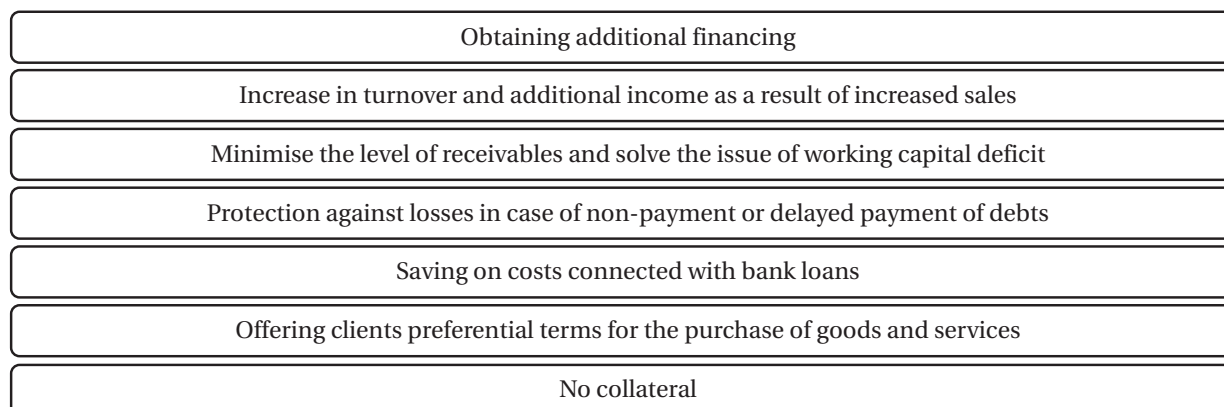


Figure 1. Competitive advantages of using a factoring service for a supplier company

Source: compiled by the author based on the study by [7; 11]

In particular, W. Jin and C. Wang identify three strategies for financing accounts receivable based on factoring methods [8]:

1. Single trade credit: the retailer uses the trade credit provided by the supplier, while the supplier uses only internal capital to support production.

2. Hybrid strategy with full factoring: the supplier provides trade credit to the retailer and sells all accounts receivable to the factor. When the loan expires, the seller pays the obligation to the factor based on the principle of limited liability.

3. Hybrid strategy with partial factoring: the supplier provides trade credit to the retailer and sells part of the accounts receivable to the factor. To better understand the role of factoring, it is assumed that the supplier's accounts receivable are divisible. According to this strategy, an arbitrary distribution of the retailer's credit risk is allowed.

According to S. I. Derevyanyenko, "factoring services are still of limited use in Ukraine". She claims that "the level of development of the factoring services market in Ukraine is low... Popular types of factoring

services, such as discounted invoice purchase and payment to the factor (bank), bank servicing of all sales accounting operations of companies with the maintenance of accounts of their debtors and submission of detailed reports, provision of guarantees of full payment even when the buyer is late or fails to pay, are not often practised in Ukraine. As a rule, customers prefer such service when the bank buys accounts of debtors at a discount, receiving payment in its favour" [6]. Therefore, the author describes the following reasons for the expediency of using factoring in Ukraine (Fig. 2). Based on research data from S. I. Derevyanyenko, O. V. Smyrna and O. A. Bereslavets, it can be concluded that the innovation of factoring in Ukraine lies in the fact that it is a real alternative to bank lending and encourages the use of Ukraine's significant financial potential. At the level of leading European countries, the demand for factoring is constantly growing, which should be taken into account for the development of this type of financial service in Ukraine as a European state.

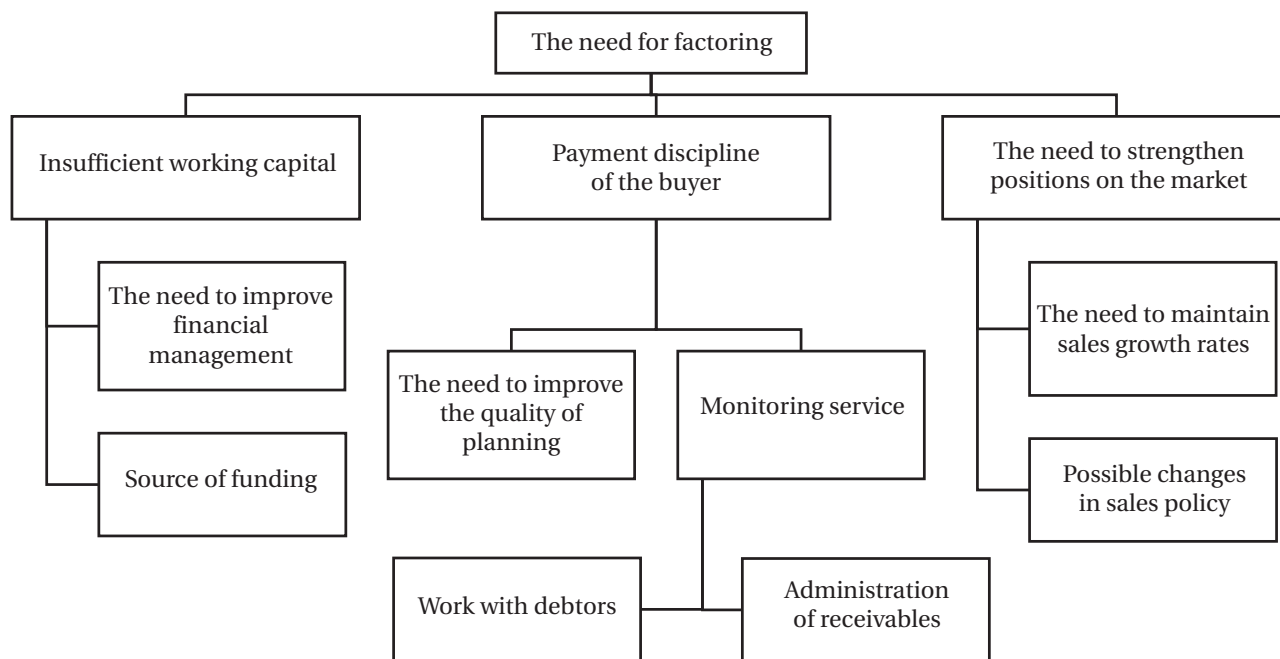


Figure 2. Reasons for the expediency of using factoring in Ukraine

Source: modified by the author based on the study by S. I. Derevyanyenko [6]

Next, the study considers the use of factoring to reduce accounts receivable on the example of "Energo Zbut Trans" LLC. As can be seen from Table 1, accounts receivable amount to 89.42% of the company's current assets as of December 31, 2021. This is a factor of "freezing" money in settlements, which leads to the need to finance debt not at the expense

of revenue, but the additional attraction of borrowed sources (accounts payable), and, accordingly, reduces the liquidity of the business. The authors of this study agree with the conclusions obtained by Ala'a Adden Abuhommous and Tareq Mashoka, who proved that the level of accounts receivable at the micro level should not exceed 15% of total assets [12].

Table 1. Current assets of "Energo Zbut Trans" LLC as of 12/31/2021

Asset item	Amount, thsd UAH	Share in total assets, %
Inventory	0	0
Accounts receivable	368,707	89.42
Including for products, goods, and services	172,277	41.78

Table 1, Continued

Asset item	Amount, thsd UAH	Share in total assets, %
Based on calculations for issued advances	120,752	29.29
Based on calculations with the budget	50,468	12.24
Other debt	25,219	6.12
Money and its equivalents	6,480	1.57
Deferred expenses	550	0.13
Other current assets	34,415	8.35
Total assets	412,316	100

Source: compiled by the author based on financial statements of "Energo Zbut Trans" LLC [20]

To use factoring through Radabank bank at the enterprise under study, the terms of service were as follows: payment amount – up to 95% of the delivery amount, administration commission – 0.12% of the transaction face value, advance payment – 0.5-8.0% of the transaction face value [17]. Since the maximum

amount of financing is not specified, the nominal value of the transaction will be 42.8% of trade accounts receivable, or 20% of all accounts receivable, in the amount of UAH 73,741 thousand. Accordingly, the calculations performed provided the following results regarding the use of factoring (Table 2).

Table 2. Result of using factoring in Radabank bank

Indicator	Value	Amount, thsd UAH
Transaction amount	100%	73,741
Payment amount	95%	70,054
Remaining amount (paid after payment of the debt by debtors)	5%	3,687
Administration fee	0.12%	88
Advance payment	8.0%	5,899
Financial result of the transaction	–	64,066

Source: compiled by the author based on [17] and data from Table 1

It can be concluded that the amount received from the factoring service will amount to 86.88% of the initial amount with the possibility to receive the remaining 5% of the transaction amount in case of payment of debt by debtors within the established time limit. The proposed method will increase sales revenue by UAH 64,066 thousand and get rid of part of accounts receivable, which significantly increases the level of efficiency of the enterprise. Thus, the use of factoring is appropriate for these financing conditions.

An absolutely innovative financial tool for optimising accounts receivable for Ukraine is accounts receivable insurance, also called commercial loan insurance. It provides for insurance of risks against late repayment of funds by the buyer or its bankruptcy. The use of this tool can be particularly effective for energy sales companies operating in a competitive market, and unable to dictate their own terms of sale or plan to conquer new market niches. This study has established that as of 01/01/2022, this type of insurance is not used in Ukraine. At the same time, in the developed countries of the world, this type of insurance is actively used at the micro level. According to the international factoring association Factors Chain International, interest in this financial service is constantly growing, which indicates an increase in the share of factoring operations in GDP [18].

According to Bi Keran and Hua Zheng, "supply chain financing on accounts receivable based on commercial credit insurance is essentially a closed ring of financing, and differs from conventional

financial methods in that it has a great advantage in controlling the sources of credit risks" [15]. The authors substantiate the need for this type of insurance as follows: "credit insurance used in the financing of supply chains for accounts receivable refers to an operation in which insurance is covered by a financial company, accepting a loan from the main enterprise as an object. When the main enterprise goes bankrupt due to force majeure, the appropriate and unpaid amount of money will be paid by the insurance company, and a limited payment of compensation will also be made to the service bank" [15].

Such a method of optimising accounts receivable as its insurance is fundamentally important for reducing the risks of non-payment of debt by debtors. Substantiation of the need for its use is carried out by analysing the quality of trade accounts receivable of "Energo Zbut Trans" LLC, which is presented in Table 3. Based on analytical calculations, the total share of overdue debt is 6.26%, and the delay period is more than one year, that is, the ability to repay the debt is extremely low and potentially this debt can be transferred to uncollectible. In the case of its preliminary insurance, this amount can be reimbursed by the insurance company almost in full, reducing credit risks for the business, which is one of the factors for ensuring financial security. In other words, the use of accounts receivable insurance as an innovative financial instrument is very important for practical financial activities at the micro level.

Table 3. Classification of trade accounts receivable of “Energo Zbut Trans” LLC by delay groups as of 12/31/2021

Asset item	Amount, thsd UAH	Share, %
Non-overdue accounts receivable	168,014	93.74%
Up to 30 days	–	–
31-90 days	–	–
91-120 days	–	–
121-180 days	–	–
181-365 days	–	–
366-730 days	10,658	5.95%
More than 730 days	560	0.31%
Unrecoverable debt	–	–
Total trade accounts receivable	179,232	100

Source: compiled by the author based on financial statements of “Energo Zbut Trans” LLC [20]

The study suggests that accounts receivable insurance is not common in Ukraine, including due to the undeveloped legal support of this financial procedure. Considering the innovation of accounts receivable insurance for the domestic financial system, the study will model the possibility of its application on the example of the enterprise. Assume that an insurance company insures accounts receivable in the amount of up to UAH 100,000 thousand. Insurance is performed at real value – the insurance amount is equal to the actual value of the property at

the time of the conclusion of the contract. The insurance contract is concluded for one year. The insurance fee (insurance premium) is 0.5% of the transaction amount. The deductible is 1% of the refund amount. Next, the study calculates the usefulness of this method for optimising accounts receivable at the analysed enterprise, if trade accounts receivable are insured in the amount of UAH 100,000 thousand, and the current 6.26% of all debt was overdue and not paid during the insurance period. The calculation results are summarised in Table 4.

Table 4. Determining the performance indicators for the use of accounts receivable insurance of “Energo Zbut Trans” LLC

Indicator	Amount, thsd UAH
Insurance amount	100,000
Amount of damage	11,218
Insurance payment	500
Franchise	112.18
Financial result of the transaction	10,605.82

Source: compiled by the author

Thus, since the amount of damage is less than the insured amount, in case of delay of debt by debtors in the amount of UAH 11,218 thousand, the company would be able to receive compensation in the amount of UAH 10,605.82 thousand, which is 94.54% of the loss amount. Next, the study analyses the effectiveness of the methods used to optimise

accounts receivable at “Energo Zbut Trans” LLC, namely their impact on the revenue received from sales of products, the amount of debt and, accordingly, the money received from its repayment using factoring and insurance, and the turnover of accounts receivable as the main factor for its assessment (Table 5).

Table 5. Effectiveness of testing methods for optimising accounts receivable (based on factoring and insurance of accounts receivable) of “Energo Zbut Trans” LLC

Indicator	Fact 2021	Plan 2022	Result of taking measures	Forecast for 2022 (after action)	Change			
					Without taking action		After taking action	
					Abs.	%	Abs.	%
Sales revenue, thsd UAH	8,905,733	9,602,607 ¹	+64,066 +10,606	9,677,279	696,874	+7.83	771,546	+8.66

Table 5, Continued

Indicator	Fact 2021	Plan 2022	Result of taking measures	Forecast for 2022 (after action)	Change			
					Without taking action		After taking action	
					Abs.	%	Abs.	%
Volume of accounts receivable, thsd UAH	368,707	297,019	-73,741 -11,218	212,060	-71,688	-19.44	-156,647	-42.49
Amount of funds, thsd UAH.	6,480	19,661	+64,066 +10,606	94,333	13,181	+203.4	87,853	+1,355.8
Turnover ratio of accounts receivable, units	24.15	32.33 ²	–	45.63	8.18	+33.87	21.48	+88.96
Cash turnover ratio, units.	1,374.34	488.4 ²	–	102.59	-885.94	-64.46	-1,271.8	-92.53
Turnover period of accounts receivable, days	14.91	11.14	–	7.89	-3.77	-25.29	-7.02	-47.09

Note: ¹ – value considering the average revenue growth over the past 3 years of 7.83%; ² – average value for the last 3 years

Source: compiled by the author

According to the results of the analysis, it can be seen that the proposed measures can increase sales revenue by 8.66%, increase cash on the balance sheet by 1,355.8%, reduce the volume of accounts receivable by 42.49%, and reduce its turnover period from 14.91 to 7.89 days, or by 47.09%.

To confirm the effectiveness of these methods to improve the financial security of the enterprise, the study will compare liquidity indicators as a basis for assessing the current and future state of the company's solvency (Table 6).

