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Social Development of the Village in the Conditions of Decentralisation of Power

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► **Abstract.** The research covers the socio-economic aspects of rural development in the context of decentralisation of governance, specific features of rural livelihoods and capacity design for development. The purpose of the study – to analyse the state and outline the prospects of social development of the village under decentralisation of power. The study used dialectical methods of cognition of processes and phenomena, monographic (analysis of social infrastructure), empirical (comprehensive assessment of the current state of the object of study), abstract and logical (theoretical generalisation and conclusions). During the study and analysis of the social development of the village, the essence of its current state is exposed, the reasons for the abandonment of most villages are characterised, and significant factors that will significantly contribute to the elimination of existing disadvantages and miscalculations in the social development of the village are identified. Theoretical and practical provisions for the social development of the village on a new innovative foundation were further developed. The problem of rural development is examined by considering both economic and social factors in their dialectical combination and interrelation. The establishment of new agglomerations was determined as a promising area of social development in the village. Specific factors of social development of the village that can threaten both its existence and the preservation and reproduction of human capital are identified and analysed. The ways to solve the existing problem in conditions of decentralisation of power were identified

► **Keywords:** Ukrainian village, social infrastructure, demography, agricultural policy, decentralisation, agricultural sector, market economy

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► Problem statement

A unique social group has developed historically on the territory of Ukraine – Ukrainian village, which in its social and economic content reflects both the nature of agricultural production and the essence of the lifestyle and activities of millions of Ukrainian peasants. In agriculture, an appropriate material and resource base and social and economic infrastructure have been established to ensure and develop social production in many sectors and the necessary living conditions for different segments of the rural population. The place and role of the peasants in the social structure of the country's population are defined by the general social code, which is primarily to provide all residents with high-quality nutritious food, guaranteeing the food security of the state.

Over the past decades, the Ukrainian village has undergone significant changes as a result of structural economic reforms: restructuring of land and property relations, the establishment of a legal framework for a market economy through the privatisation of land, and property and using individual, and family and collective labour. However, there are several complex and unresolved issues in the rural areas, first of all, regarding the social development of the village. It is known that the state of social development in rural areas largely depends on the level of agricultural production. Therewith, the reverse process is occurring on the contrary: the level of development of the social sphere depends on the level of production in rural areas. [1]. Thus, further investigation of the problems of establishment and development of the social sphere of the village, and analysis of interdependencies between individual factors of the social sphere, and between production and social indicators to predict the prospects of their development is relevant at the present stage.

During the reforms, priority attention was devoted to the development of agrarian production and corresponding industrial relations, while the issues of establishment and development of the social sphere were ignored. As

a consequence, the social sphere not only did not develop but, on the contrary, declined even more. The reason for this, first of all, should be considered the reduction of the role of the state in solving social problems of the village, the transfer of the social sphere from the state budget to the balance of local governments, which did not have the funds to finance it, and the lack of proper control over the implementation of legislative and regulatory provisions on the social development of the village. The reform of power decentralisation, the transfer of a significant part of powers, financial and other resources from central authorities to local self-government authorities, is designed to improve the social development of rural areas [2].

► Analysis of recent studies and publications

The problems of social development of the village were explored by well-known scientists and specialists, among them: O.H. Bulavka [3, 4, 5]; O.M. Borodina, I.V. Prokopa, V.V. Yurchyshyn [6]; V.S. Diiesperov [7]; M.M. Ihnatenko [8, 9]; M.F. Kropyvko [10, 11]; V.I. Kutsenko [12]; Yu.O. Lupenko [10, 4, 13]; M. Yo. Malik [10, 11, 14]; M.K. Orlaty [15]; O.I. Pavlov [16]; N.I. Patyka [17]; L.A. Rarok [18]; P.T. Sabluk [19]; A.P. Sava [20]; O.P. Slavkova [21]; V.K. Tereshchenko [22]; O.H. Shpykuliak [14, 23, 9]; M.M. Mohylova [24] etc.

The purpose of the study – to analyse the state and outline the prospects of social development of the village under decentralisation of power.

► Outline of the main material

An in-depth analysis of the establishment and development of the Ukrainian village, and its social content serves to substantiate the long-term perspective areas of radical restructuring of the rural settlement network. During centuries of the historical development of civilized social life, the peasantry has conventionally occupied and still occupies a rather significant place as the oldest community closely connected with agricultural

production, the establishment of food resources to ensure food security of the state, and satisfy the demands of the population for food.

Ukraine is one of the leading countries in the world for increasing the production and export of grain. As of December 7 this year, according to the Ministry of Agrarian Policy, more than 80 million tons of grain have been harvested, including 33 million tons of wheat, which is 26% more than last year. According to preliminary estimates, grain exports will reach 24.4 million tons, which will provide an income of about \$ 6 billion US dollars. Ukraine may become the second largest exporter after the US among grain exporters in the current marketing year (July 2021 – August 2022). The agricultural sector has the opportunity to develop more than half of the foreign exchange earnings of the state and provide a fifth of the country's GDP [25].

In general, the agricultural sector accounts for 45% of the economy, it develops almost three-quarters of retail trade turnover, and 30% of the consolidated budget [25]. Under the influence of a complex of organisational, economic, and other factors, priority is attached to the production sphere, and establishment of conditions for increasing the volume and productivity of agricultural production, as the results of the agrarian economy largely affect other sectors of the national economy.

During the years of Ukraine's independence, significant work has been performed to reform the agrarian sector, establish the foundations for social and economic changes in property relations, develop a multi-structured economy, promote the democratisation of management, and transition to a socially oriented economy. However, the issues of social development in the Ukrainian village were given a secondary role with funding on a residual approach. Consequently, this resulted in the decline of the village, which is characterised by a decline in population, adverse demographic situation, rising unemployment, low wages, and the destruction of the social sphere. Over the years, the Ukrainian village, as well as Ukraine

in general, has experienced several challenges, where demographic processes are among the main ones. According to the State Statistics Service, as of 01.09.2021, the population of Ukraine amounted to 41.3 million people, which is 400 thousand people less than in 2020. Over the past ten years, the birth rate has decreased by 40%, and the birth rate has halved. Due to depopulation, the population is ageing, which in turn increases the depopulation itself (in 2020, 48 newborns per 100 deaths) [26].

According to the forecasts of the Institute of Demography and Social Studies named after M.V. Ptukha, the population of Ukraine by 2050 may decrease to 27.9 million people, and considering migration – to 20 million (in 1991 there were 51.9 million people) [27].

The socio-economic crisis has resulted in unfavourable demographic preconditions for the reproduction of the rural population, resulting in the deterioration of the demographic potential accumulated by previous generations. From 1991 to 01.01.2021, the rural population decreased by 4.2 million people – from 16.8 to 12.6 million. The average reduction for the year was 140 thousand people. If this rate continues, in the next 30 years, the rural population will decrease to 8.4 million people [26]. The main reason for the demographic crisis was the intensification of adverse processes: low material level of people, the departure of the most productive part of them outside the country, on the one hand, the growth of mortality, divorce, ageing of the population, on the other – a decrease in fertility and marriage. A qualitatively new system of organisation of social life and everyday life of peasants should change the demographic situation and adverse trends in rural development: the development of young families, increase in birth rate, and decrease in mortality of the rural population, particularly children and people of working age, ensuring natural population growth and stopping the process of depopulation. In the period of market economy, the measures implemented in the agricultural sector should contribute to the stabilisation of

the population, optimisation of the gender-age and professional – qualification structure of labour resources, and purposefully regulate demographic and social processes in rural areas.

Regarding employment, according to the State Statistics Service of Ukraine, as of 2020, there were 15.9 million employed people aged 15-70, or 663.0 thousand people less than in the previous year. The employment rate among this category of people decreased from 58.2% to 56.2%. In addition, 1.7 million people were declared unemployed, of which 84.9% were previously employed, and the remaining 15.1% were searching for work, 22.1% of them – for 12 months or more. These are mainly young people who were unemployed after graduation, aged 15-24 years (87.5%) and 25-34 years – 12.5% [26].