Table 6. Forecast liquidity indicators of “Energo Zbut Trans” LLC

Indicator	Standard ¹	Fact 2021	Plan 2022	Forecast for 2022 (after action)	Change			
					Without taking action		After taking action	
					Abs.	%	Abs.	%
Cash, thsd UAH	–	6,480	19,661	94,333	13,181	+203.4	87,853	+1,355.8
Accounts receivable, thsd UAH	–	368,707	297,019	212,060	-71,688	-19.44	-156,647	-42.49
Current assets (minus cash and accounts receivable), thsd UAH	–	34,965	56,533 ²	56,533 ³	21,568	+61.68	21,568	+61.68
Current liabilities, thsd UAH	–	398,851	279,742 ⁴	279,742	-119,109	-29.86	-119,109	-29.86
Absolute liquidity ratio, units	0.2 - 0.5	0.02 (< norm.)	0.07 (< norm.)	0.34 (= norm.)	0.05	+332.6	0.32	+1,975.6
Quick liquidity ratio, units	0.6-0.8	0.94 (> norm.)	1.13 (> norm.)	1.1 (> norm.)	0.19	+20.34	0.15	+16.44
Current liquidity ratio, units	-106.0	1.03 (< norm.)	1.33 (= norm.)	1.3 (= norm.)	0.31	+29.74	0.27	+26.16

Notes: ¹ – determined based on methodological recommendations developed by M. Kohan [19]; ² – calculated based on planned revenue and the average value of the turnover ratio for 3 years; ³ – since optimisation methods convert accounts receivable into cash, the measures do not affect the forecasting of the volume of inventory and other current assets, but are conditionally equal to the planned value; ⁴ – calculated based on the exponential trend line for the last 3 years

Based on the results of forecast calculations, the following conclusions can be drawn:

The usual planning of the volume of accounts receivable and other current assets, based on the average turnover indicator, raised all the values of liquidity ratios, among which the current one is above the standard level (planned 1.33 versus actual 1.03 with the standard ≥ 1.2). However, it can be seen that the absolute liquidity is less than the optimal one – 0.07 with a standard of 0.2-0.5 – which means insufficient solvency of the business in the event of the

deadline for payment of creditors' debt in the near future. The result of the introduction of measures to optimise accounts receivable increased absolute liquidity to the standard range of values up to 0.34. At the same time, fast and current liquidity decreases slightly – by 0.03 units compared to the planned ones. However, the values without measures were higher than the standard ones, and the results after optimisation are no less critical, so this difference can be ignored, since in this case, all liquidity ratios indicate the solvency of the enterprise in the short term.

► Conclusions

The paper considered the theoretical foundations of the concept of “accounts receivable”, its problems for effective business operation. The state of accounts receivable and its share in assets at “Energo Zbut Trans” LLC are analysed. It turned out that its share is 89.42% of the company's assets, and, consequently, the company spends significant resources on financing accounts receivable and does not receive a significant part of revenue. It is proposed to use the factoring service through Radabank bank, which is still new for Ukraine, with the specified terms of provision. This would reduce the value of debt by 20%, increasing revenue by UAH 64,066 thousand. The state of trade accounts receivable by groups of delinquencies is investigated, it is revealed that 6.26% of the volume is overdue, and the need for insurance of accounts receivable is justified. Since such a service as accounts receivable insurance is not yet provided in Ukraine, its application was modelled. The innovation of this method lies in the ability to attract insurance companies to the sales process of manufacturing enterprises as a potential source of profit for the former and ensure the reliability of settlements of the latter with their counterparties. The results of testing the financial method showed that in the case of insurance of debt, of which those 6.26% will be overdue, they will be reimbursed by the insurance company. Thus, accounts receivable will decrease by the amount overdue, and revenue will increase by UAH 10,606 thousand. The forecast of accounts receivable and revenue for 2022 with and without taking into account the proposed measures is made, it is proved that if the proposed methodology is used, it is possible to increase revenue by 8.66% against 7.83% without applying measures, reduce accounts receivable by 42.49% against 19.44%, and reduce the period of its turnover by 47.09% against 25.29%. Despite the optimality of fast and current liquidity indicators (1.1 and 1.3, respectively), which does not

change when applying the methodology, absolute liquidity would reach an optimal value of 0.34 with a standard of 0.2-0.5, which is not achieved without the proposed measures.

The results obtained indicate the effectiveness of the proposed methods in the case of their testing in a separate enterprise, but the global application is impossible for the following reasons:

- different types of economic activity have certain differences in the management of accounts receivable. Some enterprises, in particular those that sell products to the end user (including energy sales companies), exist at the expense of sales on credit;
- the need to use the services of banks and insurance companies by many enterprises at once will lead to the collapse of the country's financial and credit system, in particular, in the event of force majeure. Financial companies simply do not have enough funds to reimburse the required amount of accounts receivable even if a small part of the claims is confirmed;
- the emergence of a sharp decline in production by enterprises with significant debt, the breakdown of trade ties with some debtor customers, and an aggressive policy of “debt collection”;
- disruption of the production and financial cycle in most businesses that are part of the supply chain.

Partial solutions to these problems can be the provision of these services for VIP clients of financial organisations, in particular, based on the analysis of their credit policy and the state of accounts receivable and payable, the introduction of restrictions on the types of economic activities of clients, restrictions on the provision of financial services in case of a crisis, the involvement of other financial institutions and organisations. These offers would allow limiting the circle of customers to the most reliable and those who really need to use the above-mentioned financial products.

► References

- [1] Lemishko, O.O. (2020). Formation of analytical tools of capital reproduction in the agricultural sector of Ukraine. *Agricultural and Resource Economics*, 6(3), 64-79. doi: 10.51599/are.2020.06.03.04.
- [2] Lemishko, O.O. (2018). Modelling of endogenous factors impacting the efficiency of the aggregate capital in Ukrainian agriculture. *Economic Annals-XXI*, 170(3-4), 10-14. doi: 10.21003/ea.V170-02.
- [3] Kobyletskyi, V.R. (n.d.). Type of financial stability. *Financial Analysis Online*. Retrieved from <https://www.finalon.com/metodyka-rozrakhunku/101-typ-finansovoi-stiikosti>.
- [4] Kondratiuk, S.Ia., & Unytska, H.Yu. (2018). Efficiency of formation and use of assets of an enterprise. Kyiv: Kyiv National Economic University named after Vadym Hetman.
- [5] Ugwudioha, O., & Onmonya, L. (2022). Determinants of accounts receivable of listed consumer goods companies in Nigeria. *Universal Journal of Accounting and Finance*, 10(4), 793-802. doi: 10.13189/ujaf.2022.100401.
- [6] Derevianko, S.I. (2020). Factoring in Ukraine: Current state and development prospects. *AOGOΣ. The Art of Scientific Mind*, 10. doi: 10.36074/2617-7064.10.007.
- [7] Smyrna, O.V., & Bereslavets, O.A. (2020). Features and problems of implementing factoring operations in Ukraine. *Business Inform*, 1, 324-330.
- [8] Jin, W., & Wang, C. (2020). Modeling and simulation for supply chain finance under uncertain environment. *Technological and Economic Development of Economy*, 26(4), 725-750. doi: 10.3846/tede.2020.12054.
- [9] Ivanova, M.I., Hrosheleva, O.H., & Usatenko, O.V. (2020). Management of industrial enterprise receivables as a tool of economic security. Economics and enterprise management. *Pryazovskyi economic herald*, 18(1), 87-92. doi: 10.32840/2522-4263/2020-1-16.
- [10] Havran, V.Ya., Danylyuk, Kh.P., & Havran, M.I. (2020). Improving receivables management of the enterprise in the context of new challenging market conditions. *Bulletin of the Lviv Polytechnic National University. Series “Problems of Economics and Management”*, 4(1). doi: 10.23939/semi2020.01.151.

- [11] Niemczyk, N., Hubel, L., & Kravets, I. (2021). Features of marketing promo-campaigns of Ukrainian confectionery manufacturers within domestic and foreign markets. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 8(4), 36-44. doi: 10.52566/msu-econ.8(4).2021.36-44.
- [12] Abuhommous, A.A., & Mashoka, T. (2017). A dynamic approach to accounts receivable: The case of Jordanian firms. *Eurasia Business and Economics Society Accepted*. doi: 10.1007/s40821-017-0074-8.
- [13] Madaleno, M., Bărbuță-Mișu, N., & Deari, F. (2019). Determinants of net trade credit: a panel var approach based on industry. *Prague Economic Papers*, 28(3), 330-347. doi: 10.18267/j.pep.696.
- [14] Soboleva, Y.P., Matveev, V.V., Ilminskaya, S.A., Efimenko, I.S., Rezvyakova, I.V., & Mazur, L.V. (2018). Monitoring of businesses operations with cash flow. *Analysis, International Journal of Civil Engineering and Technology*, 9(11), 2034-2044.
- [15] Keran, B., Zheng, H., Qinwen, S., & Yu, Z. (2021). Analysis on credit risk assessment for accounts receivable supply chain financing based on credit insurance. *E3S Web of Conferences*, 275, article number 01065. doi: 10.1051/e3sconf/202127501065.
- [16] Law of Ukraine No. 2145-VIII "On Education". (2017, September). Retrieved from <https://zakon.rada.gov.ua/laws/show/2145-19#Text>.
- [17] Website of the Radabank. (n.d.). *Factoring*. Retrieved from <https://www.radabank.com.ua/ua/factoring/>.
- [18] The official website of the International Factoring Association Factors Chain International (FCI). (n.d.). Retrieved from <https://fci.nl/en>.
- [19] Kokhan, M.O. (2021). *Methodological recommendations for the preparation of the individual independent work "Crisis express diagnostics of the financial state" from the course "Economic security and anti-crisis management"*. Lviv: Lviv National University named after Ivan Franko.
- [20] Website "Energo Zbut Trans". (n.d.). *Limited Liability Company "Energo Zbut Trans"*. Retrieved from <https://enerhozbuttrans.com.ua/company/>.

Інноваційні фінансові методи оптимізації дебіторської заборгованості та їх вплив на ефективність діяльності підприємства

Андрій Володимирович Кравцов

Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна

► **Анотація.** Своєчасна оптимізація дебіторської заборгованості має важливе значення для розвитку бізнесу та економіки в цілому, тому що це активно сприяє зменшенню «заморожених» у заборгованості коштів, зниженню потреби у додаткових джерелах її фінансування, та, відповідно, підвищує ліквідність компанії, що, в свою чергу, сприяє покращенню її репутації як надійного партнера. У зв'язку з недосконалістю фінансової системи та непопулярністю сучасних заходів оптимізації боргу на підприємствах України, особливої актуальності набуває здійснення аналізу реальних проблем формування дебіторської заборгованості і дослідження перспективних напрямів її скорочення. Метою дослідження є розгляд та апробація інноваційних для України фінансових методів оптимізації заборгованості контрагентів перед підприємством, серед яких факторинг та страхування дебіторської заборгованості. Практичне значення проведеного дослідження полягає у наступному: на основі проведеного аналізу поточного стану дебіторської заборгованості, запропоновано використання послуги факторингу для її оптимізації; за допомогою методу моделювання визначено ключові прогностичні індикатори ліквідності на досліджуваному підприємстві, сформовано напрями страхування дебіторської заборгованості, обґрунтовано ефективність запропонованих заходів. У статті узагальнено теоретичні основи оптимізації дебіторської заборгованості в системі забезпечення ефективності діяльності підприємства. Проведено аналіз фінансово-економічного стану бізнесу. Досліджено аналітичне забезпечення системи показників та оцінка якості формування дебіторської заборгованості. Виконано прогнозування та оптимізацію рівня дебіторської заборгованості на основі інноваційних фінансових методів з метою забезпечення ефективної діяльності бізнесу. Наведено шляхи вдосконалення управління дебіторською заборгованістю підприємства. Доведено позитивний вплив заходів на ефективність діяльності підприємства на основі фінансових показників: коефіцієнтів ліквідності та оборотності. Вказано проблеми повсюдного застосування запропонованої методики, надано пропозиції щодо вирішення цих проблем. Практичне значення отриманих результатів полягає у прикладній спрямованості інноваційних фінансових методів, викладених у роботі, використання яких покращить процес оптимізації дебіторської заборгованості на рівні підприємства, вдосконалив процес управління дебіторською заборгованістю, підвищить рівень ліквідності та прибутковості бізнесу. Матеріали статті будуть корисні науковцям, які займаються питаннями управління та оптимізації дебіторської заборгованості, та можуть бути комплексно використані у господарській діяльності ТОВ «Енерго Збут Транс»

► **Ключові слова:** факторинг, страхування, управління, бізнес, ліквідність, прогностичні індикатори



UDC 316.334.55

Institutional Models for Managing Rural Development in the Economy of the European Union Countries: Specifics, Priorities, Tools

Svitlana Andros*, Andrii Bilochenko

National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine

► **Abstract.** The relevance of the study is conditioned by the need to create an effective model of the current institutional environment that can ensure the unity of economic processes in the management of rural territories in Ukraine based on the best foreign practice. The purpose is to summarise the experience of the EU countries on the functioning of institutional models for managing rural development for adaptation in Ukraine. The task is to formulate conceptual approaches to the formation of an institutional model for managing rural development in Ukraine, considering the fundamental principles of building a system for rural development management in the EU countries. General scientific methods were used as a tool for obtaining information for informed management decisions in the field of rural development management: analysis and synthesis; induction, deduction and analogy; abstraction; generalisation; idealisation, etc. The main trends and priorities of the agricultural policy implemented by the European Union are considered. Centralised and decentralised rural development management systems are described. Heterogeneous management models between centralisation and decentralisation are presented. The multi-level nature of the management concept as a key specific component is substantiated. The functioning of the system of distribution of tasks between the European Commission, the national state, and the regions is considered. Models of distribution of programming and management competencies in various management systems, and the forms of relations between different levels of government have been improved. The procedure for the functioning of the rural development programming system in Germany is presented. The classification of different countries based on the distribution of responsibility for managing programmes that were intended for rural development is considered. Vertical coordination and relations between the state and regions in countries with a decentralised form of governance are analysed. Methodological approaches to the development of an institutional model for managing rural development are proposed. The practical significance of the study lies in the development of recommendations that improve the efficiency and consistency of management decisions on the establishment of an institutional model for managing rural development in the Ukrainian economy

► **Keywords:** European Commission, programmes, levels of governance, agricultural policy, centralisation and decentralisation, financing

► Introduction

With the escalating phenomena of the global food crisis, food security and the preservation of the territorial integrity of the state are becoming an urgent issue. Ukraine has already begun the search for a way out of the protracted socio-ecological-economic crisis of rural areas, which is conditioned by historical reasons, formal privatisation, the underdevelopment of the system of local self-government bodies, the collapse of social and industrial infrastructure, the low level of diversification of the rural economy, and the weak development of small agribusiness.

In the European Union (EU) countries, much attention is paid to finding and implementing effective approaches to managing rural development. For this

purpose, a multi-level and interdepartmental system of management and financing of rural development has been created, and a set of administrative, economic, legal, and other tools for rural development is used [1; 2]. A significant role is assigned to small agribusiness, which can significantly improve the quality of life of the rural population by increasing their employment, income and providing the necessary services in industrial, social, recreational, and other spheres. Small agribusiness plays a crucial role in the process of diversification of the rural economy, especially in the service sector and non-agricultural activities [3; 4].

Such attention to rural areas is explained by the fact that they often have a significant natural and

► **Suggested Citation:** Andros, S., & Bilochenko, A. (2022). Institutional models for managing rural development in the economy of the European Union countries: Specifics, priorities, tools *Ekonomika APK*, 29(3), 51-61.

*Corresponding author

cultural potential that is not used, the development of which will improve the well-being of not only rural residents, but also the overall population of the country. The sustainability of rural development is largely determined by the multi-industry balanced structure of the rural economy [5].

A number of ministries and departments participate in the development and implementation of rural development programmes with the active participation of agro-industrial associations, environmental organisations, regional administrations, representatives of the private sector, and the rural population.

The main trends in the process of forming agricultural policy are:

- institutional systems in various European countries, which, despite historical and political differences, are increasingly moving towards decentralisation and the transfer of governance to regions and subregional institutions;
- supranational institutions that govern public policy by establishing a single set of general rules for all participating countries;
- local level, which puts increasing pressure on higher levels (regional and National) seeking to expand their participation in policy development and management.