According to the Institute of Demography and Social Studies, named after M.V. Ptukha [27], the most active and motivated people aged 25-35 go to work abroad, and the second group is people of pre-retirement age, most of whom will retire in 10 years. The labour force will be replenished by those who are under 20 years old, and their proportion is the lowest among people of working age. All this will result in a deficiency of the skilled labour force in ten years.

It is expected that by 2050 the number of pensioners in the total population will increase from 20% to 30%, that is, every third of residents will be a pensioner. Already in 10 years, there will be two pensioners per working person, i.e. in the official sector of the economy up to 8 million will be employable persons, while the number of pensioners will increase to 16 million [27].

The same trends in employment are inherent in rural areas, which have 28,221 settlements with 5.5 million people aged 15-70, including almost 5 million employed. There are 3 million people involved specifically in agriculture, forestry, and fisheries, which is 1.3 million less than in 2000 and accounts for 18.2% of the total number of employed (in 2000 – 21.5%). Among the total number of employed, one in six worked in agriculture, forestry, and fisheries. These farms are considered to

be the main activity of the informally employed population (44.1%). Among the employed population, the smallest share (160.7 thousand, or 1.2%) was represented by skilled agricultural workers [26].

The employed population consists of members of private farms, which number almost 4 million. They provide production of more than 35.4% of gross agricultural products, including 31.7% of crop production and 47.7% of livestock production. In addition, the number of people employed in household farms has slightly increased in recent years, which is explained by difficulties with employment and the necessity to provide their food requirements. Therewith, the number of hired workers in agriculture, in particular from 2000 to 2020, decreased from 2.8 million to 445.4 thousand people, and the number of self-employed increased [26].

In rural areas, according to the State Employment Service, last year alone, compared to the previous year, the number of employed decreased by 213 thousand people, the employment rate decreased from 56.2% to 54.1%, while the number of unemployed increased by 80 thousand people (to 573.2 thousand), and the unemployment rate increased from 8.7% to 10.4%. Among the unemployed, 32.2% were previously employed in agriculture, forestry, and fisheries. There are serious discrepancies between the demand and supply of labour. If, on average, in Ukraine, as of January 1, 2021, 11 unemployed people applied for one vacant job, then, in agriculture 41 qualified workers applied for one vacancy. In general, the number of vacancies for rural residents remains limited [28]. The problems of rural employment cannot be solved without the participation of public authorities. First, it is necessary to legislatively define the employment status of persons who own or use land plots (shares). Secondly, the employment of those who used to work in cities and, having lost their jobs, returned to the countryside is still under question. If they had at least one-hundredth of a hectare of land, they were classified as employed in private farms. Thus,

official employment is solved, but in fact, people remain unemployed. Thirdly, the significant role of the state in the development of non-agricultural (alternative) activities in rural areas, can involve the unemployed population.

Low wages in agriculture have been an unresolved problem for many years. Despite its gradual annual growth, the level of average monthly wages is the lowest compared to wages in the economy in general and in other sectors (Table 1).

Table 1. Average monthly wage in agriculture as a percentage of wages in other sectors, %

Indicator	Year				
	2017	2018	2019	2020	2021 (august)
In general in the economy	81.1	80.8	83.2	84.0	83.4
Industry	75.5	74.4	74.1	76.3	77.6
Construction	92.2	91.4	93.4	99.0	98.4
<i>Transport</i>	74.9	72.7	74.7	81.5	77.5
Trade	75.5	76.2	80.9	86.2	85.3
Financial and insurance activities	44.8	44.3	45.7	47.8	49.6

Source: According to the State Statistics Service of Ukraine [26]

Low incomes of citizens with constantly rising prices for housing and communal services are intended to compensate for housing subsidies. However, the number of subsidies and the number of households receiving them have recently decreased significantly. If in 2018, 3.9 million households received subsidies, in 2021 – only 2.4 million. Accordingly, the amount of subsidies for 2021 with preliminary adjustment is planned for UAH 35.2 billion against UAH 43.1 billion paid in 2018 [29].

Lack of money deprives rural households of the opportunity to purchase the necessary equipment for their requirements. About 80% of households use mostly manual labour for the cultivation of land plots, and only 17.4% – agricultural machinery, and these are farms with more than one hectare of agricultural land. In 2021, only 19.1% of rural households had a tractor, 1.4 – combines, 11.5 – seeders, 13.7 – cultivators, 2.5% – cars [26].

Regarding the state of fixed assets in the country in general, the situation is as follows: firstly, more than 80% of them are physically depreciated and require replacement, and secondly, the provision of agriculture with a tractor fleet

does not exceed 45-50%. Therewith, the production, in particular, of tractors in 2019 compared to 2000 decreased by almost 2.5 times in 2020, only 900 tractors with an engine power of more than 59 kW were produced. And this is in conditions when in 2019, the number of agricultural machinery in enterprises significantly decreased: tractors – by 59.1%, grain harvesters – by 59.4%, and corn harvesters – by 81% [30]. And thirdly, only in 2019, compared to the previous year, the average price for one tractor increased by 7.5%, corn harvester – by 57.7%, and milking machine – by 38.8%. Therewith, during this period, the price of grains and legumes decreased by 10.4%, oilseeds – by 10.7%, and meat – by 2%. For the regular reproduction of the machine and tractor fleet, it is necessary to renew 8-12% of the equipment annually, while only 3-5% is renewed [26].

Own production of agricultural machinery is restored and developed too slowly. Agrohholdings, and somewhat more capable farms, tenants of shares, as a rule, buy imported equipment. Thus, in 2019, 45% of tractors and 21.9% of combines were imported [26]. Moreover, the import of agricultural machinery has increased 17 times.

Therewith, rural households at current prices, which are growing from year to year, do not have the opportunity to buy both imported and domestic agricultural machinery. They are forced to lease their land plots.

The purchasing power of rural residents is decreasing, the cost of living is rising, most families are not provided with the subsistence minimum and are below the poverty line, and 67% of the population considers themselves poor. Salaries and pensions are low, and prices and tariffs for utilities are constantly rising. In particular, over the year, gas prices have increased by 2.6 times, and utility prices – by 35%. The population's debt for utilities as of October 1, 2021, increased by 1.5 times [26]. Ukraine ranks last in Europe in terms of living standards. According to the results of the recent UN happiness rating, which includes all components of the material and spiritual state of people, Ukraine is in 110th place. According to the Ukrainian Institute for the Future (UIF) [31], for the living standards of Ukrainians to reach the current level of Italy, Spain, and Slovenia by 2030, Ukraine's GDP growth should exceed 10 times. It is completely unrealistic. The National Bank of Ukraine, for example, forecasts the GDP level in 2021 to be 3.1% instead of 3.8%, and in 2022 – from 4% to 3.8%.

As a result of miscalculations in the implementation of agrarian reform, violation of inter-sectoral equivalent exchange, deepening disparity of prices for industrial and agricultural products, inflation, constant price growth, adverse processes acquired a stable tendency, which resulted in a significant decrease in the solvency of the population, continuous rise in the cost of living and ultimately determined a significant reduction in the consumption of staple foods, its transition beyond the minimum physiological provisions. Thus, more than half of the family budget (58.9%) is spent on food products. On average, in 2020, 65.7% of meat, 58.1% of milk, and 48.0% of fish and fish products were consumed per person to the standard. Most families are not provided with the subsistence minimum, which is significantly lower than the UN poverty standard [26].

The above factors encourage the most economically active and able-bodied part of the population to go abroad with the hope of improving their lives. According to unofficial data, more than 10 million mostly young people with appropriate professional training work abroad, mainly in Poland, Russia, the Czech Republic, and Germany.