The institutional model of rural development management should achieve the goals and solve the tasks set in the field of agricultural policy, considering special laws and regulations. The main mission of special laws is to determine the main proportions between the development of market relations and existing regulation at the state level.

It is territorial exclusivity, and organisational and economic potential that determine the initial conditions for the establishment and implementation of a new management model in the spatial aspect. This concerns, firstly, ensuring the improvement of the quality of life and life support of people, a new format of process modernisation of the economy, infrastructure, and public administration system; secondly, determining the decisive importance for a particular territory, in the real space of the territorial section of economic, social, and other transformations.

It is necessary to reform the national policy of rural development in Ukraine. However, the effectiveness of any economic and social reforms is largely determined by the state of the institutional environment and the changes taking place in it. The low effectiveness of the national policy of rural development in Ukraine causes the need for further theoretical study and the development of scientifically sound recommendations based on the generalisation of the experience of EU countries on the functioning of institutional models for managing rural development. The above together determines the relevance and originality of the specified topic.

The purpose of the study is to summarise the experience of the European Union countries on the functioning of institutional models for managing rural development for adaptation in Ukraine.

In accordance with this goal, the study aims to formulate conceptual approaches to the establishment of an institutional model for managing rural development in Ukraine, considering the fundamental principles of building a rural development management system in the EU countries.

There are many scientific publications in the press devoted to the analysis of the European experience of rural development, mainly the experience of the European Union (EU) countries [6; 7]. European experience is considered in the monograph along with the solution of other research problems on sustainable rural development [8]. Consideration of methodological recommendations [9] on the relevant topic allowed systematising approaches to the implementation of the national policy in the field of ensuring sustainable development of rural areas, its information base, and the institutional environment.

Theoretical and methodological problems and strategic priorities of sustainable rural development in Ukraine are reflected in the studies by Y.M. Gadzalo, V.M. Zhuk, M.M. Mogylova et al. [10]. The main aspects of sustainable rural development and agricultural production in Ukraine were investigated by Yu.O. Lupenko et al. [11]. The researchers developed approaches to solving the problems of developing agricultural production, increasing employment and income of the rural population, social development of the village, and the development of local self-government. Papers [12-14] reveal the essence of the agricultural policy of developed countries, trends in the development of world markets for agricultural raw materials and food, ensuring food security, using biological resources and soil and climate potential. However, insufficient attention is paid to the development of rural areas as a factor in increasing the competitiveness of the agricultural sector and preserving the territorial integrity of the state.

In addition, a clear system of views on European approaches to rural development, which can be defined as a paradigm of rural development, has not yet developed. In this case, G.B. Kleiner considers such a paradigm as “a universally accepted body of knowledge and assessments of accumulated data that has been used by specialists for some time as a kind of “template” for problem setting and problem-solving” [15]. In the study [16], which reflects the conceptual views of the research team on rural development, the European experience was rather underinvestigated. According to P. Bardhan, “the new management situation and management paradigm determine the need for deep development of new organisational principles of structuring: complementing the principles of organising a single management centre with the principles of decentralisation, autonomy of functional structures and assigning social and legal responsibility for independent actions to these structures”. It is this approach that allows excluding or at least minimising defects in public administration [17].

Based on the analysis of scientific sources based on the generalisation of models implemented in practice in the EU, two areas of conceptual approaches to

rural development can be distinguished. Both areas are based on the dualism of concepts: “exogenicity/endogenicity” (the first area) and “industry/territory” (the second area). Within the framework of the first area, exogenous, endogenous, and neoendogenic approaches are distinguished, the essence of which, according to N. Ward et al., is expressed in the form of appropriate institutional models [18]. Certain differences of the theoretical model of the economy of the self-organising paradigm, presented by P. Lowe and J. Murdoch [19], consistent with the neoendogenic approach to rural development. This refers to such properties as: a) the cooperative nature of the dynamics of economic subsystems, the possibility of collective effects in the economy; b) the ability to self-reproduce; c) the dependence of the current state on prehistory, the ability to preserve information (in the form of a connection structure between the elements of the economic system); d) the network structure of subsystems with a trend to form a complex economic connection and interdependence between them. The second area of conceptual approaches to rural development, based on the dualism of the concepts of “industry/territory”, is described in detail by F. Mantino [20], and later – by J. Murdoch and A.C. Pratt [21]. At the same time, industry-specific, redistributive, and territorial approaches are distinguished. Y. Buitenhuis et al. [22; 23] reveal the problems of institutional insufficiency and the need to develop institutions to achieve the goals of planned transformations, which allows identifying areas for improving the institutional environment during the transition to rural development management.

Thus, the lack of development of conceptual and methodological aspects, and the scientific and practical significance of institutional support for decision-making in the field of rural development management based on the best foreign practice, led to the need for further study.

► Materials and Methods

The key condition for the comprehensive provision of national security of Ukraine is the effective management of rural development. Having natural and technological advantages, Ukraine is constantly in an aggressive external environment, which is manifested by increasing competition and instability of border areas. All these challenges and threats to the country's security determine the need for rapid response, development, and implementation of high-quality management decisions. The institutional model of rural development management should achieve the goals and solve the tasks set in the field of agricultural policy, considering special laws and regulations.

Economic development of rural areas is a guarantee of consolidation and sovereignty. The theoretical platform for choosing the methodology of economic space research is based on the provisions of economic theory, the theory of long-term technical and economic development, the principles and methods of building an institutional theory.

In the process of research, depending on its goals and objectives, the following methods of cognition and analysis of economic processes are used: theoretical generalisation – when substantiating the main trends and priorities of agricultural policy implemented by the EU; statistical comparisons – when identifying and evaluating the effectiveness of the functioning of the system of distribution of tasks between the European Commission, the national state and regions; analysis of hierarchies – when studying the model of distribution of programming and management competencies in various management systems and analysing the forms of relationships between different levels of government; system method – when evaluating the effectiveness of functioning of heterogeneous management models between centralisation and decentralisation; expert assessments – when considering classification different countries based on the distribution of responsibility for managing programmes that were intended for rural development; analysis and synthesis, induction and deduction – when analysing vertical coordination and relations of the state and regions in countries with a decentralised form of management; comparison – when considering countries (Germany and Italy) with the most complex models in Europe, which are characterised by a very strong territorial division of powers and functions.

The methodology for studying the processes of rural development is based on the unity of the provisions of the methodology of economic growth, which includes:

- methodological approach to the study of the development of rural territorial systems using the tools of institutional theory and conceptual foundations of sustainable development;
- approach to revealing the specifics of institutional factors of rural development, determining their impact on the achievement of strategic goals;
- areas for improving the programme and target method of planning and managing rural development in Ukraine based on the best experience of the EU;
- analysis of European and Ukrainian approaches to the management of rural development;
- investigation of the state and trends of rural development in the EU, including in Germany and France, and the development of proposals for their use in Ukraine;
- identification of the possibility of adapting the EU experience in rural development in Ukraine;
- development of recommendations for improving the organisational and economic foundations of rural development management in Ukraine based on the best European practice;
- consideration of new trends in changing the pace of economic dynamics of EU countries and their regions.

The key goal is to build an institutional model of economic growth in the agro-industrial complex and rural areas based on the study of foreign experience in managing rural development.

Within the framework of this target setting, the need to develop theoretical and methodological

foundations for the effective development of territorial socio-economic systems to substantiate management decisions in a particular agricultural territory is determined.

A comprehensive methodological approach allows: first, to consider the institutional model of rural development management as an integral organic part of a single long-term process; second, to determine the socio-economic genotype of the territory; third, to establish structural shifts in relation to the cyclical nature of agricultural production development; fourth, to calculate the total potential of organisational and economic development of the rural territory.

► Results and Discussion

All other things being equal, sometimes in the worst conditions, the object or organisational structure in which the most effective management system functions

almost always wins. The current approach to assessing the hierarchical and organisational implementation of management processes in any system, regardless of its functional area, is that management should distinguish perspective and strategic, and operational and tactical levels, the relationship between which determines the degree of centralisation and decentralisation of the management system. The relative importance and specific role of different levels varies depending on the institutional structure of each country. In countries with centralised governance, the national level prevails; conversely, the intermediate and regional levels are more important in countries with more decentralised governance. To understand the organisation of different levels of management, various activities for programming and managing rural development policies are considered, and the distribution between individual levels and individual actors is analysed (Fig. 1).

Phases of programming and management		Centarlisred system	Decentralised system	Mixed system
Design and planning	Strategic programming	State level of competence	State level of competence	Agreement between the state and regions
	Placemant of found resources		Regional level of competence	Agreement between the state and regions, subregional authorities and economic and social parties
	A doption of operational programme			Regional and sub-regional level of competence (including development agencies)
Programme management	Implementation	State level of competence	Regional level of competence	
	Selection of recipient district			
	Selection of grassroots partnership	Partly state, partly regional level of competence	Partly sub-regional, partly local level of competence	
	Selection and financing of individual recipients			
	Control, monitoring, analysis and evaluation of results	State level of competence	Competence distribution between all levels	Competence distribution between all levels

Figure 1. Models of distribution of programming and management competencies in different management systems

Source: compiled by the authors based on the study by F. Mantino [7], J.A. Bardegue [13]

Management systems can be considered dynamic because they change over time. From this standpoint, there are two global factors of change: on the one hand, institutional and administrative reforms in different countries, on the other hand, the process of globalisation. “Local governments are becoming increasingly important in countries around the world: they are gaining more power and more financial independence, they are trying to gain more weight at the national level, and in some cases at the

international level. The processes of globalisation weaken national states, but strengthen the grassroots levels and their governments” [6]. In rural development, there are processes that characterise the current stage of globalisation: a) the development of technological and organisational abilities of food chains at the international level; b) the emergence of large pools of human and technological capital (China and India). These processes form a competitive challenge that is more pronounced in the field

of agriculture and national rural areas. This situation encourages the emergence of effective policy areas: this is a classic combination of horizontal policy areas developed at the national and regional levels and grass-roots policies resulting from cooperation between local actors and regional institutions.

It is appropriate to emphasise the importance of the principles of solidarity and decentralisation in the implementation of regional development and rapprochement policies, as well as rural development policies. This refers to a model that defines the institutional architecture of the EU. The model that the European Commission sees concerns determining the roles of the main institutional and socio-economic (partnership) actors in policy formulation and implementation [24].

The model includes the following principles:

- European Commission and national, regional, and local authorities define development priorities in a coordinated manner, which are provided with specific quantitative, verifiable goals;
- office is fully entrusted to member countries and regions, which should systematically send reports on the use of resources received from the EU;
- for transparency in the management of EU resources and compliance with EU regulations, member states and regions must be provided with adequate and effective management, monitoring, and control systems. In accordance with the principle of delegating management functions to member countries and regions, the European Commission plays a powerful role in the development of programmes and monitors the results of the implementation of the support programme at the stages of the management vertical [24].

The European Commission participates in the activities of supervisory committees, making critical comments, where necessary, on all aspects of programme management. Considering the operational level of coordination and management of territorial support measures, an important role is played by management bodies that are responsible for the effectiveness and regularity of management and implementation of support measures [7]. The management body is the support programme promotion centre: it evaluates the eligibility of all support applications, issues financial obligations, and makes payments to support recipients. From the standpoint of decentralised management of EU funds, a governing body should be provided for each form of support, whether it is an EU support programme, an operational programme, a single programming document, or an EU initiative programme. It associates itself with a body of public importance; a national or regional administration, if it refers to national projects/regional programmes, respectively.

In a decentralised system, the presence of the national administration in day-to-day management is significantly reduced (programmes are defined and adopted at the regional level) and concerns strategic planning, distribution of financial resources among lower levels. At the same time, general rules for preparing monitoring and evaluating results are also established (Fig. 1). The system is characterised by

both the leading role of the regional level and the possible integration of the middle and basic levels. In fact, in order for the system to qualify as decentralised with an insufficiently strong regional presence, a set of functions implemented at a lower level is required. That is why the selection of individual projects and decentralised financial management are key functions for checking the existence of effective decentralisation at the level of grassroots partnerships [17]. Another fundamental feature of decentralised systems is the presence of a large number of institutions, associations, and various types of institutions, which makes it necessary to coordinate at several levels, including at the local level.

Decentralised management implies management that is transferred to regions and local self-government [7]. Under a centralised system, most of the management functions are transferred to the national authorities (Fig. 1). The selection of local partnerships or the selection of individual projects at the grass-roots level is the responsibility of national bodies or regional institutions, which are subordinate to the national level. Coordination problems arise at the national level between different departments of the national administration [14]. In fact, the regional level influences the determination of the degree of decentralisation, but to understand the idea of local governance, what is crucial is not who manages policy from above (both at the state and regional levels), but how local or intermediate levels affect bottom-up governance.

Member states develop their regional rural development programmes (RRDP), which include pan-European priorities in this area: promoting knowledge transfer and innovation in agriculture and forestry in rural regions; improving the competitiveness of all agricultural sectors, stimulating generational change in agricultural enterprises, and promoting innovative agricultural methods, sustainable forest management; promoting food chain organisation, risk management in agriculture; restoration, conservation and improvement of ecosystems dependent on agriculture and forestry; promoting efficient use of resources and supporting the transition to a low-carbon and climate-resistant economy; promoting social integration, rural economic development, and combating poverty [16].

For the period 2014-2020, the European Commission approved 118 programmes from 28 countries in various areas of rural development. These programmes are designed based on the needs of the territories, and within their framework, EU member states set quantitative indicators for achieving their goals. The amount of funding is determined considering the fact that 30% of the funds of all programmes should be directed to environmental protection [24].

As part of further research, the study will consider the classification of different countries based on the distribution of responsibility for programme management.

- countries with centralised management – countries where there is a national level of programme development and management (Ministry of Agrarian Policy and Food of Ukraine);

- countries with decentralised management – countries where regional or other subnational authorities are responsible for programmes. The transfer of authority takes place from above, at the national level, even before the start of the programme development stage;

- countries with mixed management – countries where management responsibility and financial resources are distributed between national and regional levels for one specific programme. Considering the three types of programmes, it is possible to formulate different guidelines.

As for the EU RRDP, there is a clear heterogeneity: more than 40% of resources are distributed through a centralised management system. This figure covers more than half of all resources, if mixed management programmes are also taken into account. The centralised management model dominates the European rural development policy [22]. This includes northern European countries: such as Denmark, Sweden, Ireland, the Netherlands, Luxembourg, Austria, and a country with a centralised management system in Europe – France. Of the southern European countries, Greece is the only country that falls into the category of countries with a centralised governance model. In all these countries, measures to support rural development are managed from the centre, although with the involvement of local authorities, as is the case in the Netherlands, where provinces are given a place in choosing the area of public funding. This does not exclude the fact that the overall priorities, the choice of measures and their financial structure are established by the central body that manages the agricultural policy and rural development of the country.

The decentralised model is used in countries with a predominant institutional structure (with low financial security indicators) with strong regional powers both in the federal administrative system (in Germany) and as a result of the transfer of the full powers and functions of the agricultural sector from the national level to the regional level (in Italy) [4]. Germany and Italy are two countries where the RRDP programming and management process is fully delegated to the regions, and the role of joint leadership and coordination remains with the central government [14].