Ukrainian citizens are already among the top five recipients of permanent residence or citizenship in 10 out of 27 EU countries. According to EUROSTAT, in 2020, more than 600 thousand Ukrainians received their first residence permit in EU countries. It is the largest group of citizens among all beneficiaries. Of all issued visa permits for Ukrainians, more than 81%, or 488.9 thousand, are for Poland.

According to the Social Group "Rating", 35% of Ukrainians want to leave Ukraine forever, and 54% of them are young people aged 18-35. Thus 65% of respondents are ready to work not in their field of speciality, and 30% – are in lower positions. Among potential migrants, the first place is occupied by economic inquiries. Every year, migrant workers transfer to Ukraine 10 billion US dollars to, and up to 5 billion, according to various estimates, is brought in cash. In total, it is equal to the revenue from foreign trade turnover of food and agricultural products, which, in particular, as of 1.01.2021 amounted to 15.5 billion US dollars [32].

The massive outflow of rural residents results in the deepening of the adverse demographic situation, the degradation of the countryside has been occurring for a long period, and 14 rural settlements disappear from the map of Ukraine annually on average (432 for the period 1990-2021), particularly, small and medium-sized villages, which are practically extinct.

Despite the legislative and regulatory acts adopted by the state on the design and development of the social sphere of the village, it has not developed over the years of independence, but, on the contrary, is in decline due, first of all, to the lack of sufficient funds and material and technical resources. It results in the suspension of systemic

restoration of consumed funds in the social sphere, and its material and moral decline.

The material basis of the social sphere in the village, the totality of objects belonging to the sphere of services to the rural population, is the social infrastructure, which in most rural settlements is at a low level and does not correspond to the modern requirements of civilized public life. Therewith, the potential of social infrastructure continues to decline, which decreases the commissioning of housing and communal and socio-cultural facilities, reduces educational and cultural opportunities for the rural population, and complicates the provision of medical care. The development of social infrastructure largely determines the standard of living and social security of the population, the establishment of conditions for the development, reproduction, and provision of human capital. According to the Law of Ukraine "On the priority of social development of the village and agro-industrial complex in the national economy", the minimum amount of investment aimed at strengthening the material and technical base of the social sphere of the village and agro-industrial complex should be at least 1% of GDP, including at least half of the investment should be allocated for the construction of non-production facilities [33]. However, from year to year, the Law is not implemented both in the construction of social infrastructure facilities and in providing quality services to the rural population. Although the average per capita level of housing in the countryside is somewhat higher than in the city, the housing stock in rural areas is physically and morally outdated, one third of rural houses were constructed before the 60s, more than 47% – in the 60s-70s, 15% – in the 80s, the rest – since the early 90s of the last century. The vast majority of rural households are characterised by unsatisfactory quality and low levels of comfort of housing stock. There is no water supply, sewerage, central heating, hot water, bath, or shower.

To improve the housing and social conditions of rural households in all regions, by the Decree of the President of Ukraine "On measures

to support individual housing construction in rural areas" [34], funds were established to support individual housing construction in rural areas and regional programmes "Own House" was approved, which provide rural developers with long-term preferential loans with a 3% per annum interest rate (large families are exempt from paying interest). Last year alone, 1388 Ukrainian families joined this program and received soft loans. The implementation of the program "Own House", in particular in the Chernihiv region, deserves attention. As of 1.08.2021, 7160 families from 518 rural settlements, using state credit support and using soft loans, have constructed 760 residential houses with a total area of 78.0 thousand m² and 274 outbuildings with an area of 19.8 thousand m², purchased 330 residential houses or apartments, constructed 780 km of street gas pipelines and water pipes, and equipped 5618 estates with engineering facilities. Preferential loans have benefited 1250 young families and 2168 families of rural pensioners, 715 workers in education, 365 – in medicine, 257 – in culture and social services, 347 – in local government, and 2560 workers in agriculture. Large families received 245 interest-free loans. In addition, 380 families purchased 319 units of agricultural machinery, 369 units of agricultural equipment, and 150 heads of livestock [35].

In the Ivano-Frankivsk region, for example, they determined the term of the program implementation – five years and, accordingly, calculated the projected amount of funding. Thus, for 2021 – 2025, funding for UAH 74.3 million is planned, including UAH 44.3 million from the state budget, UAH 20.9 million from the regional budget, and UAH 9.1 million from the district budget. During this period, it is planned to introduce 121 houses, reconstruct and overhaul – 51 houses, provide communications – for 190 houses, and purchase – 60 houses. However, in general, in the state, the regional programs "Own House" is far from being implemented, as the funds planned for them are not allocated [36].

Medical care for the rural population remains problematic. According to the annual report of the

World Economic Forum, the main regression in Ukraine is recorded in the field of health care – 101st place out of 141 countries under study. Although medical reform has been launched as part of the decentralisation reform and several legislation and regulations have been adopted, rural healthcare is in an unsatisfactory state. Out of 4 thousand outpatient clinics and almost 13 thousand paramedic and obstetric stations, only 28% have water supply, and one-third – wells, 18% do not have bathrooms, and only 17% of paramedic and obstetric stations and outpatient clinics are provided with transport. The provision of outpatient clinics per 10 thousand people is approximately 2.5 (the European figure is almost 5). Funds allocated for rural medicine are usually not used. Thus, UAH 6 billion was provided for the construction of outpatient clinics in rural areas in 2017-2019. However, at the time of the audit conducted by the Accounting Chamber in 2019, 39% of the allocated funds were used and only 17% of the planned outpatient clinics were constructed, of which 58.5% were ready for operation [37]. In rural areas, in the vast majority of cases, primary health care is not able to provide the required assistance to patients. Therefore, a significant part of them receives it at the second or third levels, although with proper provision of villages with medical facilities, the appeal to the primary level is at least 70-80%. The implementation of the medical reform involves the construction of new and repair of existing outpatient clinics with the appropriate equipment, specialised transport, and required medicines to provide quality care to patients. The load on one primary care doctor should be up to 1.5 thousand patients, and the distance from the outpatient clinic should not exceed 5 km. The Law of Ukraine “On Improving the Accessibility and Quality of Health Care in Rural Areas” [38] defines the introduction of telemetry medicine in rural areas as one of the main directions of health care development, which will enable both the doctor and the patient to receive online consultations from qualified high-level specialists. However, rural medicine is not prepared for this at all. First of all, it is required to implement several practical

measures to provide healthcare institutions with modern telecommunication technologies (Internet, software, computer, and other equipment). Some provisions of the reform should be reconsidered, and the reasons for its obvious lagging behind should be analysed.

There is an urgent issue of staffing of primary health care institutions, which are staffed with 70-75% of doctors. Most of them are older people, as young specialists are reluctant to go to work in the village, mainly due to the lack of required conditions there. The above-mentioned law defines efficient mechanisms for attracting qualified personnel to rural medicine, in particular through guaranteed wages, proper working conditions, provision of required medical equipment and transport, provision of service housing, mobile communication, preferential loans for the construction or purchase of housing, compensation for housing and utilities, promotion of professional knowledge and practical skills. However, the available funding for rural healthcare is unable to ensure the implementation of this law.

Doctors from rural areas should be trained in school. It includes career guidance among high school students, the establishment of specialised classes, allocation of specific quotas for rural applicants for admission to higher education institutions, provided that they return to the village after graduation. The tradition when economic entities, caring about the personnel of the village, employed students of medical, pedagogical, and agricultural universities for full financial support during all the years of study should be revived. Currently, this could be initiated by united territorial communities, agricultural holdings, and large farms together with other entities. The rural coefficient (RC) should be more actively used when young people enter higher education institutions.