Special attention should be paid to the United Kingdom, which does not have a single development plan, but consists of four historical provinces: Northern Ireland, Wales, Scotland, and England. At the same time, it is impossible to talk about a completely centralised model, because here decentralisation concerns only the first three provinces, both through the transfer of existing powers and through the size of the provinces themselves, which are approaching the largest regions of Italy. England is close in its characteristics to a large European country. Between these two alternative models are Spain, Portugal, Finland, and Belgium, which occupy an

intermediate position in the classification, since they simultaneously represent the characteristics of national and regional governance. This choice is based on the criterion of distribution of tasks and resources between the state and regions. The state has secured some regulatory measures, believing that these measures (measures to support unfavourable areas) can be better managed at the national rather than regional level [7]. The following factors indicate different benchmarks and a return to a centralised model for measures to support rural development in Europe.

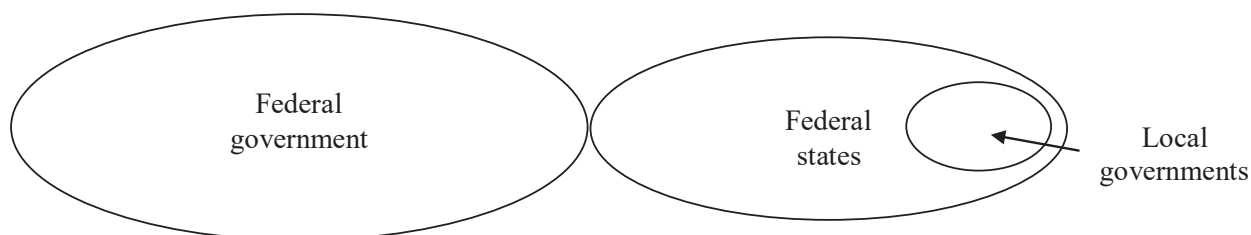
Firstly, the traditions of administrative management and institutional mechanisms that have developed in different countries determine the choice in delegating authority to directly manage the programme. Germany, with its strong federal structure, on the one hand, and France, with its traditionally centralised government structure, on the other, are two extreme cases of the European approach. Other countries are located between these extreme margins.

Secondly, there is a characteristic antithesis between centralised and decentralised models. This contrast follows from the belief that if decentralisation means higher efficiency in implementing rural development policies, then the centralised model corresponds to higher efficiency in spending funds by meeting the deadlines for implementing support programmes and achieving savings on the scale of administrative management [17]. On the other hand, the centralised model simplifies administrative management and programme development phases, because it reduces the number of subjects involved in the process, the time of negotiations, and the number of programmes developed at the output. These reasons, which help explain the growing interest in the centralised model, include penalty mechanisms for programmes that are inefficiently spent.

The third factor explaining the tendency to maintain centralised governance was the guarantees of greater effectiveness of policies that are not regional, but supranational in nature, for which regional governance may be too narrow and therefore incompatible with the goals it pursues.

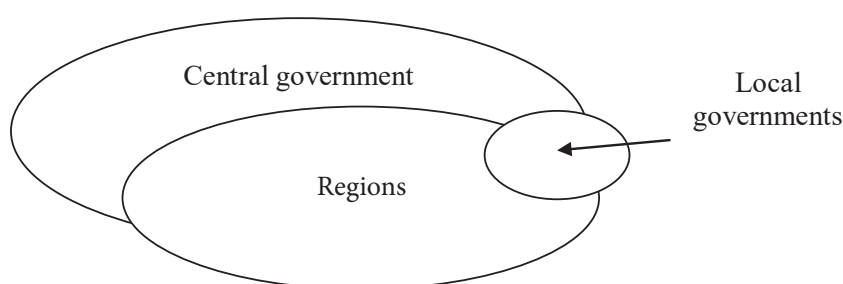
As mentioned above, rural development policy management models in Europe vary. Germany and Italy have the most complex models in Europe, which are characterised by a very strong territorial division of powers and functions [19]. Given that Germany has introduced a federal system of government, the two countries have a lot in common in everything else: a) they have implemented the decentralisation of legislative and administrative functions based on regions (21 regions and autonomous provinces in Italy, 16 lands in Germany); b) both countries have a strong push for decentralisation processes; c) relations between different levels of government are based mainly on a multipolar system or cooperation [4]. The forms of relationships between different levels of government are shown in Figure 2.

A. Bipolar or dual system (classical federalism)



- Division of competences between the federal government and the governments of the federal states
- Local governments subordinate to the federal states

B. Multipolar or cooperative system



- Many levels of government perform a certain function on the same issue
- Each level has its own function and its own sphere of autonomy
- Each level of government has a direct relationship with another

Figure 2. Forms of relationships between different levels of government

Source: compiled by the authors based on the study by E.D. Markina and L.S. Markin [6]

Note the following differences between this model:

a) in the cooperative model, functions are divided in such a way that in relation to the same issues (environment, social services, etc.), different levels of government perform any function;

b) the policy is launched through the participation of several levels of government, each of which represents its own territorial interests;

c) for this reason, the cooperative model allows for duplication and provides tools to solve the problems associated with this duplication: the main mechanism is to coordinate the main steps between the state and the regions and, to a certain extent, with local authorities;

d) the formulation of the national policy is the subject of constant negotiations between different levels of government. This mechanism is formalised through conferences that involve the subjects of

relations (the state, regions, and local self-government bodies) [7].

The cooperative model was developed in Germany, Italy, and France. However, the main problem of the cooperative management model is the low efficiency of decision-making. Indeed, the need to reach an agreement between different levels of government can significantly slow down the decision-making process and delay the introduction of innovations. At the same time, the existence of a model of cooperative relations shifts the decision-making centre towards the periphery. This is positive for improving the decision-making process in a situation of internal heterogeneity of individual countries, but it can negatively affect, devalue the possibilities of centralised coordination, and lead to fragmentation of policy directions. Figure 3 shows the procedure for the functioning of the rural development programming system in Germany.

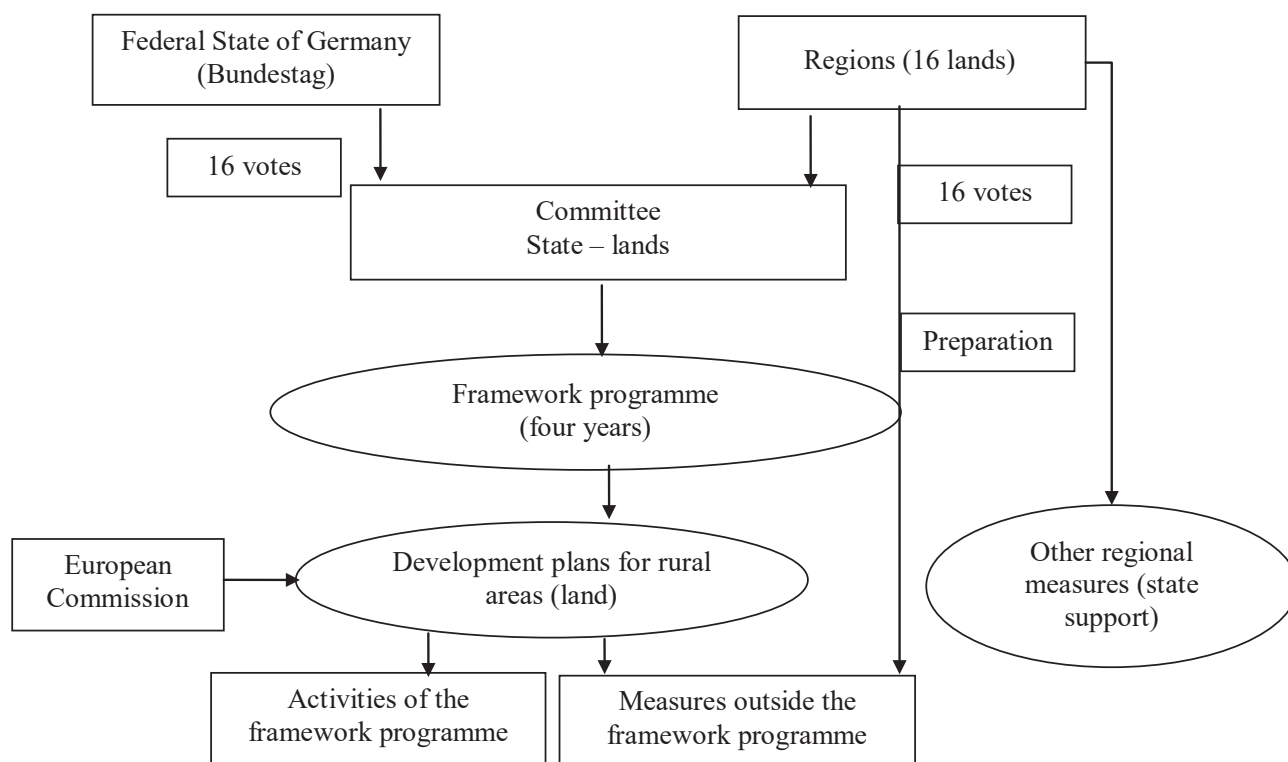


Figure 3. Functioning of the rural development programming system in Germany

Source: improved by the authors based on the study by N. Ward, P. Lowe and J. Murdoch [14]

Given the federal structure of the German administrative system, regional development programmes are prepared and managed only at the individual land level. Individual regional programmes should be comparable to the framework programme developed at the federal level by the relevant committee, which includes representatives of the federal state and lands on equal terms. The committee is the main place for coordinating agricultural policy in Germany and at the same time, the main place where the federal government provides guidelines for the RRDP. Currently, the framework programme individualises the priorities of classical structural policy (sales structures, forest plantations, and improvement of the structure of agricultural enterprises). Through the framework programme, the federal government guarantees national co-financing of these areas of structural reform in the form of 60% (the remaining 40% of funds are allocated to land). For all measures related to the diversification of the rural economy and improving the quality of life, with the exception of measures related to the restoration of rural villages, the costs lie entirely on federal states. It follows that in a situation of lack of national and regional financial resources (due to internal budget constraints), the lands prefer to choose those support measures for which there is co-financing with national funds, namely towards measures to support agricultural enterprises.

This mechanism of joint decision-making and

co-financing leads to the formulation of policies aimed mainly at supporting the agricultural sector. These results are caused by land governments, and they show up so strongly that they reduce the federal government's ability to make decisions about the allocation of financial resources.

In addition to joint programmes, each EU member state has its own rural development programmes (RDP). These programmes consider the specific needs of each territory and contain quantitative and economic indicators for achieving the development goals of their district. At the same time, each EU member state has chosen for itself the main activities offered by the EAFRD list, considering the funds required for each area. Each state in the RDP has its own strategy for rural development, which is implemented based on the SWOT analysis [23].

In the EU countries, forms of multi-level governance developed and enriched over time, until they became one of the key points in the functioning of rural development policies. The spread of local planning forms supported by the EU has gradually led to the emergence of partnership models (local partnerships, forms of joint actions of various kinds, project committees, etc.), which were aimed at bringing together operators who can thus participate in the development and even implementation of rural development strategies. Figure 4 presents the EU policy on rural development for the period 2014-2020.

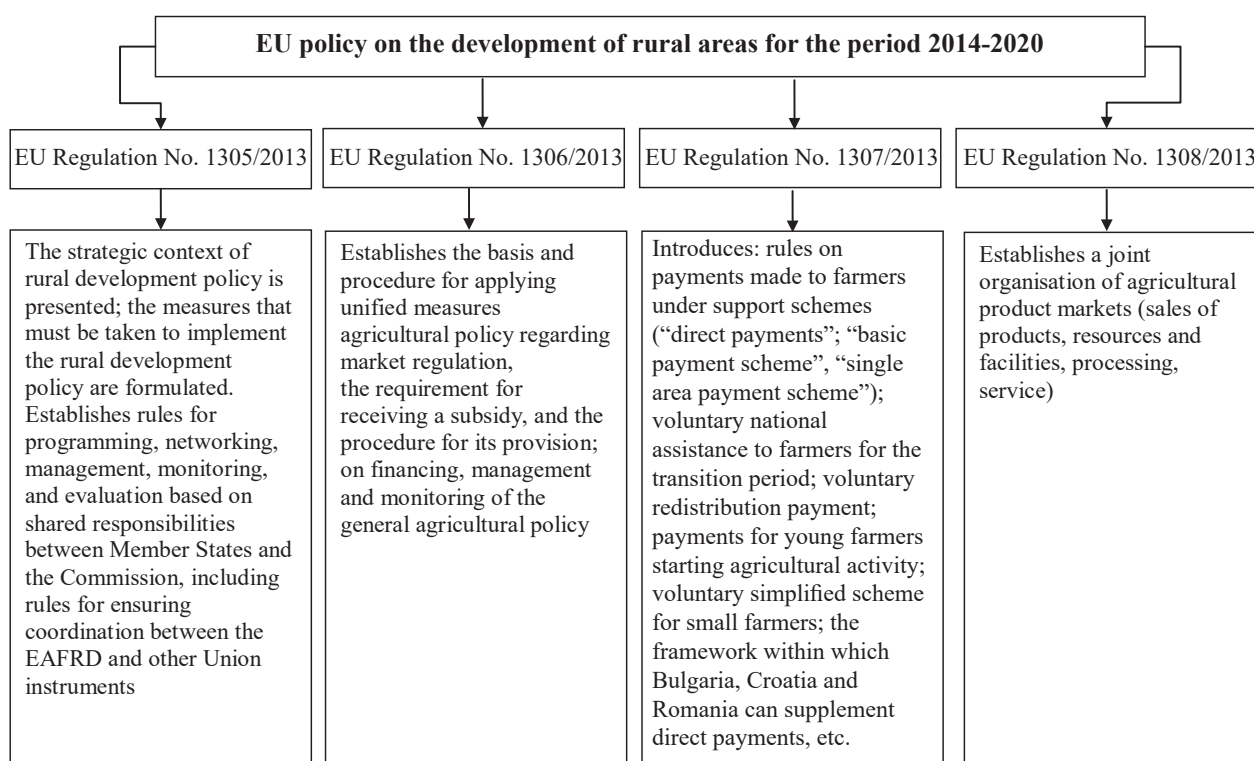


Figure 4. EU rural development policy for the period 2014-2020

Source: compiled by the authors based on [25-28]

The experience of the EU member states shows that the effective development of industrial and social processes in rural areas depends mainly on vertical cooperation.

On December 2, 2021, the agreement on the reform of the Common Agricultural Policy (CAP) was officially adopted. The new law, which is due to come into force in 2023, paves the way for a fair, environmental and efficiency-oriented CAP. Its purpose is to ensure a sustainable future for European farmers, provide targeted support to small farms, and provide EU countries with greater flexibility to adapt measures to local conditions. Agriculture and rural areas are central to the European Green Deal, and the new CAP will be a key tool in achieving the goals of the farm-to-table strategy and biodiversity conservation strategies [24].

For the period 2023-2027, the CAP will be built around ten key goals. Focused on social, environmental, and economic goals, these goals will form the basis for EU countries to develop their CAP strategic plans. The goals are: to ensure fair profits for farmers; to increase competitiveness; to improve the position of farmers in the food chain; to act on climate change; to care for the environment; to preserve landscapes and biodiversity; to support generational renewal; to revitalise rural areas; to protect food quality and health; to encourage knowledge and innovation.

Therefore, rural development programmes in the EU focus on supporting agriculture and forestry

in general, developing farms and entrepreneurship in rural areas, supporting young farmers, developing non-agricultural activities and services, managing investments in architecture, culture, nature protection, landscape, environmental management, and other areas.

► Conclusions

The study found that the European context is characterised by heterogeneous approaches to the issue of rural development. This heterogeneity is conditioned by the following factors: 1) differences in the structure and mechanism of functioning of the agricultural sector, and in the level of competitiveness of various rural areas not only in individual countries, but also in individual regions; 2) differences in the institutional structure, in particular: in the distribution of powers between the central government, regions, and local self-government, in the relationships between them in the development and implementation of policies; in the ability to direct, coordinate, and manage this policy at all levels; 3) differences in the essence and characteristics of decentralised levels (regions, local government, and self-government).