Personnel training requires qualitatively new approaches to education, particularly in rural areas. And it is essential to start with preschool education, which more than half of the village children do not have access to. According to the State

Statistics Service, in 2020, 39% of children aged 1 to 6 years were covered by preschool education institutions, and according to the Institute of Educational Analytics, in the 2019/2020 academic year, only 8.5% of the total number were covered by out-of-school education institutions [26].

In rural areas in the 2020/2021 academic year, there are 9.3 thousand secondary education institutions (62.5%), including 2.5 thousand small schools, the number of which is decreasing every year. 365 schools have already been closed, and another 93 schools are expected to be closed in 2021-2022 [26]. Small schools lack both resources and qualified staff and lack the required extracurricular activities for students. It results in a low level of quality of knowledge, which affects the results of EIT and limits the opportunities for higher education. Access to high-quality education in rural areas is much worse than in cities. According to PISA 2018 information sources, in Ukraine, the difference between the performance of students in rural areas and large cities is more than two years.

To improve the quality of education in rural schools and to provide funds for the development of the educational sphere in the framework of the decentralisation reform, the process of optimisation of the network of educational institutions has been launched, which involves reducing the number of schools and consolidating classes. Allocations to schools with less than 50 students (according to the ITS "DISO" 97.5% are rural schools) are limited, and state subventions for hub schools are simultaneously increased. The objective is to ensure that children study in the primary school in the village and continue their education in the hub school, which should be fully equipped with classrooms, laboratories, Internet, computer equipment, sports facilities, and qualified personnel.

According to the Ministry of Education and Science of Ukraine, as of the beginning of October this year, there were 993 hub schools in Ukraine, including 492 in AHs, almost one and a half thousand branches, of which 719 are in AHs. Already 1750 school buses have been purchased and are

used to transport 90.6 thousand students to hub schools [39].

School optimisation is an objective process. However, it should be implemented in a balanced manner, considering several factors. First, it is essential to identify hub schools in advance and strengthen their material and technical base, establishing a modern educational environment. Secondly, to increase the amount of state-targeted subventions for road infrastructure, purchase the required number of school buses to transport children to hub schools. In the reform of the educational sphere, amalgamated communities are expected to perform an active role, in particular in the development of roads, and investment in hub schools, since subventions, will be allocated based on co-financing. Thus, the legislation allows AHs to transfer the saved funds to the general budget for the next year and use them for road repairs or make additional payments to teachers.

Many complex and unresolved issues are noted in other spheres of the social infrastructure of rural areas – cultural, domestic, trade, and transport services, which serve as evidence of the critical state of the social sphere of the village, which results in the destabilisation of the national economic complex. There is practically no state investment in the social development of rural areas, and the adopted legislation and regulations are declarative.

The neglect of the social sphere, destructive demographic processes, unemployment, low wages and high prices for essential goods and utilities, and poverty are threatening the preservation and reproduction of human capital, and the existence of the Ukrainian village in general.

In the country, the design of processes connected with the development of public awareness of the objective necessity of socio-economic and technical-technological restructuring of the Ukrainian village, and its agrarian sphere of production are gaining more and more development. Several attempts to develop organisational and economic programmes for the revival and development of the Ukrainian village have been

implemented, including the adoption of the Law of Ukraine “On the Priority of the Development of the Ukrainian Village and the Agro-Industrial Complex in the National Economy”, the State Target Programme for the Development of the Ukrainian Village for the period up to 2015, the State Target Programme for Sustainable Development of Rural Areas for the period up to 2020, the State Strategy for Regional Development for 2021-2027, which identifies, among others, rural areas that require particular attention. [40]

The main principles of these documents are ensuring sustainable development of the Ukrainian village, improving the living conditions of the rural population, implementing social standards and provisions for living and working in rural areas, and providing rural settlements with social infrastructure. Unfortunately, both the law and any of the programs remained unimplemented. Financing the social sphere of the village has been and continues to be based on the residual principle. The main sources of such funding were local budgets, which did not have enough money even for their simple functioning. During the period of reforming the management of social and economic development of the country in the field of power decentralisation, the sources of filling local budgets have been significantly expanded. From 2014 to 2019 alone, local budgets increased by UAH 206.4 billion (from UAH 68.6 to UAH 275 billion). While in 2015, the proportion of local budget revenues (excluding transfers) was 18.5%, in January-August 2021, it was 23.3%. Local budget revenues per capita for eight months of 2021 increased by 121.2% compared to the same period last year. For example, in the Vinnytsia region last year, compared to the previous year, revenues to the general fund of the budgets of AHs increased by 6.2%, and personal income tax – by 5.9% [41]. Planned capital expenditures in the budgets of AHs have increased almost 4 times. With the support of donor countries – Switzerland, Canada, and the European Commission, several projects of socio-economic development of communities are being implemented in the region, and

the implementation of three international technical assistance projects funded by the European Union is underway. Currently, according to the Constitution of Ukraine, local communities are endowed with broad powers. They approve the budgets of the respective administrative-territorial units and control their implementation, establishing local taxes and fees by law. AHs have become priority public investors in their territories. In addition, they will be allocated subventions from the state budget for the development of social infrastructure, in particular, for the construction of new and repair of existing cultural, sports, communal facilities, etc. In addition, they will be allocated subventions from the state budget for the development of social infrastructure, in particular, for the construction of new and repair of existing cultural, sports, communal facilities, etc. Since, as always, there is a lack of financial resources, there are various reasons for delays in their transfer to AHs and regions. In 2021, state financial support for community design and infrastructure development was reduced by UAH 20.1 billion, including UAH 0.5 billion for rural design [42].

Land resources are an essential factor in filling the budget of rural territorial communities in conditions of power decentralisation and local self-government reforms. In this regard, it is essential to accelerate the transfer of agricultural land from the state to commercial ownership of rural territorial communities, and state-owned agricultural land located outside settlements. Their involvement in economic turnover in the interests of the local population will be an essential factor in both rural development and diversification of the rural economy.

The process of structural reorganisation of the agrarian economy should be implemented in the field of radical restructuring of the socio-economic context of rural settlements, the establishment of new agglomerations in the structure of united territorial communities, which reflect the territorial concentration of agricultural and industrial production, targeted at the location of production and technological, residential,

administrative, cultural, educational and health sectors of public life within the existing rural areas. Agro-industrial and social agglomerations are an essential step towards solving a global problem – the restoration and preservation of the Ukrainian village.

► Conclusions

The problems of preserving the Ukrainian village, its human capital and the urgent necessity of their solution require strengthening the role of the state in the system of agrarian relations, which is determined, first of all, by the implementation of appropriate agricultural policy as a powerful factor of both economic and social development of rural areas. However, often the absence of such a policy negatively affects the rural settlement network and requires a reasonable definition of strategic areas of functioning of the social sphere and improvement of the economic mechanism for regulating its development.

The development of a long-term strategy should be based on the theoretical foundations for the establishment of a fundamentally new scientifically based innovative model of structural

reorganisation with the gradual development of priorities for economic and social development of agricultural production. In determining the priority areas for the implementation of the strategic course of structural reorganisation of the economy, it is essential to significantly strengthen its social orientation, with priority provision of conditions for the comprehensive intellectual and physical development of human capital. It is about the radical restructuring of the social and economic context of the Ukrainian village, but it is about the overall development of the social and psychological essence of its inhabitants. First of all, it concerns the development of a full-fledged living environment, ensuring the economic and social interests of the rural population, comprehensive development of rural areas under the condition of increasing production volumes, and acceleration of socio-economic transformations in the countryside. Successful solutions to these objectives will be facilitated by the reform of power decentralisation, increasing the role and significance of local self-government authorities in the economic and social development of the Ukrainian village.