The development of the concept of stimulating the development of entrepreneurship in rural areas until 2030 and the adjustment in this regard of the provisions of the National Economic Strategy for the period up to 2030 determined the need to formulate conceptual approaches that can be used

as their basis. The European experience of rural development convincingly shows that complex and painstaking work is required to form human and social capital that can mobilise the inclusion of resource potential in the process of rural development based on the principles of partnership, other institutions of self-development, and “rural networks”. The bottom-up movement with top-down financial, informational, and institutional support can fundamentally change the socio-economic situation in rural areas.

A comparison of institutional models of rural area management in the EU and Ukraine allows reveals that: the mechanism of institutional management of integrated rural development includes systematised measures (legislative, organisational, economic) aimed at improving the quality of life and rural areas; in the EU, institutional models of rural area management are implemented considering federal programmes that are implemented quite actively.

It is motivated that in Ukraine an important point is to expand the list of programme activities that should be financed from the state budget, so that regional authorities can choose them considering the characteristics of rural areas of a particular subject of the state; it is advisable to use the best experience of individual EU countries in drawing up forecasts of rural development in the creation of rural development programmes in Ukraine, which would allow combining an administrative approach (top-down) with a subsidiary (bottom-top). As a result, the creation of rural development programmes will be integrated into a single system, and this will avoid duplication of activities carried out in rural areas; institutional models of effective rural development require a new, post-industrial understanding of innovation and economic activity. The experience of these models can be borrowed from the Scandinavian countries, which are similar in natural and climatic conditions to some rural areas of Ukraine.

► References

- [1] Biczkowski, M., Jezierska-Thöle, A., & Rudnicki, R. (2021). The impact of RDP measures on the diversification of agriculture and rural development – seeking additional livelihoods: The case of Poland. *Agriculture*, 11(3), article number 253. doi: 10.3390/agriculture11030253.
- [2] Cowie, P., Townsend, L., & Salemin, K. (2020). Smart rural futures: Will rural areas be left behind in the 4th industrial revolution? *Journal of rural studies*, 79, 169-176. doi: 10.1016/j.jrurstud.2020.08.042.
- [3] Reznikova, N., Bulatova, O., Yatsenko, O., & Ivashchenko, O. (2022). Fiscal instruments of regulatory competition in the face of challenges to macroeconomic stability during a pandemic COVID-19. *Economics of Development*, 21(2), 35-41. doi: 10.57111/econ.21(2).2022.35-41.
- [4] Keim-Klärner, S., Bernard, J., Bischof, S., Van Dülmen, C., Klärner, A., & Steinführer, A. (2021). Analyzing social disadvantage in rural peripheries in Czechia and Eastern Germany: Conceptual model and study design. *Thünen Working Papers*, 170. doi: 10.3220/WP1614067689000.
- [5] Zhang, X., & Zhang, Z. (2020). How do smart villages become a way to achieve sustainable development in rural areas? Smart village planning and practices in China. *Sustainability*, 12(24), article number 10510. doi: 10.3390/su122410510.
- [6] Markina, E.D., & Markin, L.S. (2019). Analysis of rural area management models in the economies of the European Union and the USA. *Economics and Ecology of Territorial Entities*, 3(4), 27-41. doi: 10.23948/2413-1474-2019-3-4-27-41.
- [7] Mantino, F. (2010). *Rural development in Europe: Policies, institutions, and local actors from the 1970s to the present*. Rome: FAO; Milano: Business Media of the Sole 24 Ore.
- [8] Lupenko, Yu.O., Andros, S.V., Tulush, L.D., Lupenko, Yu.O., Andros, S.V. (Eds.). (2020). *Microfinancing of agricultural production*. Kyiv: National Research Center “Institute of Agrarian Economy”.
- [9] Lupenko, Yu.O., & Gutorov, A.O. (2021). *Methodological recommendations for assessing the level of inclusive development of rural society and rural territories*. Kyiv: National Scientific Center “Institute of Agrarian Economy”.
- [10] Gadzalo, Y.M., Zhuk, V.M., Mogylova, M.M., & Gadzalo, Y.M. (Eds.). (2019). *Scientific foundations and strategic priorities of sustainable development of rural areas of Ukraine*. Kyiv: National Scientific Center “Institute of Agrarian Economy”.
- [11] Lupenko, Yu.O., Malik, M.Y., Bulavka, O.G., & Lupenko, Yu.O. (Eds.). (2019). *Strategic directions of sustainable development of rural areas for the period until 2030*. Kyiv: National Scientific Center “Institute of Agrarian Economy”.
- [12] Gorton, M., & Davidova, S. (2004). Farm productivity and efficiency in CEE applicants’ countries: A synthesis of results. *Agricultural Economics*, 30(1), 1-16. doi: 10.1016/j.agecon.2002.09.002.
- [13] Bardegue, J.A., Rosada, T., Bebbington, A.J., Currie-Alder, B., Kanbur, R., Malone, D., & Medhora, R. (Eds.). (2014). *The rural transformation. International development: Ideas, experience, and prospects*. Oxford: Oxford University Press.
- [14] Bukhtiyarova, T.Y., & Demyanov, D.G. (2019). A new model of management in the economic space of rural territories: Theory and research methodology. *Society and Power*, 80(6), 87-98. doi: 10.22394/1996-0522-2019-6-87-98.
- [15] Banks, J., & Marsden, T. (2000). Integrating agri-environment policy, farming systems and rural development: Tir cymen in Wales. *Sociologia Ruralis*, 40(4), 466-438. doi: 10.1111/1467-9523.00161.
- [16] Bardhan, P. (2002). Decentralization of governance and development. *Journal of Economic Perspectives*, 16(4), 185-205. doi: 10.1257/089533002320951037.
- [17] Ward, N., Atterton, J., Kim, T.Y., Lowe, P., Phillipson, J., & Thompson, N. (2005). Universities, the knowledge economy and “neo-endogenous rural development”. *Centre for Rural Economy Discussion Paper Series*, 1, 1-15. Retrieved from <https://www.ncl.ac.uk/media/wwwnclacuk/centreforruraleconomy/files/discussion-paper-01.pdf>.
- [18] Ward, N., Lowe, P., Murdoch, J., Van der Ploeg, J.D., & Van Dijk, G. (Eds.). (1995). Beyond endogenous and exogenous models: Networks in rural development. In *Beyond modernization: The impact of endogenous rural development* (pp. 87-105). Assen: Van Gorcum.

- [19] Mantino, F. (2013). La riforma delle politiche di sviluppo rurale 2014-2020. *Rivista. Agiregioni Europa*, 9(35). Retrieved from <https://agiregionieuropa.univpm.it/it/content/article/31/35/la-riforma-delle-politiche-di-sviluppo-rurale-2014-2020>.
- [21] Murdoch, J., & Pratt, A.C. (1993). Rural studies, modernism, postmodernism and the post-rural. *Journal of Rural Studies*, 9(4), 411-427. doi: 10.1016/0743-0167(93)90053-M.
- [22] Buitenhuis, Y., Candel, J., Feindt, P.H., Termeer, K., Mathijs, E., Bardaji, I., Black, J., Martikainen, A., Moeyersons, M., Sorrentino, A. (2020). Improving the resilience-enabling capacity of the common agricultural policy: Policy recommendations for more resilient EU farming systems. *Eurochoices*, 19(2), 63-71. doi: 10.1111/1746-692X.12286.
- [23] Kononenko, L., Atamas, O., Nazarova, H., Selishcheva, Ye., & Kononenko, S. (2022). Optimization of small agricultural producer's taxation by creating innovative-integrated structure. *Scientific Horizons*, 25(6), 100-110. doi: 10.48077/scihor.25(6).2022.100-110.
- [24] Common Agricultural Policy. (2022). *The new common agricultural policy: 2023-27*. Retrieved from https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/new-cap-2023-27_en.
- [25] Regulation (EU) of the European Parliament and of the Council No. 1305/2013 "On Support for the Development of Rural Areas from the European Agricultural Fund for Rural Development (EAFRD) and Repealing Regulation (EC) No. 1698/2005 of the Council" (2013, December). Retrieved from <http://data.europa.eu/eli/reg/2013/1305/oj>.
- [26] Regulation (EU) of the European Parliament and of the Council No. 1306/2013 "On the Financing, Management and Monitoring of the Common Agricultural Policy and Repealing Council Regulations (EEC) No. 352/78, (EC) No. 165/94, (EC) No. 2799/98, (EC) No. 814/2000, (EC) No. 1290/2005 and (EC) No. 485/2008. (2013, December). Retrieved from <http://data.europa.eu/eli/reg/2013/1306/oj>.
- [27] Regulation (EC) of the European Parliament and of the Council No 1307/2013 "Laying Down Rules for Direct Payments to Farmers Under Support Schemes Under the Common Agricultural Policy and Repealing Council Regulation (EC) No. 637/2008 and Council Regulation (EC) No. 73/2009. (2013, December). Retrieved from https://zakon.rada.gov.ua/laws/show/984_023-13#n799.
- [28] Regulation (EU) of the European Parliament and of the Council No 1308/2013 "Establishing a Common Organization of the Markets in Agricultural Products and Repealing Council Regulations (EEC) No. 922/72, (EEC) No. 234/79, (EC) No. 1037/2001 and (EC) No. 1234/2007". (2013, December). Retrieved from <http://data.europa.eu/eli/reg/2013/1308/oj>.

Інституційні моделі управління розвитком сільських територій в економіці країн Європейського Союзу: специфіка, пріоритети, інструменти

Світлана Вікторівна Андрос, Андрій Миколайович Білоченко

Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна

► **Анотація.** Актуальність статті полягає у необхідності створення ефективної моделі діючого інституційного середовища, здатного забезпечити єдність економічних процесів в управлінні сільськими територіями в Україні на основі кращої зарубіжної практики. Мета – узагальнення досвіду країн Європейського Союзу щодо функціонування інституційних моделей управління розвитком сільських територій для адаптації в Україні. Завдання – сформулювати концептуальні підходи до формування інституційної моделі управління розвитком сільських територій в Україні з урахуванням принципових засад побудови системи управління сільським розвитком у країнах ЄС. Як інструмент отримання інформації для обґрунтованого прийняття управлінських рішень у сфері управління розвитком сільських територій застосовувалися загальнонаукові методи дослідження: аналіз та синтез; індукція, дедукція та аналогія; абстрагування; узагальнення; ідеалізація та ін. Розглядаються основні тенденції та пріоритети сільськогосподарської політики, що здійснюється Європейським Союзом. Описано централізовані та децентралізовані системи управління сільським розвитком. Представлено неоднорідні (гетерогенні) моделі управління між централізацією та децентралізацією. Обґрунтовано багаторівневий характер концепції управління як ключовий специфічний компонент. Розглянуто функціонування системи розподілу завдань між Єврокомісією, національною державою та регіонами. Удосконалено моделі розподілу компетенцій програмування та управління у різних системах управління. Удосконалено форми взаємовідносин між різними рівнями влади. Представлено порядок функціонування системи програмування сільського розвитку у Німеччині. Розглянуто класифікацію різних країн на основі розподілу відповідальності за управління програмами, які призначалися для розвитку сільських територій. Проаналізована вертикальна координація та відносини держави та регіонів у країнах з децентралізованою формою управління. Запропоновано методичні підходи до розробки інституційної моделі управління розвитком сільських територій. Практична значущість статті полягає у розробці рекомендацій, які забезпечують підвищення ефективності та узгодженості управлінських рішень щодо формування інституційної моделі управління розвитком сільських територій в економіці України

► **Ключові слова:** Єврокомісія, програми, рівні управління, сільськогосподарська політика, централізація та децентралізація, фінансування



UDC 338.43:631.1:332.1

State Support for the Agricultural Sector in the Context of Inclusive Rural Development

Oksana Rykovska*

Institute for Economics and Forecasting National Academy of Sciences of Ukraine
01011, 26 Panas Myrnyi Str., Kyiv, Ukraine

► **Abstract.** The agrarian sector as a system-forming sphere of the rural economy becomes decisive for rural development based on inclusiveness. The influence of the state on the development of the sector by means of financial support should not only contribute to strengthening the production capacity and competitive advantages of commodity producers, but also have a positive impact on the development of rural areas and increase the opportunities for attracting the population to public life. These tasks are being updated in the context of a long-term budget deficit, in particular, aggravated by the conduct of military operations and the need to direct public funds in areas with the greatest multiplicative effect. The purpose of the study is to investigate the impact of state financial support for the agricultural sector on rural development from the standpoint of compliance with the principles of sustainability and ensuring the inclusivity of socio-economic development. To achieve this goal, the study used: general logical methods of analysis and synthesis in the development of laws regulating the system of state support in Ukraine; statistical and economic methods for grouping recipients of state support by different statuses, programmes, areas; methods of mathematical analysis to assess the dynamics of indicators and identify patterns of distribution of support funds, calculating the dependence of budgets of territorial communities on agricultural production. Tabular and graphical methods were used to visualise the results of the study. The abstract and logical method was used to generalise conclusions and formulate proposals. Based on the study results, including the analysis of the agricultural companies that received the most financial support from the state in three years, the public irrationality of the existing distribution of state support is substantiated, which leads to an increase in the gap between the production capacities of farmers, strengthening the uneven development of the agricultural sector and rural areas as a whole. The implemented improvement of legislative norms is not reflected in the practical plane, so the trend of asymmetric distribution of funds in favour of large businesses remains. The study argues for the need to introduce a number of changes in the system of distribution and use of state financial support for the agricultural sector, concerning regulatory support and control over its implementation, strengthening requirements for recipients of funds in terms of economic and social responsibility to promote rural development based on the principles of inclusivity. One of the conditions for all programmes funded by the state should be the prioritisation of achieving a social effect and maintaining sustainable development. Taking into account the proposed changes would help to preserve the multi-complexity of agriculture and the sustainability of food systems, expand the circle of recipients of support and strengthen the financial stability of small producers, increase revenues to local budgets, and increase the efficiency of using public finances in terms of their public function, achievement of a synergistic effect from the use of budget funds in the economic, social, and environmental spheres, establishment of sustainable foundations of rural development on an inclusive basis

► **Keywords:** agriculture, financial support, sustainable development, agricultural producers

► Introduction

Modernity needs a reorientation of societal development models, which until recently prioritised solely economic interests, towards the goal of sustainable, inclusive development in a balanced three-dimensional space: economic, social, and environmental. Public policies in any sector, especially through financial mechanisms, must be consistent with sustainable development commitments, with a focus on respect for human rights, ensuring access for all segments of the population to participate in

socio-economic life, and equitable distribution of public goods. State support for agriculture has a significant impact on achieving the goals of agricultural policy, so the issue of effective use of these funds is relevant and socially significant. The success of transformation for more than a third of the country's population will depend on how effective the support measures are in terms of meeting the public interest.

In most countries, agricultural production is supported by the state. These significant financial

► **Suggested Citation:** Rykovska, O. (2022). State support for the agricultural sector in the context of inclusive rural development. *Ekonomika APK*, 29(3), 62-72.

*Corresponding author

resources are used to stimulate agricultural production, maintain the competitiveness of commodity producers, and ensure food security. Historically, the policy of state support is updated during significant socio-economic transformations. In the United States, it began with the Great Depression, when nearly 20% of Americans lived in rural areas and received their livelihood directly or indirectly from agriculture. As a result, the first measures were aimed at maintaining raw material prices and incomes of rural households. In European countries, a powerful impetus for the development of support policies was the food shortage caused by the Second World War. And the original EU policy was aimed at ensuring the adequacy of domestic food supplies and supporting agricultural development. In the future, the goal of supporting each country was to increase the competitiveness of the industry and strengthen trade positions in the global liberalised market. An additional but equally important effect of support is the impact on rural development.

In the study "State support for the development of Ukrainian territories in 2019" conducted by the U-LEAD with Europe programme [1] financial support for agricultural producers is included in the area of "Rural development", which emphasises its social significance. Accordingly, it is necessary to investigate the effectiveness of state support not only in terms of changes in the profitability, price, and profitability of agriculture, but also to consider the social impact, in particular, compliance with sustainable management methods, social responsibility, rural development, reducing income polarisation, etc.

In Ukraine, most of the studies are devoted to the economic efficiency of state financial support and its impact on the development of domestic agriculture. At the same time, in different periods, in accordance with the current problems at that time, the areas of using budget funds, their compliance with the adopted development strategies and legislative innovations adapted to European conditions are analysed. Over the past 10 years, much attention has been paid by the global scientific community to developing areas for economic development based on the principles of inclusivity. Expanding opportunities to involve people in the processes of production, distribution, and income generation is becoming a fundamental policy framework in many countries.

Thus, *the purpose of the study* is to investigate the impact of state financial support for the agricultural sector on rural development from the standpoint of compliance with the principles of sustainability and ensuring the inclusivity of socio-economic development. To achieve this goal, the following scientific tasks will be solved: the channels of influence of agricultural activities on inclusive rural development are substantiated; legislative innovations in the field of state support for the agricultural sector from the standpoint of inclusivity are outlined; financial support for the agricultural sector for previous years is analysed; areas for improving the conditions for providing state support to promote rural development based on inclusivity are determined.

State support for the agricultural sector is a pressing issue for many Ukrainian researchers. The evolution of the establishment and gradual development of state support in Ukraine was studied by O. Borodina [2], B. Paskhaver [3], I. Tytarchuk [4] et al. A thorough investigation of the international experience of protectionist policy in relation to agriculture is presented in the monograph edited by O. Borodina [5]. Considering the evolutionary changes in the international practice of support by the authors' team, the conceptual foundations for the development of the system of state support for the agricultural sector of the Ukrainian economy in the context of globalisation are developed and a change in the focus of support towards promoting the development of small-scale production and improving the mechanisms and institutional environment for providing state assistance, in particular, for the development of rural areas, is proposed.

A broad discussion regarding the state support for the agricultural sector continued in Ukraine during the preparation for WTO membership (2008). Analysis of theoretical and applied aspects of state support for the agricultural sector in the context of compliance with the provisions of the agreement on agriculture, signed within the framework of the protocol on Ukraine's accession to the WTO, a clear distinction between measures of internal support for agriculture between those that do not affect the production and trade of agricultural products (measures of the "green box") and those that cause a distorting effect on trade (measures of the "yellow box"), the possibility of repurposing individual subsidies for permitted areas, determining the volume and modes of use of "boxes" became the main research topics of S. Kyryzyuk [6], Kobuta [7], M. Kropyvko [8], O. Mogylnyi [9], P. Gaidutskiy [10] and others.

The investigation of agricultural protectionism in the context of signing the association agreement between Ukraine and the EU and further harmonisation of Ukrainian and European legislation is given a prominent place in the studies by T. Zinchuk [11], I. Kobuta [12], T. Ostashko [13], A. Khodakivska [14], A. Zagurskiy [15], Y. Lupenko [16], A. Panuhnyk [17]. T. Zinchuk and O. Skidan, emphasising the advantages of financial support for farmers in the EU countries, note the presence of "the existing skew of the current mechanism for distributing direct payments, which does not contribute to the development of small farms and reduces their competitiveness", and emphasise the need to change the "design of direct payments in order to ensure greater efficiency and accessibility directly by farmers" [18, p. 113-125]. H. Hryhorieva [19], P. Kulnych [20], and O. Gafurova [21] have devoted their study to the problems of the legal provision of state support for agriculture.

Investigating the support of the agricultural sector as a state financial mechanism for improving the efficiency of agricultural production, researchers focus on the fairness of its distribution, restrictions that exist for small producers, and preferences that large agricultural enterprises have [22]. Based on the experience of some European countries, for example, Germany, where there is no support for large

agricultural producers at all (there is a principle: higher profits – higher taxes), and the regulations of the CAP EU (Common Agricultural Policy of the EU) on the introduction of additional social and environmental requirements for profitable enterprises to receive state assistance [23], Ukrainian researchers suggest improving the regulatory requirements for providing and receiving support, considering aspects of fair distribution of funds between different groups of producers.

Together with a thorough investigation of various aspects of supporting the agricultural sector, especially its economic feasibility, the issues of the general efficiency of public funds allocated to support the agricultural sector remain rather understudied. In the context of a long-term budget deficit, in particular, aggravated by the conduct of military operations, the effect of using public funds should be multiplicative, and one of its mandatory manifestations should be the promotion of inclusive development of rural communities. This paper is aimed at investigating this particular aspect.

► Materials and Methods

The methodological basis of the research is theoretical generalisations and substantiation of the role of agriculture in rural development on an inclusive basis. Systematisation of direct channels of influence of agricultural activities on inclusive development allowed forming a system of indicators for operational monitoring and forecasting of prospects for increasing inclusion in social development. Using general methods of analysis and synthesis in the development of laws and regulations that directly regulate the system of state support in Ukraine, it is specified that non-compliance with legislative norms has a multi-vector negative impact and violates the establishment of sustainable development conditions based on inclusivity.

Empirical research was conducted based on the data of the “Report on recipients of state support in the agricultural sector for 2019-2021”, published by the Ministry of Agrarian Policy and Food of Ukraine. Using the statistical and economic method, recipients of state support were grouped by different statuses, programmes, and areas; analytical data on the dynamics of indicators were processed and patterns of distribution of support funds were identified. Agricultural dependence of the budgets of territorial communities was determined based on data from the state web portal of the budget for citizens [24]. Using mathematical analysis methods, the share of taxes in the budget revenues of territorial communities, which depends on agricultural production, was calculated.

The information base of the study is formed based on publicly available statistical data of the

state statistics service of Ukraine, reports of the Ministry of Agrarian Policy and Food of Ukraine, web portals of territorial communities, and Internet resources with information about these producers of agricultural products. The location of production facilities and the main activities of agricultural producers were determined based on open data from the counterparty verification service YouControl [25]. To form a sample of subsidised budgets of territorial communities, data from the analytical portal of community capacity were used [26].

Tabular and graphical methods were used to visualise the results of the study. The abstract and logical method was used to generalise conclusions and formulate proposals.

► Results and Discussion

The development of communities, especially those dominated by rural settlements, is significantly dependent on agriculture. The agricultural sector prevails in the rural labour market and provides employment for 38% of the employed population. Although 2/3 of these farmers work informally, they receive income from agricultural activities [27]. In total, almost 4.0 million household farms [28], which is more than 80% of their total number, produce agricultural products for their own consumption and for sale, and their well-being depends to a greater or lesser extent on agriculture. Agricultural activities have a significant impact on the budgets of territorial communities. In 2021, a third of local budget tax revenues were generated by agricultural production. Payment for land (land tax and rent from individuals and legal entities), a single tax from agricultural producers, and personal income tax on income from renting out land in the budgets of some rural communities reached more than 50% of tax revenues. Among the most agrarian-dependent communities are Horodkivska rural community of the Vinnytsia Oblast, whose budget tax revenues are 50% dependent on agriculture; Mykhaylivska rural community of the Poltava Oblast – 56%; Blahodatnenska rural community of the Mykolaiv Oblast – 58.9%; Kochubeyivska rural community of the Kherson Oblast – 62%; Ulanivska rural community of the Vinnytsia Oblast – 62.2%; Krasnopilska rural community of the Zhytomyr Oblast – 65.5%, and others [24].

Thus, the agricultural sector as a system-forming sphere of the rural economy and social development of communities becomes one of the main economic factors of inclusive rural development. Ensuring productive employment and income of the rural population, and forming the revenue side of community budgets are direct channels for the impact of agricultural activities on inclusive rural development (Fig. 1).

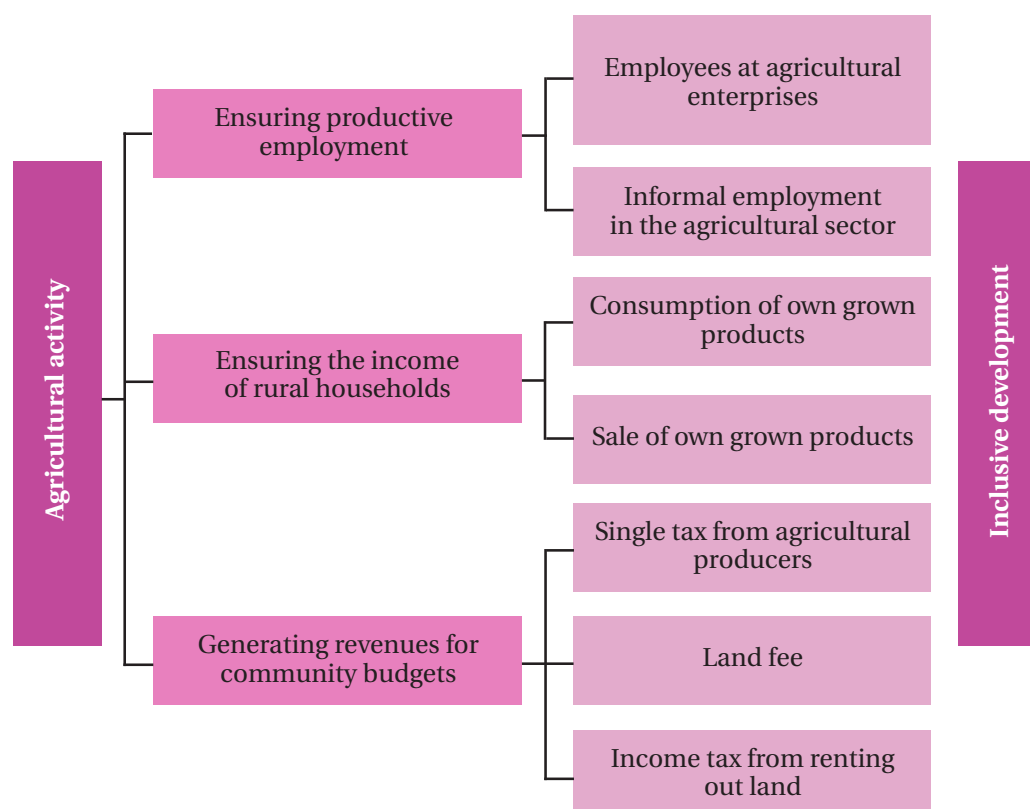


Figure 1. Channels of direct impact of agricultural activities on inclusive rural development

Source: compiled by the author

Changes in quantitative and qualitative indicators of certain factors, namely, an increase in the level of productive employment in the status of employees or self-employed persons, a decrease in informal employment, an increase in individual income from agricultural activities and tax revenues to the budget, will increase the well-being of the population, access to quality goods and services and, accordingly, will contribute to socio-economic development on an inclusive basis.

As noted above, agricultural production in the vast majority of countries, including developed ones, is supported by the state. Budget resources are spent to stimulate agricultural production, ensure food security, etc. The impact of support on rural development is evaluated separately. This study tests the

hypothesis as to what extent the existing state support for farmers in Ukraine contributes/hinders rural development on an inclusive basis. Financial support for the agricultural sector is one of the protectionist measures of the state. The level of agricultural protectionism depends on legally established norms and economic opportunities, and its course depends on established development priorities. The Law of Ukraine “On Amendments to the Budget Code of Ukraine” provides “to establish that in 2017-2021 the annual amount of funds from the national budget of Ukraine allocated for state support of agricultural producers is not less than 1% of output in agriculture” [29]. The actual volume of state support for farmers is significantly lower, and this trend has continued throughout the entire period of operation of the Law (Table 1).

Table 1. Regulatory and actual volumes of state support for the agricultural sector

	2017	2018	2019	2020	2021
Agricultural output, <i>million UAH</i> ¹	707,792	847,587	842,767	892,852	1,017,851,3*
State support for the agricultural sector, <i>billion UAH</i>	5,379.3 ²	4,237.0 ²	4,567.7 ³	4,031.4 ³	4,712.4 ³
Legally established support rate (1%), <i>billion UAH</i>	7,077.92	8,475.87	8,427.67	8,928.52	10,178.51
Compliance with the legal norm, %	76.0	50.0	54.2	45.2	46.3

Source:

¹Economic accounts of agriculture (production account and income generation account) [30]

²The Law of Ukraine “On the National Budget of Ukraine” for the corresponding years.

³Report on recipients of state support in the agricultural sector [31]

*Calculated data. In 2021, the index of agricultural products compared to 2020 was 114.4% (the volume of agricultural products in constant prices is used to calculate the index). Express issue of the State Statistics Service of 01/18/2022 Agricultural output index in 2021 (preliminary data) [32]

In 2017, the volume of state support amounted to 76% of the norm established by law, and agricultural producers did not receive almost UAH 1.7 billion. In the future, despite the increase in gross agricultural output, support remained almost at the same level, and in 2020 its volume amounted to only 45.2% of the expected amount according to the norms. In other words, the legislative regulation of certain provisions does not guarantee the allocation of funds in full, which indicates the exclusive dependence of state financial support on the capabilities of the budget and the priorities of the authorities. Restrictions on public financial resources increase competition in access to support funds and increase attention to the effectiveness of their use. More powerful agricultural enterprises have advantages in the fight for limited finances, and thus insufficient funding to support the agricultural sector becomes the first factor in the exclusivity of various, including small, agricultural producers.

Another virtually unimplemented legislative initiative was amendments to the Law of Ukraine "On State Support for Agriculture of Ukraine" regarding new principles of state support, compliance with which should contribute to the preservation of multi-layered agriculture and the sustainability of food systems. In particular, the established principle of fairness should be ensured by the proportionality of the distribution of state support and limiting the maximum amount of support per producer of agricultural products, and the principle of "targeted area of state support – priority provision of state support to small farms, including family farms that own and/or use no more than 100 hectares of agricultural land" [33]. The adopted legislative innovations are not reflected in the practical plane. Neither the procedures for using support funds nor the passports of budget programmes set requirements for compliance with the implemented initiatives. Regulation of recipients of state support, considering preferences for small farms, would help to increase the level of inclusion [34]. Thus, failure to comply with the legally established norms on the volume of support and the principles of its distribution violates the establishment of the economic basis for Inclusive development.

Given that public finances, first of all, should ensure the fulfilment of national needs for socio-economic development, the allocation of sectoral and/or

industrial support should be accompanied by the establishment of clear requirements of a public nature. When allocating state allocations to support the agricultural sector, it is necessary to take into account a number of external effects, in particular the socio-economic impact on the development of communities where the main activities are carried out, the payment of taxes to both local and state budgets, job creation, compliance with environmental standards, etc.

According to the "Report on recipients of state support in the agricultural sector" in 2019-2021, the total amount of state support amounted to UAH 13.3 billion [31]. Its recipients were about 19 thousand agricultural producers. Among the main beneficiaries are powerful farms of the agricultural holding type; producers whose land bank is more than 1,000 hectares; farms that are registered in the register of large taxpayers, which, according to the norms of the tax code, include companies with an annual income of more than EUR 50 million or a total amount of annual contributions to the state budget of more than EUR 1.5 million [35]. But farms that cultivate land with an area of up to 50 hectares (their share is 47.3% of working farms [36, p. 164]), and households are almost deprived of the opportunity to use financial support from the state. Currently, there are no real preferences to support small agricultural producers, who most need additional financial resources.