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Соціальний розвиток села в умовах децентралізації влади

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► **Анотація.** У статті розглянуто соціально-економічні аспекти розвитку сільських територій в умовах децентралізації управління, особливості організації життєдіяльності сільських територій та формування потенціалу для розвитку. Мета статті – проаналізувати стан й окреслити перспективи соціального розвитку села в умовах децентралізації влади. У процесі дослідження використано діалектичні методи пізнання процесів і явищ, монографічний (аналіз соціальної інфраструктури), емпіричний (комплексна оцінка сучасного стану об’єкта дослідження), абстрактно-логічний (теоретичні узагальнення та формування висновків). Під час вивчення й аналізу соціального розвитку села розкрито сутність його сучасного стану, охарактеризовано причини занедбаності більшості сіл, визначено важливі чинники, які суттєво сприятимуть усуненню наявних недоліків і прорахунків у соціальному розвитку села. Набули подальшого розвитку теоретичні й практичні положення щодо соціального розвитку села на новій інноваційній основі. Проблема розвитку села розглядається при врахуванні як економічних, так і соціальних факторів у їх діалектичному поєднанні та взаємозв’язку. Визначено перспективним напрямом соціального розвитку села створення нових агломераційних формувань. Визначено і проаналізовано конкретні фактори соціального розвитку села, які можуть поставити під загрозу як його існування, так і збереження та відтворення людського капіталу. Намічено шляхи вирішення наявної проблеми в умовах децентралізації влади

► **Ключові слова:** українське село, соціальна інфраструктура, демографія, аграрна політика, децентралізація, аграрний сектор, ринкова економіка



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Macroeconomic Investment Process in Agriculture of Ukraine

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► **Abstract.** Investments in agriculture are an essential factor in implementing the enormous potential of the agricultural sector in Ukraine and accelerating economic growth and development. The scientific approaches to the significance of the mechanism of regulation of investment activity, which will ensure the development of a set of efficient investment flows, are investigated. The purpose of the study is to substantiate the theoretical provisions on the essence and features of the investment process and the most significant areas of its activation in agriculture. In the course of the study, the following methods were used: dialectical – in the knowledge of investment processes and phenomena; abstract-logical – substantiation of theoretical provisions on the development of investment processes; economic-statistical – identification of trends and patterns in the investment process; graphical – estimates of the main indicators of the dynamics and structure of investments; correlation-regression analysis – establishing interdependencies between indicators; strategic planning – in substantiating the investment forecast. The theoretical provisions and methodological approaches to assessing the macroeconomic investment process by their main features are generalised, and the most significant areas of its activation in agriculture are substantiated. Theoretical provisions on the economic essence of the investment process were further developed, in particular, the definition of its concept about agriculture, 16 most significant features and areas of activation were proposed. The results of the study can be used in the development of investment strategies and national policy in agriculture

► **Keywords:** investments, signs of investment process in agriculture, agricultural policy, investment forecast

► Problem statement

Investments are the most significant factor in the economic and social development of society.

They are particularly significant in agriculture, whose products and other results generate multiplier effects in most areas and segments of the economy. Therefore, to achieve increasing positive changes in the economy and society, it is essential to constantly intensify the investment process in agriculture.

The upward dynamics of investment and qualitative changes in the investment process at the macroeconomic level establish opportunities for accelerated growth of productive forces, the design of an innovative model of agricultural development, and increase the efficiency of land, material, technical and other resources, productive and human capital used in this process (Shubravska, 2012). The solution of the objective to intensify

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investment processes in agriculture requires the application of various macroeconomic policies, mechanisms, means, tools, management, organisational, economic, and other measures. Their correct choice for macroeconomic management of the investment process in agriculture is based on assessments of its condition, investment attractiveness, and capabilities of investors, the state, and institutional participants of investment processes. In connection with the above, this subject remains relevant today.

► Analysis of recent studies and publications

Various aspects of the investment process in agriculture have resulted in a significant amount of research. Thus, the Organisation for Economic Co-operation and Development (OECD) monitors investment processes in member countries and participants of the organisation (Agricultural policy, 2022). In recent years, foreign authors have drawn attention to the necessity of making responsible investments (Bulman, Cordes, Mehranvar, Merrill, & Fiedler, 2021; Principles for responsible Investment..., 2014), establishing an appropriate policy framework for them (Policy Framework for Investment..., 2013), and understanding the nature and significance of investments in agriculture for the development of the entire economy (Understanding Impact Performance, 2020), the impact of COVID-19 on land investments (COVID-19 and Land-based Investment, 2021), the innovative nature of agricultural investments (Kremer, Gallant, Rostapshova, & Thomas, 2019), investments in energy efficiency (Rasmussen, 2016), social investments (Kremer, Petters, Nyarko, & Walter, 2021), adherence to investment methodology (Our Investment Methodology, 2017), conducting annual investor surveys (Hand, Hannah, Sophia, & Noshin, 2020), identifying investment prospects (Amit, Bouri, Abhilash, Mudaliar, Hannah, Schiff, Rachel, Bass & Hannah, Dithrich, 2018), regulating business investments (Korutarom, & Biekpem, 2013), considering the impact of macroeconomic factors on investments (Farooq, Ahmed, & Khan, 2021), supporting investments in small and medium agribusiness (Eskesen, Agrawal, & Desai,

2014), etc. National researchers have explored aspects of agricultural policy and investment attraction strategies (Agricultural Investment Policy, 2015; Order of the Cabinet..., 2019), investment support for agricultural development (Kisil, 2018; Lupenko, & Zakharchuk, 2018; Mamontova, 2017) innovative investments (Reznik, Slobodianyuk, & Kotliarov, 2018; Ilchuk, & Shpomer, 2017; Shubravska, 2012), regional investment (Mezentseva, & Moroz, 2011), investment methodology (Kisil, 2015; Reznik, 2008), etc.

However, as an economic phenomenon, the macroeconomic investment process in agriculture has been understudied, which does not contribute to the development of a proper mechanism for ensuring its sustainability and management, reducing the impact of risks, increasing efficiency, and enhancing the positive impact of agricultural investment on food security, increasing export potential and the development of the entire economy. The purpose of the study is to substantiate the theoretical provisions on the essence and features of the investment process and the most significant areas of its activation in agriculture.

Materials and methods. The research methodology is based on the dialectical method of scientific knowledge and a systematic approach to the investment processes, methods of abstract-logical, economic-statistical, graphical, correlation-regression, and forecasting.

► Outline of the main material

It is established that in scientific research and practice the investment process at all levels of management should be considered a multifaceted and multidimensional economic phenomenon, which occurs over time and is characterised by various features. In assessing the investment process, its participants, depending on their requirements, should follow the provisions of the relevant economic concepts, in particular marginalism, physiocracy, capital, labour, and energy, and evaluate the investment process in terms of money flow, economic value, financial assets, tangible resources, and intangible values, energy, labour, organisational measures, etc. Depending on the level of management of the investment

process, analytical and forecast estimates should model: for an investment project – cash flow; for an enterprise, territory, region, and agriculture in general – the movement of economic value; for an investor – capital flow; for finance – the movement of financial assets; for land, energy, and labour – their minimised amounts for a given investment. According to organisational measures, the investment process should be considered as a set of actions of investors when implementing their investments at all its phases and stages.

In studies of the macroeconomic investment process, it is necessary to proceed from the fact that it is primarily constituted by numerous investment projects and activities performed by their owners and project participants (Dem'ianenko, *et al.*, 2003). In agriculture, they are associated with real investments and consist of pre-investment, investment, and post-investment stages. At the pre-investment stage, a hypothesis, strategy, or investment program is developed, areas, objects, and sources of investment are determined, and an investment plan or project is developed. At the investment stage, various types of invested capital are transformed into real objects and assets, put into operation, and developed project capacities. At the post-investment stage, the circulation and turnover of the advanced capital are performed, and its value is transferred from the sphere of production to the sphere of circulation. The last stage is completed by decommissioning the facility. Having returned part of the advanced capital already in the first production cycle, the investor can invest it in another project. The subjects involved in the process of implementing a specific investment project in agriculture are the owners of the invested capital, management, and employees of agricultural enterprises, owners of leased land plots, banking, and other financial institutions, suppliers of fixed assets, material resources, and services, buyers of products, municipal property authorities, the state, etc. In the investment process, they establish economic relations. Since there is an inequality in the distribution of gross value added in the relations between the participants of investment processes, the objective of macroeconomic

management of the investment process should be to determine the indicative levels of the rate of return on capital and the development of conditions for balancing the economic interests of their institutional participants.

The investment process at the macro level requires regulation, as its insufficient activity violates the sustainability of economic development and food security of the state, and excessive investment results in investment crises. Thus, in case of an insufficiently active investment process, incentives and support measures should be applied, while in case of excessive investment or harmful investments – to restrain this process to prevent adverse trends. Among the factors influencing the investment process in agriculture, external factors objectively prevail, thus, they should become the object of priority regulation and support of investments, development of a favourable investment climate, and proper investment infrastructure, which is considered to be the most significant component of agricultural policy.

Using natural resources, agriculture depends on natural and climatic conditions. According to the UN scientific plan to address climate, biodiversity, and pollution emergencies, natural resources used in agriculture should be assessed in the relevant investment process as natural capital (United Nations Environment Programme, 2021). Based on this, the participants of the investment process should understand the necessity of their responsibility for the economical use of natural resources, environmental protection, and spending part of the net profit for such purposes, and the possibility in the future to determine the economic value of the natural factors involved by society.

In economic terms, the author proposes to consider the investment process in agriculture at the macro level as a continuous flow of organisational, economic, and other measures and economic values developed by the owners and other participants of investment projects by investing monetary, material, financial, land, biological, energy, and other resources and assets, including natural capital, to obtain the corresponding benefits. To intensify this process, it is required to stimulate

and support it, and to prevent investment crises and the adverse effects of unwanted investments – to apply measures to deter it and prevent other adverse effects.

Analytical studies have identified the 16 most significant features that characterise the investment process in agriculture at the macro level: its continuity, sustainability, rhythmicity (cyclical-ity), level of activity, changes in scale and intensity, type of capital reproduction, structural changes, innovation, investment attractiveness, investment orientation of agricultural policy, development of investment infrastructure, place and role of small and medium-sized agribusinesses, access to investment resources, balanced economic relations, compliance with environmental and ecological requirements, social efficiency and place in the global investment process.

For the development of agriculture, the following conditions and areas of its activation must be developed according to these most significant features of the macroeconomic investment process:

- continuity – in case of possible seasonal changes, crises, and other unforeseen circumstances, the investment process should be continuous, as should the constant satisfaction of daily consumer demands of the population for food and reproduction of productive forces;
- sustainability – investments should be the foundation for ensuring sustainable development of agricultural production;
- rhythmicity – is considered a multi-cyclic phenomenon conditioned upon seasonal, current, and long-term cycles, in particular, the Simon Kuznets cycle, in which the priority of investments in agriculture and the food industry alternately changes. The author proposes to consider the rhythm of the investment cycle only as a separate, though significant, manifestation of the investment rhythm. Systematic studies of investment rhythm should consider the totality of all specific manifestations of the investment rhythm, in particular changes in investment volumes by periods of the year and years, structural changes, investment ratios in economic activities, reproductive, by participants,

regional, changes in the dynamics of specific investment indicators. The extreme characteristics of the investment rhythm are manifested in the slowdown of investment activity, and in the investment “overheating” of the economy or its specific sector, which was observed during the financial crisis of 2008-2009. Thus, in assessing the economic policy and its investment component, it is necessary to determine the nature of the investment rhythm and to prevent neither slowdown, imbalance, or imbalance in investment activity, nor its excessive, uncontrolled, monopolistic, and destructive activity. In macroeconomic management of investment processes, the nature of investment rhythm should be predictable. Further scientific research in this area is necessary and relevant. Their results will allow the development of the fundamental provisions of the science of investment rhythm as a section of investment, which explores the nature of the investment rhythm, principles, methods, and tools for its assessment and mechanisms of macroeconomic management of investment processes.

Among the main features are distinguished:

- activity – the investment process is defined by the pace of changes in the activity of investment activity, the indicators of which in agriculture should be constantly growing within the optimal or specified values;
- increase in scale and intensity – the ratio of investment amounts to the object, including the previous period, the desired growth of indicators in dynamics;
- reproduction – provision of the expanded type of reproduction of fixed capital at the expense of capital investments;
- structural changes – implementation of measures to improve the structure of investments and sources of their financing depending on development requirements;
- innovativeness – ensuring the growth of the proportion of innovative measures and projects in the total value of investments in agriculture by stimulating and supporting their implementation;
- investment attractiveness – assessed by specific methods, its level in agriculture, in general, is largely determined mainly by external factors, and

to increase it requires the implementation of measures of national significance to establish a favourable investment environment and reduce risks;

- investment orientation of agricultural policy – when developing such a policy, it is necessary to ensure a set of measures to prioritise the stimulation and support of investments;

- development of investment infrastructure - organisational and other assistance to the development of the system of organisational, economic, material and technical, financial, credit, information, consulting, scientific and other entities that provide services to investors, promote the efficient development and distribution of real investments, and enhance investment activity;

- investment activity of small and medium agribusiness should be active, it should be stimulated and supported by the state as a priority;

- availability of investment resources – resources are freely available to producers, particularly small ones, and are provided by agricultural, price, financial, credit, and other policies;

- balance of economic interests of participants of the investment process in agriculture – is

reached using agricultural policy and support of investment projects by the identified priorities, and indicative benchmarks for reaching mutual agreements between the participants of a particular investment project on the rate of return or other benefits for their contribution to this project;

- accordance with environmental and ecological requirements and social performance – provides for responsible investment activities and measures of each investor, a system of state control over environmental management and compliance with environmental requirements, and mechanisms of state incentives and support for investments for such purposes;

- involvement in the global investment process – investments in agriculture contribute to the growth of the domestic agri-food sector's proportion in the global agricultural and food markets and global capital flows.

The estimates of the above most significant features of the investment process established that its course in agriculture of Ukraine in 2010-2020 was continuous and is expected to be the same until 2030 (Table 1).

Table 1. Indicators of the dynamics of capital investments in agricultural production in 2010-2020 and their forecast until 2030

Year	Capital investment indicators, million UAH		Index of capital investments to the previous year, %	Index of inflation (+), deflation (-) of capital investments to the previous year
	in prices of the relevant years	brought to of the price dimension in 2020		
<i>In fact</i>				
2010	10817.7	21959.9	x	x
2011	16140.9	30619.3	139.4	10.2
2012	18564.2	34826.4	113.7	1.3
2013	18175.0	34405.3	98.8	-0.9
2014	18388.1	31756.2	92.3	8.9
2015	29309.7	40857.7	128.7	30.7
2016	49660.0	60287.2	147.6	21.8
2017	63400.7	79187.5	131.4	-3.7
2018	65059.4	85032.6	107.4	-4.8
2019	58555.4	76766.2	90.3	-0.3
2020	50189.4	50189.4	65.4	20.3
<i>Forecast</i>				
2021	x	54200.0	108.0	x
2022	x	58400.0	107.8	x

Table 1, Continued

Year	Capital investment indicators, million UAH		Index of capital investments to the previous year, %	Index of inflation (+), deflation (-) of capital investments to the previous year
	in prices of the relevant years	brought to of the price dimension in 2020		
2023	x	62500.0	107.0	x
2024	x	67300.0	107.7	x
2025	x	75000.0	111.4	x
2030	x	135000.0	112.5	x

Source: data of the State Statistics Service of Ukraine and author's calculations