According to the above-mentioned report, during the study period, individuals (households) received only 8.2% of the total amount of support [31]. In 2019, support was provided for the cultivation of young cattle, in 2020-2021 – in support of beekeeping (Table 2). In 2019, about 100.0 thousand recipients of the "subsidy for young animals" used state support. This is the largest number of individuals who received financial support during the period. In 2020-2021, beekeepers could receive a special budget subsidy for existing bee colonies. The number of recipients annually was about 5 thousand people [37]. Through the mechanism of additional payment of USC to members/heads of family farms, the state redistributed UAH 603.6 thousand. Considering that the minimum amount of USC for one person in 2021 was UAH 15,950, and the possible amount of additional payment by the state was 0.9 of the minimum insurance premium [38], the number of recipients of this type of support was less than 100 people.

Table 2. State support for households (individuals)

Year	Area of state support	Support amount, thousand UAH	Share in the total amount of support, %
2019	Special budget subsidy for raising young cattle	615,356.5	13.5
2020	Special budget subsidy for existing bee colonies	239,798.8	5.9
2021	Special budget subsidy for existing bee colonies	240,000.0	5.1

Source: Report on recipients of state support in the agricultural sector [31]

Financial support for households that produce agricultural products is an important factor in economic inclusion. These financial resources increase the production potential of small agricultural producers, contribute to the development of the local economy, and improve the well-being of the rural population. But given the number of recipients, such government support remains a scarce resource with limited impact on the inclusivity of rural development.

Among the recipients of state support in almost all of them are farms. This category of producers includes farms with 20 hectares of land, as well as with 5,000 hectares or more. Due to the lack of differentiation of farms by their size or volume of production/income, the principles of fair distribution of support funds and monitoring of their target direction are violated. As a result, farmers who produce high-margin cereals, oilseeds, and chicken receive high-value state support funds. But small farms rely exclusively on their own resources and ensure the production of

labour-intensive vegetables, fruits, berries, livestock products, etc. Without a clearly defined classification of farms and rationing of criteria for classifying them as large, medium, and small, state support will continue to finance profitable agricultural businesses.

The analysis of only the areas of state support indicates the preservation of preferences for large farmers. The largest amount, as in previous years, was allocated to support animal husbandry – UAH 5.1 billion (Fig. 2). In certain areas of the programme “State support for the livestock industry”, more than 2/3 of funds were received by corporate structures, in particular, for partial reimbursement of the cost of construction and reconstruction of livestock farms and complexes (28%), partial reimbursement of purchased breeding animals for further reproduction (19%), partial reimbursement of construction and reconstruction of grain storage and processing enterprises (15%). The corresponding activity is carried out only by large agricultural producers.

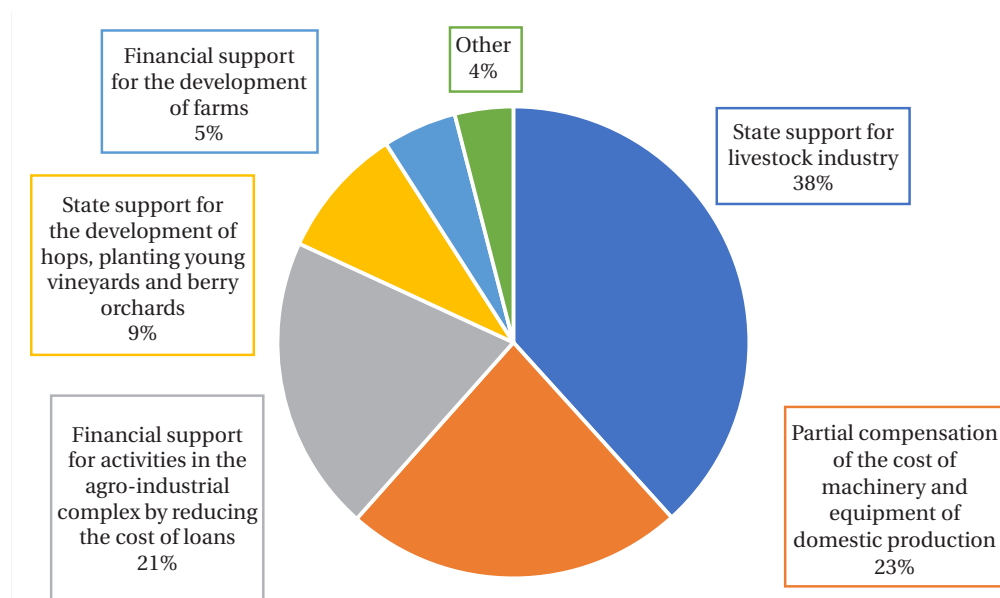


Figure 2. Distribution of state support in the agro-industrial complex during 2019-2021

Source: Report on recipients of state support in the agricultural sector [31]

The situation is similar in the areas of “Financing partial compensation for the cost of machinery and equipment of domestic production”, and “Financial support for activities in the agro-industrial complex by reducing the cost of loans”, for which UAH 3.1 billion and UAH 2.7 billion were allocated, respectively. Recipients of funds are mainly large farmers. The main limiting factors for attracting amalgamated communities and farmers to these programmes are: a large amount of collateral, which ranges from 150 to 300% of the loan amount; small management sizes (¾ of all farms have up to 100 hectares of agricultural land in their land use); insufficient level of documented financial turnover, etc. [22].

Only 5% (UAH 0.7 billion) of the total amount was allocated for financial support for the development

of farms. But even in this group of recipients, there are farms with hundreds of hectares of land, production volumes that allow forming batches of products for sale on the Electronic Grain Exchange, and the need for equipment worth hundreds of thousands of UAH.

As a result, in accordance with the directions of financial support and the use of funds, the individual sector, including small farms, potentially received about 15-20% of the total support. Despite the fact that its share in the production of agricultural products is 46% [36, p. 45]. The asymmetry of the distribution of support funds among recipients increases the polarisation of the production potential of farmers, eliminates the competitive advantages of small producers, and makes it impossible to develop

multi-layered agriculture. The long-standing disproportionality in the distribution of state support undermines the foundations for the formation of family management and the development of multiculturalism in rural areas. "The creeping process of latifundation and monopolism and displacement of small and medium-sized enterprises in the future threatens a complex of destructive consequences for rural areas" [39] and undermines the country's food security. State support for the agricultural sector does not promote inclusive development, but rather strengthens intersectoral (corporate vs individual) segregation.

A detailed analysis of recipients of state financial support for the agricultural sector (the top 30 recipients were determined annually) shows that about 20% of the total amount of funds allocated during 2019-2021 is used by a very limited, partially recurring circle of agricultural producers. Among the 66 leading companies, 6 companies received support annually, 9 more – twice during the period, the rest – used the state's financial resources for one year. According to the organisational and legal status of the leaders-recipients of support, only 7 farms (10%)

received state support, the rest were limited liability companies, private companies and joint-stock companies. The rating of recipients is headed by JV LLC "Niva Pereyaslavshchiny", which has obtained UAH 164 million of support in the "Partial reimbursement of the cost of production of livestock farms and complexes, milking parlours, agricultural processing enterprises". Another UAH 15.7 million was received in other areas. The company operates on more than 20.0 thousand hectares of agricultural land and is a vertically integrated business model that specialises in growing and storing grain, producing mixed feed, fattening pigs, meat processing, and selling products through its own retail network. Next in the rating is LLC "Vinnytsia Poultry Farm", which in the direction of "Partial reimbursement of the cost of production of livestock farms and complexes, milking parlours, enterprises for processing agricultural products" in 2019 received almost UAH 112 million of support; in 2020 – UAH 48.9 million. The company specialises in poultry breeding. Other agricultural companies that received more than UAH 50 million of state financial support during 2019-2021 are shown in the Table 3.

Table 3. Top 13 recipients of state support, 2019-2021

Rating	Company name	Main specialisation	Agricultural land under cultivation, <i>thsd ha</i>	Support amount, <i>UAH</i>	Registration in the Register of large taxpayers
	JV LLC "Niva Pereyaslavshchiny"	01.11	23.0	179,719,065.0	Yes
	LLC "Vinnytsia Poultry Farm"	01.47	0.1	164,942,219.0	Yes
	FG "Gadz"	01.24	0.670	135,763,163.0	No
	LLC "PK Dniprovskiy"	01.47	–	130,719,261.0	Periodically
	LLC "Buchachagrokhlibprom"	01.11	22.4	127,457,185.0	No
	LLC "Agrarian company 2004"	01.11	35.0	112,131,801.0	Periodically
	LLC "Intelko Agro"	01.11	94.1	101,867,151.0	Yes
	PRJSC "Malynove"	01.47	–	101,756,540.0	No
	AP NPP "Vizyt"	01.11	9.0	72,163,247.0	No
	LLC "Agrofirma Pischanska"	01.11	5.6	71,875,305.0	No
	LLC "Baryshivska grain company"	01.11	53.0	62,467,983.0	Periodically
	JLLC "Druzhba-Nova"	01.11	109.5	55,453,271.0	Yes
	LLC "Pyatidni"	01.11	15.9	50,000,000.0	No

Source: Report on recipients of state support in the agricultural sector [31]

Nine of thirteen companies specialise in the cultivation of cereals (except rice), legumes, and oilseeds, one – in the cultivation of pome and stone fruits, apples, pears, and seedlings, and the main activity of the rest is poultry breeding. In the cultivation of these agricultural companies specialising in crop production, there are from 20 to 100 thousand hectares of agricultural land. Half of the companies belong to vertically integrated business structures.

The companies JV LLC "Niva Pereyaslavshchiny", LLC "Vinnytsia Poultry Farm", LLC "PK Dniprovskiy", LLC "Enselko Agro", JV "Druzhba-Nova" are registered in the Register of large taxpayers. Two more companies – "Agrarian company 2004" and LLC "Baryshevska Grain Company", receiving state funds annually, were registered in the register for one year. Registration in the Register indicates large financial turnover, while due to gaps in the legislation, it does

not guarantee the payment of significant amounts of taxes. Some of the listed companies, in particular, those that specialise in poultry breeding, are registered as single tax payers of group 4 and pay a fixed amount, which depends on the regulatory and monetary assessment of agricultural land (in 2021, the average tax amount was UAH 1,320.0/month). Having significant assets, and receiving state support in the amount of more than UAH 50 million, companies pay symbolic taxes and receive super-profits, including at the expense of the state budget.

As noted above, the main specialisation of most top companies is crop production. The level of profitability of crop production in 2020 was 22.3 % (wheat – 33%, sunflower – 29%) [40]. Thus, the state finances a profitable agricultural business without any restrictions. Requirements for compliance with the principles of sustainable agricultural development. The current procedures for the use of funds, which determine the mechanism for providing state support and passports of budget programmes that predict the effective performance of programmes, are devoid of requirements and obligations of a social and environmental nature. In the context of limited fiscal capacity, agricultural policy should focus not on financing the development of large profitable agribusinesses, but on supporting multi-agriculturalism and achieving synergies between economic, social, and environmental budgetary resources.

Another fact points to the public irrationality of the existing distribution of state support funds. By supporting powerful agricultural enterprises, the state allegedly helps to increase export revenue and fill the budget. This allows for further redistribution of budget funds, including financing social programmes related to low incomes of the population. At the same time, the volume of payments for unemployment benefits, assistance to low-income families, the provision of benefits and subsidies to pay for housing and communal services, etc., can be significantly reduced by reducing the number of people in need of this assistance. Simplification of access and establishment of preferences for receiving direct support by small farms and rural farm-type households, of which, according to expert estimates, there are at least 600 thousand [22], would help strengthen the productive potential of farmers, increase their well-being and would have a multiplier effect in the field of rural development.

Agricultural production of companies is carried out in rural areas. The analysis of the impact of their production and financial activities on local budgets is assessed through the level of subsidisation of communities. Six communities where JV LLC “Niva Pereyaslavshchiny”, LLC “Vinnytsia Poultry Farm”, LLC “PK Dniprovskiy”, LLC “Entelko Agro”, LLC “Agrofirma Pischanska”, JV “Druzhba-Nova” are registered transfer a reverse subsidy to the state budget, which indicates a high level of financial viability of these communities, including due to the activities of agricultural producers. Three communities with four top agricultural companies registered receive a basic subsidy from the state budget. The most significant is the Trybukhivska rural territorial

community of the Ternopil Oblast with a population of 8.8 thousand people, on the territory of which FG “Gadz” and LLC “Buchachagrokhlibprom” are registered and operate. Receiving millions in state support annually, in particular in 2021 – almost UAH 100.0 million, payments of companies to the budget, for example, personal income tax, which is considered when calculating the volume of equalisation subsidies, were so small that they led to the need to receive UAH 5.875 million of the basic subsidy. This became possible both due to imperfect legislation on taxation of producers and opportunities for shadow businesses, and the lack of current monitoring of the use of funds, analysis of the real effectiveness of the use of public finances from the standpoint of their public function.

Given the difficult economic situation in the country, the budget deficit, the significant need for public finances and competition in their distribution, it is necessary to radically change the policy of state production support in the agricultural sector. All programmes funded by the state should be aimed at obtaining a public effect and take into account the inclusive aspect – justice in access, distribution, and quality. In order to reduce the economic polarisation of the production potential of farmers, aggravated, among other things, by state support, it is necessary to change the conditions for providing and controlling the use of public funds.

In order to balance the economic, social, and environmental components of development, rational use of public finances and achieve public interests, it is necessary to change the vector of state support for the agricultural sector in favour of small producers. Firstly, the share of state financial support provided to small producers and households should be clearly normalised. Distribution of support should be carried out according to the contribution of each sector to the total production. Households together with farms produce 46.1% of agricultural products, including 50.2% of livestock products and 44.9% of crop production. This proportion should at least be maintained in the distribution of financial support.

Secondly, all recipients of budget support should be transferred to the general tax system and it is necessary to set a minimum support threshold for using tax benefits.

Thirdly, recipients of support in the amount of more than UAH 10 million need to set a mandatory minimum number of jobs created.

Fourthly, recipients of support, the total amount of which for three years amounted to more than UAH 50 million, must finance the community development fund, where production activities are carried out, in the amount not lower than the basic equalisation grant of the corresponding community.

Continuing the search for effective means of supporting agricultural producers, the Ministry of Agrarian Policy in 2022 introduced a programme for providing microgrants for the development of horticulture (for planting and arranging a new garden, berry patch, vineyard). With 30% co-financing, farmers and sole proprietors can become recipients. An additional requirement is the return of 50% of the

grant to the budget in the form of taxes and fees for 5 years [41]. Another grant support will be co-financing the development of greenhouses. Both private entrepreneurs and agricultural companies or farms that own or lease land for a period of at least 25 years can become participants of the programme. Under the terms of this programme, recipients will be required to pay 50% of the grant amount in the form of taxes and fees for 3 years and employ more than 40 employees.

Given the complicated conditions for receiving such assistance and the financial “exsanguination” of farmers in wartime, the programme is unlikely to be too popular. According to the organiser of the agricultural cooperative “Victory Gardens” Lubomyr Gaidamaka, “for the construction of a greenhouse farm on 1.6 hectares of closed ground, at least UAH 14 million is needed (excluding the cost of land and communications). That is, the proposed UAH 7 million is only 50% of the cost of the complex. And the most unrealistic condition for fulfilment is the creation of 40 jobs, while a maximum of 18-20 workers are needed for a greenhouse complex on 2 hectares” [42]. Given that 50% of the grant amount will need to be returned in the form of taxes, this type of state support becomes practically a loan for producers, and not grant assistance. The proposals to improve state support clearly highlighted the points regarding the mandatory creation of new jobs and the elimination of tax benefits. But it is necessary to start implementing these initiatives carefully, based on thorough calculations, and, of course, not in wartime.