Therewith, the dynamics of capital investments in agricultural development in 2010-2020 were unstable. After the financial crisis of 2008-2009, investors additionally used previously deferred investment resources, which resulted in the effect of the post-crisis surge of capital investments. Thus, their volume in 2011 compared to the previous year increased by 39.4%. In the following unfavourable investment activity years 2012-2015, capital investments in agriculture fluctuated in the range of 32-41 billion UAH. When, after a definite stabilisation of the military situation in Donbas, the confidence of national investors was restored, their volumes in 2016-2017 in price terms in 2020 increased by 47.6 and 31.4%, respectively. However, in the following 2018, the growth rate of capital investment compared to the previous year was only 7.4%, in 2019, it decreased all, and in 2020 the investment decline developed into a crisis, the overcoming of which of paramount significance for the state (Statistical information, 2022). Investment activity in agriculture in the analysed period was generally low, with an average annual capital investment index of 111.5%. Thus, the increase in their scale in agriculture was insignificant – 2.8 billion UAH. Therewith, in the absence of a crisis for investment activity in the periods 2013-2014 and 2019-2020, the scale of capital investment in agriculture could reach an increase of 11 million UAH per year. The unstable dynamics, activity, and scale of changes caused not only insufficient rates of reproduction of capital advanced for agricultural development but continued the process of replacing capital-intensive types of production with relatively low-capital-intensive ones. There-

with, the latter developed an innovative foundation, which ensured the competitiveness of agricultural business in the domestic and world markets.

If the main adverse factors persist, investment activity in agriculture will probably not be intensive enough in the next 3-5 years, and the instability of investment processes will remain. With the weakening of adverse external factors in the future, the volume of capital investments will gradually increase. Under the realistic scenario of the forecast, it is expected that the dynamics of capital investments in agriculture will be described by the following features: 2021-2022 – a slight post-crisis surge in investment activity; 2023-2024 – some slowdown in investment activity; 2025 – the beginning of the intensification of investment processes; 2026-2030 – increasing the pace of investment development. To ensure more optimistic forecasts, it will be necessary to use additional investment factors. Investment activity in agriculture is performed in conditions of inflation of prices for investment resources. From 2011-2020, its average annual rate was 8.4%, which adversely affected the investment opportunities of commodity producers. In the future, investors should be expected to increase the level of inflation risks.

In the macroeconomic investment process, a specific rhythm is associated with the Simon Kuznets cycle, in which investment processes in the agriculture and food industry are interconnected (Kuznet, 1930). This is confirmed by the course of this cycle in the agro-food sectors of the Ukrainian economy in the period 1990-2020 (Fig. 1).

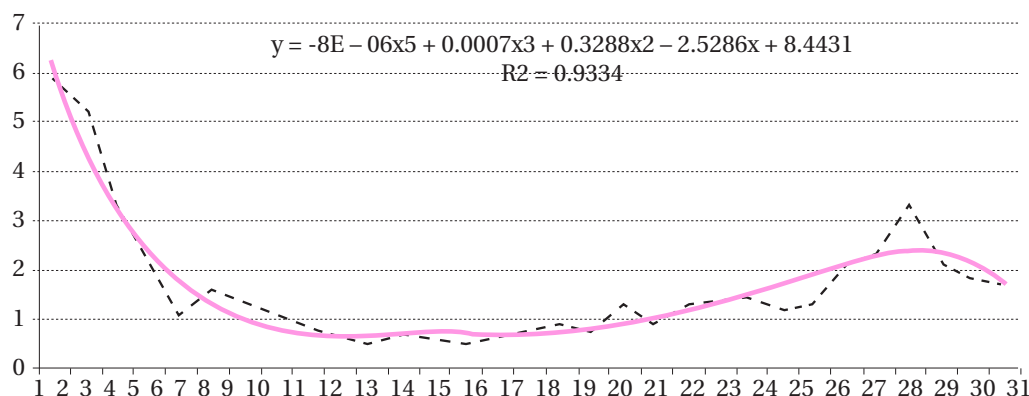


Figure 1. Ratio between capital investments in agriculture and food industry in the period 1990-2020 by actual and fifth order parabola, UAH/USD

Note. Numbering on the abscissa axis from 1 to 31 years corresponds to the sequence of years from 1990 to 2020, on the ordinate axis – the size of the analysed indicator in dynamics

Source: author's calculations based on the data of the State Statistics Service of Ukraine

According to the figure, the duration of one cycle of Simon Kuznets for the conditions of Ukraine, in which the priority of investment in agriculture over the food industry alternately changes, is 26-27 years, while the favourable phase of this cycle for agriculture is 13-14 years. Currently, compared to the food industry, agriculture is more attractive for investment. According to the algorithm of the investment cycle, the phase favourable for agriculture, gradually weakening, will last until 2024-2025.

Then the food industry will become an investment priority. Presumably, with the onset of the priority phase of the food industry, the growth rate of export potential of agro-food products with high added value will accelerate. Considering this, it is appropriate for agri-food companies to start preparing for the development of strategies, programs and projects to increase the capacity of processing agricultural raw materials and selling food and other products with high added value.

Successful development of agro-food sectors of the economy and increasing their market

potential is ensured only by appropriate agricultural policy. The experience of OECD member states and individual member countries serves as an example of the development of such a policy. Agricultural policy indicators of OECD member countries and participants, including Ukraine, are monitored annually (Agricultural policy, 2022). In most of the countries monitored by the OECD, through various mechanisms of state regulation, the excess of prices for agricultural products sold over input prices for consumed inputs is ensured, which is considered as a support for producers. Therewith, the amounts of output and consumed resources are compared to the prices of world markets. In the vast majority of countries, the ratio between the output and input prices of agricultural producers for products and resources, and the proportion of their support, currently exceeds one, which allows producers to develop their sources of financing investments for the expanded reproduction of capital. And in Ukraine, only this ratio is minimal or unsatisfactory (Table 2).

Table 2. Proportion of support to agricultural enterprises (PSE), % of their gross receipts, 1996-2019

Year	OECD	EU	Ukraine
1996	27.34	31.18	-23.82
1997	26.09	29.98	-15.74
1998	29.84	33.37	8.44
1999	32.90	35.86	3.00

Table 2, Continued

Year	OECD	EU	Ukraine
2000	30.13	30.33	-0.10
2001	26.89	28.20	-0.69
2002	28.12	30.83	3.77
2003	26.97	31.13	-1.89
2004	26.96	30.48	-0.02
2005	25.86	28.58	0.47
2006	23.99	27.31	9.04
2007	20.10	22.32	1.72
2008	19.06	20.60	-2.56
2009	20.81	22.61	6.94
2010	19.20	19.33	5.25
2011	17.76	17.75	-3.64
2012	18.23	18.99	-0.24
2013	16.90	19.56	-0.02
2014	16.36	17.27	-1.44
2015	16.97	18.77	0.54
2016	17.86	19.58	-1.45
2017	16.97	18.88	-0.81
2018	17.72	19.66	2.10
2019	18.72	19.48	2.96
2020	18.07	19.33	1.38

Source: (Agricultural policy, 2022)

According to these data, the practice of agricultural policy development in Ukraine does not correspond to the world. Provided in the state budget for 2022, 8.0 with the actual 4.6 billion UAH to support farmers does not add optimism. Considering the world practice, such a level of state support for agriculture in Ukraine (\$ 8 per 1 hectare of land used by agricultural enterprises) can be described as critical. It causes adverse phenomena in the investment processes in agriculture. If this situation continues, existing and new threats to the economy and society of the state will intensify.

Therefore, similar to the practice of OECD members and other countries, Ukraine should implement measures to develop an agricultural policy that would provide appropriate support and incentives for investment in agriculture. The purpose of this policy is to develop investments in the amount that corresponds at least to their minimum amount in developed countries.