► Conclusions

The agricultural sector as a system-forming sphere of the rural economy is also becoming crucial for rural development based on the principles of inclusivity. The main channels of influence are the creation of opportunities for productive employment, income generation for the rural population, and the establishment of budget revenues for territorial communities. At the same time, the efficiency of agriculture in terms of its social significance largely depends on state regulation, including state support.

To achieve the main goal of state support, namely, stimulating agricultural production and ensuring food security, conditions, requirements, and areas of financing are constantly being improved. At the same time, the adopted legislative innovations regarding the minimum standards for the amount of support and improvement of principles in favour of fair distribution of funds and prioritisation of small producers were not reflected in the practical plane. At the same time, the trend of supporting large-scale production remains unchanged. Public finances in Ukraine are too expensive a resource, and the

distribution of funds should be aimed at obtaining a synergistic effect. In particular, state support for the agricultural sector should promote its development on the basis of sustainability in compliance with economic, social, and environmental requirements. Currently, there are no requirements for compliance with social and environmental standards in the procedures for using support funds that regulate the conditions for receiving budget funds.

According to the results of the analysis of recipients of state support for the period 2019-2021, it was found that 66 companies out of a total of 19 thousand recipients obtained about 20% of support. At the same time, these producers, taking advantage of legislative gaps, avoid fair taxes, work in the shadows, concentrate extra-large areas of agricultural land and receive super-profits at the expense of budget funds, etc. Other farmers do not have enough financial resources, which restricts access to new technologies and equipment and makes it impossible to increase productivity and competitiveness. The existing system of state support not only does not contribute to compliance with the principles of inclusion, but also performs exactly the opposite role. Due to state support, the gap between the production opportunities of farmers, the profitability of their management increases, and the uneven development of the agricultural sector and rural areas as a whole increases. Rural communities, having a very valuable potential for agricultural production, remain subsidised and limited in financial resources.

Most studies on state support for the agricultural sector are devoted to determining the economic effects for producers, analysing the impact of additional financing on increasing production and increasing economic profitability. The authors of this study focused on the issues of public efficiency of public funds allocated to support the agricultural sector. In the context of a long-term budget deficit, in particular, aggravated by the conduct of military operations, the effect of using public funds should be multiplicative, and one of its mandatory manifestations should be the promotion of inclusive development of rural communities.

The changes proposed based on the results of the study in the system of distribution and use of state support funds, improving the conditions for its provision will contribute to the preservation of multilateralism of agriculture and the sustainability of food systems, expanding the circle of recipients and strengthening the financial stability of small producers, increasing revenues to local budgets, improving the efficiency of the use of public finances in terms of their public function, the establishment of sustainable foundations for rural development on an inclusive basis.

► References

- [1] State support for the development of Ukrainian territories in 2019. (2019). Retrieved from https://decentralization.gov.ua/uploads/library/file/438/State_support_for_territorial_development_in_2019.pdf.
- [2] Borodina, O. (2006). State support for agriculture: Concept, mechanisms, efficiency. *Agricultural Economics*, 109-125.
- [3] Pashkaver, B. (2014). Agrarian reforms: History and modernity. *Economy of Ukraine*, 4, 94-96.

- [4] Tytarchuk, I. (2006). *State support of agriculture in terms of economy transformation of AIQ* (PhD. thesis, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine).
- [5] Borodina, O., Kyryzyuk, S., Popova, O., & Borodina, O. (2008). *State support of the agricultural sector: Evolution, problems*. Kyiv: Institute for Economics and forecasting NASU.
- [6] Borodina, O., & Kyryzyuk, S. (2008). Institutional principles of changes in state support of the agricultural sector of Ukraine in accordance with WTO requirements. *Economics and Forecasting*, 3, 87-105.
- [7] Gerasymenko, A., Ozhelevskaya, T., Lebedeva, L., & Moskalenko, O. (2022). Agricultural service cooperatives in Ukraine: Institutional development drivers. *Scientific Horizons*, 25(6), 89-99. doi: 10.48077/scihor.25(6).2022.89-99.
- [8] Kropyvko, M. (2006). Methodical approach to the formation of an organizational and economic mechanism of state support for the development of agriculture. *Economika APK*, 11, 13-18.
- [9] Mogylnyi, O. (2022). Improvement of the organizational and economic mechanism of sustainable development of the agrarian sphere: Theoretical and methodological principles. *Economy and State*, 5, 19-27.
- [10] Gaidutsiy, P. (2005). About the main principles of reforming the system of state support for agriculture and rural areas. *Economika APK*, 11, 43-48.
- [11] Zinchuk, T. (2008). Vectors of agrarian protectionism in the conditions of Ukraine's membership in the WTO and the European perspective. *Scientific Bulletin of Chernivtsi University. Economy*, 367, 78-84.
- [12] Kobuta, I. (2010). Agrarian aspects of creating a free trade zone between Ukraine and EU. *Actual Problems of Economics*, 4, 31-38.
- [13] Heyets, V., Ostashko, T., & Shynkaruk, L. (Eds.). (2014). *Assessing the impact of Agreement of Association / Free Trade Agreement between Ukraine and the EU on Ukraine's economy*. Kyiv: Institute for Economics and forecasting NASU.
- [14] Khodakivska, O., & Mogylnyi, O. (2017). Agroholdings of Ukraine: Agrarian policy and future challenges. *Economy of agro-industrial complex*, 6, 33-41.
- [15] Zagurskiy, O. (2012). Institutional provision of state support of the agrarian sector of Ukraine. *Finance of Ukraine*, 8, 122-129.
- [16] Lupenko, Y. (2014). Priority directions of innovative activity in the agrarian sphere of Ukraine. *Economika APK*, 12, 5-11.
- [17] Panuhnyk, O. (2017). System of state support agrarian sector of Ukraine transformation directions and ways. *Actual Problems of Innovative Economy*, 1, 5-10.
- [18] Zinchuk, T., Skidan, O., & Zinchuk, T. (Ed.). (2019). *Structural modernization of the EU SAP as a response to the challenges of globalization. Agrarian policy of the European Union: Challenges and prospects*. Kyiv: "Center for Educational Literature".
- [19] Hryhorieva, H. (2019). *State support of agriculture of Ukraine: Problems of legal support*. Kherson: "Helvetika" Publishing House.
- [20] Kulnych, P. (2017). Legal regulation of nature use in Ukraine: The unity of differentiation and integration. *Constitutional State*, 28, 282-290.
- [21] Gafurova, O., & Syvolotska, S. (2017). General characteristics of non-financial measures of state support for farms. *Scientific Bulletin of NULES of Ukraine. Series "Law"*, 264, 66-74.
- [22] Borodina, O. (Ed.). (2021). *Modernization of the economic policy of the development of spheres of activity and markets: In 4 parts*. Kyiv: Institute for Economics and forecasting NASU. Retrieved from <http://ief.org.ua/docs/mg/346.pdf>.
- [23] EU Agricultural Domestic Support: Overview and comparison with the United States. (2021). Retrieved from <https://crsreports.congress.gov/product/pdf/R/R46811>.
- [24] State budget web portal for citizens. (n.d.). Retrieved from <https://openbudget.gov.ua/>.
- [25] Counterparty verification service. (n.d.). Retrieved from <https://youcontrol.com.ua/>.
- [26] Community capacity portal. (n.d.). Retrieved from <http://surl.li/rmhg>.
- [27] The State Statistics Service of Ukraine. (2021). *Labour force of Ukraine 2020*. Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/07/zb_r_s_2020.pdf.
- [28] Express information of the State Statistics Service of Ukraine. (2022). *Peasant farms on January 1, 2022*. Retrieved from <http://www.ukrstat.gov.ua>.
- [29] Law of Ukraine No. 1789-VIII "On Amendments to the Budget Code of Ukraine". (2016, December). Retrieved from <https://zakon.rada.gov.ua/laws/show/1789-VIII?lang=uk#Text>.
- [30] Economic accounts of agriculture (production account and income generation account). (n.d.) Retrieved from <http://www.ukrstat.gov.ua>.
- [31] Report on recipients of state support in the agricultural sector. (2021). Retrieved from <https://minagro.gov.ua/ua/pidtrimka/zvit-shchodo-otrimuvachiv-derzhavnogo-pidtrimki-v-galuzi-apk?v=61c04b8439d5f>.
- [32] Index of agricultural products in 2021 (preliminary data). (2022). Retrieved from <http://www.ukrstat.gov.ua/express/expr2022/01/05.pdf>.
- [33] Law of Ukraine No. 985-IX "On Amendments to Certain Laws of Ukraine Regarding the Functioning of the State Agrarian Register and Improvement of State Support to Agricultural Producers". (2020, November). Retrieved from <https://zakon.rada.gov.ua/laws/show/985-20#n32>.
- [34] Borodina, O.M. (Ed.). (2020). *Inclusive rural development in Ukraine*. Kyiv: Institute for Economics and forecasting NASU. Retrieved from <http://ief.org.ua/docs/mg/330.pdf> ISBN 978-966-02-9456-1.
- [35] Tax Code of Ukraine. (2010, December). Retrieved from <https://zakon.rada.gov.ua/laws/show/2755-17#Text>.
- [36] Agriculture of Ukraine 2020. (2021). Retrieved from https://ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/09/zb_sg_20.pdf.

- [37] According to the Resolution of the Cabinet of Ministers of Ukraine No. 107. "On Approval of the Procedure for the Use of Funds Provided in the State Budget for State Support for the Development of Animal Husbandry and Processing of Agricultural Products". (2018, February). Retrieved from <https://zakon.rada.gov.ua/laws/show/107-2018-%D0%BF#n10>.
- [38] Resolution of the Cabinet of Ministers of Ukraine No. 565. "On the Approval of the Procedure for Providing Additional Financial Support to Family Farms Through the Mechanism of Additional Payment for the Benefit of Insured Persons – Members/Heads of Family Farms of a Single Contribution to Mandatory State Social Insurance". (2019, May). Retrieved from <https://zakon.rada.gov.ua/laws/show/565-2019-%D0%BF#Text>.
- [39] Mogyl'nyi, O. (2021). Transformation of organizational and legal forms of agriculture: From multi-system to latifundation. *Ekonomika APK*, 1, 15-27.
- [40] The National Academy of Sciences named the profitability of agricultural products for 2020. (2021). Retrieved from <https://agropolit.com/news/19612-u-naan-nazvali-rentabelnist-silskogospodarskoyi-produktsiyi-za-2020-rik>.
- [41] The government approved programs of non-refundable grants for the creation of greenhouses and gardens. (2022). Retrieved from <https://minagro.gov.ua/news/uryad-zatverdiv-programi-bezpovorotnih-grantiv-na-stvorennya-teplic-i-sadiv>.
- [42] Conditions for obtaining grants are too much for farmers. (2022). Retrieved from <https://agroportal.ua/news/eksklyuzivny/umovi-otrimannya-grantiv-neposilni-dlya-fermeriv>.

Державна підтримка агросектора в контексті інклюзивного сільського розвитку

Оксана Володимирівна Риковська

Інститут економіки та прогнозування НАН України
01011, вул. Панаса Мирного, 26, м. Київ, Україна

► **Анотація.** Аграрний сектор як системоутворююча сфера сільської економіки стає визначальним для сільського розвитку на засадах інклюзивності. Вплив держави на розвиток сектора засобами фінансової підтримки має не лише сприяти посиленню виробничих потужностей та конкурентних переваг товаровиробників, а й позитивно позначатися на розвитку сільської місцевості та підвищувати можливість залучення населення у суспільне життя. Ці завдання актуалізуються в умовах тривалого бюджетного дефіциту, зокрема посиленого веденням воєнних дій та необхідністю спрямовувати державні кошти за напрямками з найбільшим мультиплікативним ефектом. Метою статті є дослідження впливу державної фінансової підтримки аграрного сектора на сільський розвиток з позиції дотримання принципів сталості та забезпечення інклюзивності соціально-економічного розвитку. Для досягнення визначеної мети використовувалися: загальнологічні методи аналізу і синтезу при опрацюванні нормативно-правових актів, які регулюють систему державної підтримки в Україні; статистико-економічні методи для групування отримувачів державної підтримки за різними статусами, програмами, напрямками; методи математичного аналізу для оцінки динаміки показників та виявлення закономірностей розподілу коштів підтримки, розрахунку залежності бюджетів територіальних громад від сільськогосподарського виробництва. Для візуалізації результатів дослідження використано табличний та графічний методи. Абстрактно-логічний метод застосовувався для узагальнення висновків та формулювання пропозицій. За результатами проведеного дослідження, у т.ч. на основі аналізу діяльності агрокомпаній, які протягом трьох років отримали найбільшу фінансову підтримку держави, обґрунтована суспільна нераціональність існуючого розподілу коштів державної підтримки, що спричиняє збільшення розриву між виробничими можливостями аграріїв, посилення нерівномірності розвитку аграрного сектора і сільської місцевості загалом. Здійснене удосконалення законодавчих норм не знайшло відображення у практичній площині, тож зберігається тенденція асиметричного розподілу коштів на користь великого бізнесу. Аргументовано необхідність впровадження низки змін у систему розподілу та використання коштів державної фінансової підтримки аграрного сектора, що стосуються нормативно-правового забезпечення та контролю за його виконанням, посилення вимог до отримувачів коштів в частині економічної та соціальної відповідальності для сприяння розвитку сільських територій на засадах інклюзивності. Однією з умов всіх програм, які фінансує держава, має стати пріоритетизація досягнення суспільного ефекту та підтримання сталого розвитку. Врахування запропонованих змін сприятиме збереженню багатогалузності сільського господарства та стійкості продовольчих систем, розширенню кола отримувачів підтримки та посиленню фінансової стійкості малих виробників, збільшенню надходжень до місцевих бюджетів, підвищенню ефективності застосування державних фінансів з точки зору їх суспільної функції, досягненню синергетичного ефекту від використання бюджетних коштів в економічній, соціальній та екологічній сферах, формуванню стійких основ сільського розвитку на інклюзивних засадах

► **Ключові слова:** сільське господарство, фінансова підтримка, сталий розвиток, агровиробники

ЕКОНОМІКА АПК
Науково-виробничий журнал

Том 29, № 3
2022

Літературний редактор:
І. Залюбовський

Редагування бібліографічних списків:
К. Сосєдко

Комп'ютерна верстка:
К. Сосєдко

Підписано до друку 19.05.2022
Формат 60*84/8
Ум. друк. арк. 8,6
Наклад 50 прим.

Видавництво: Національний науковий центр «Інститут аграрної економіки»
вул. Героїв Оборони, 10, м. Київ, 03127, Україна
E-mail: info@eapk.com.ua
www: <https://eapk.com.ua/uk>

EKONOMIKA APK
Scientific and Production Journal

Volume 29, No. 3
2022

Literary editor:
I. Zalyubovskyi

Editing bibliographic lists:
K. Sosiedko

Desktop publishing:
K. Sosiedko

Signed to the print 05/19/2022
Format 60*84/8
Conventional Printed Sheet 8.6
Circulation 50 copies

Publisher: National Scientific Center "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
E-mail: info@eapk.com.ua
www: <https://eapk.com.ua/en>