The unstable dynamics of capital investments in agriculture, performed at the expense of all sources of financing, still have an ascending character. However, their total amount per 1 ha of land in recent years does not exceed \$ 70, while only at \$ 150/ha, the state is considered to be developing. The manifestation of the insufficient scale of investment in agriculture of Ukraine, in particular, is considered to be: growth of food imports; instability of investment activity in agriculture, predominant specification on the production of low capital-intensive and low value-added products, destruction of part of the food industry, where capital-intensive agricultural products were used. Due to the intensification of agriculture, most enterprises of agro-technical service, construction, water management, land reclamation, and other areas have suspended their activities. Particularly decreased the number of workplaces in rural areas. The development of an efficient agricultural policy and its investment-oriented nature should be

considered one of the most significant objectives of the national policy of socio-economic development.

Innovations in the investment process in agriculture have a significant position, but their significance for the development of national innovative segments of the economy is decreasing. Investors in agriculture have invested in the production of a limited range of the most profitable low-capital and export-oriented products, the establishment of elevator capacities, and the increase of logistics and export potential. In this case, mainly foreign-made machinery and technologies, seeds, and plant protection products are used. Mentioned features of innovations in the investment process result in the fact that most of the added value established in the national agriculture flows out of the state, and the material and technical foundation of the national innovation infrastructure, especially institutions of agrarian science, is not properly developed.

The feature of the investment process in agriculture is the reduction of small agribusiness participation in it. If its proportion in the total amount of capital investments in 2017 was 42.9%, in 2018 – 37.6, and in 2019 – 32.5%. Small enterprises sell their products mainly to market intermediaries at lower prices, they have relatively higher risks of losing products and property as a result of raider attacks, they have fewer opportunities for lending and receiving state support, etc. Support and stimulation of investment activity of small agribusinesses should be one of the most significant objectives of the national agricultural policy. Such priorities should include measures to: promote the design of investment infrastructure; the development of balanced economic relations between institutional participants in the investment process; the inclusion in investment projects of measures that consider environmental and ecological requirements, provide significant social and macroeconomic effects, and are implemented in the foreign logistics of national exports.

Investments in agriculture are currently constrained by widespread cases of imbalanced economic relations, resulting in significant differences in the levels of capital efficiency of participants in

investment projects. The imbalance is manifested, in particular: in relatively low rates of lease payments for land plots of citizens and low wages of staff, and hence the profitability of land and human capital; excess of credit rates over the level of profitability of most investment projects in agriculture, which results in their rejection; unreasonable overstatement of prices for resources and services consumed in agriculture; significantly lower prices for the purchase of agricultural products by intermediaries compared to domestic and foreign markets. The settlement of economic relations will be facilitated by indicative or recommendatory benchmarks of inclusiveness established for the owners of investment projects, particularly those for which state support is provided, which will help to establish equal opportunities for all participants in these projects. It is particularly essential to adhere to the principles of inclusiveness, considering the contribution and level of risk of project participants.

For example, if, according to the results of the project analysis, the profitability of a particular project for a business entity is 15%, then it is economically feasible to adhere to the following ratios in the project efficiency of capital: the human indicator should be 7-10 percentage points higher; land – rent at a rate of 6-9% (actually 3-5%); investment – the rate of return on the capital advanced by the project owner – 10-12%; the margin of suppliers of resources and services is below the payback level of the project, and the margin of buyers of products is not higher than one third. These indicators are approximate, but compliance with them by mutual agreement of the participants of a particular project will establish conditions for the development of fair economic relations and the manifestation of their synergy, and ultimately increase the level of macroeconomic efficiency of investments.

► Conclusions

1. For agricultural management, the investment process in agriculture should be considered a multifaceted and multidimensional economic phenomenon, which runs over time and is described by various features.

2. By economic essence, the investment process in agriculture at the macro level is a continuous flow of organisational, economic and other measures and economic values developed by owners, and other participants of specific investment projects by investing money, material, financial, land, biological, energy, other resources and assets, including natural capital, to obtain the relevant benefits by each participant. The activation of this process at the macro level requires measures to stimulate and support it, and the prevention of investment crises and the adverse consequences of harmful unwanted investments requires the application of measures to deter and counteract adverse factors.

3. Management of the investment process in agriculture at the macro level involves the achievement of its most significant features and trends, such as continuity, sustainability, rhythmicity (cyclicality), increasing the level of activity, increasing the scale and intensity, ensuring expanded reproduction of capital, structural changes, innovation, investment attractiveness, investment orientation of agricultural policy, development of investment infrastructure, growth of the place and role of small and medium-sized agribusinesses, access to investment resources, balanced economic relations, compliance with environmental and

ecological requirements, social efficiency, gaining a proper place in the global investment process.

4. Investment activity in agriculture is influenced by various factors, among which external ones prevail. Under the influence of these factors, the dynamics of capital investment in agriculture are unstable but tend to grow at an average annual rate of 6.6%. According to the realistic scenario of the forecast, this growth rate in the period up to 2030 can be increased to 12.5%.

5. The most significant areas of intensification of the investment process in agriculture in the future are considered to be: maximum establishment of conditions for the development of investment processes based on the investment of private capital; implementation of an efficient agricultural policy using the experience of developed countries, which provides for the regulation of investment activities of producers by supporting and stimulating investments, and in case of investment crises and adverse effects of investment activities – their prevention and counteraction; priority support for the investment development of small agribusiness, investment and innovation infrastructure, responsible investments; ensuring the access of investment process participants to borrowed and attracted sources of financing for their investment projects and activities, etc.

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Макроекономічний інвестиційний процес у сільському господарстві України

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► **Анотація.** Інвестиції у сільське господарство є важливим фактором реалізації колосального потенціалу аграрного сектору в Україні та прискорення економічного зростання і розвитку. Досліджено наукові підходи значення механізму регулювання інвестиційної діяльності, який забезпечить формування набору ефективних інвестиційних потоків. Мета статті – обґрунтувати теоретичні положення щодо сутності й ознак інвестиційного процесу та найважливіших напрямів його активізації в сільському господарстві. У процесі дослідження використано методи: діалектичний – при пізнанні інвестиційних процесів і явищ; абстрактно-логічний – обґрунтуванні теоретичних положень щодо розвитку інвестиційних процесів; економіко-статистичні – виявленні тенденцій та закономірностей в інвестиційному процесі; графічний – оцінках основних показників динаміки і структури інвестицій; кореляційно-регресійного аналізу – встановленні взаємозалежностей між показниками; стратегічного планування – при обґрунтуванні прогнозу інвестицій. Узагальнено теоретичні положення і методичні підходи до оцінок макроекономічного інвестиційного процесу за основними їх ознаками та обґрунтовано найважливіші напрями його активізації у сільському господарстві. Набули подальшого розвитку теоретичні положення щодо економічної сутності інвестиційного процесу, зокрема запропоновано визначення його поняття стосовно сільського господарства, 16 найважливіших ознак і напрямів активізації. Результати дослідження можуть бути використані при формуванні інвестиційної стратегії та політики держави у сільському господарстві

► **Ключові слова:** інвестиції, ознаки інвестиційного процесу в сільському господарстві, сільськогосподарська політика, прогноз інвестицій



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Prospects for the Development of Organic Production in Ukraine Under the European Green Deal

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► **Abstract.** The transition to organic agricultural production is a requirement of the time given the deteriorating environmental situation in the world. Currently, Ukraine is one of the most powerful producers and exporters of agricultural products in the world, and the reorientation of organic agricultural production will strengthen and consolidate its position in the world market. The purpose of the research is to perform a comprehensive description of the general state of development of organic agriculture in Ukraine in the context of the new green course of the European Union and to substantiate possible prospects. Research methodology. In the course of the research, the following methods were applied: regulatory and legal analysis (when making a comparison between the regulatory component of Ukraine and the European Union); scientific abstraction (when forming a hypothesis of the further algorithm of organic product development in terms of institutional and practical component); scientific analysis (when assessing the degree of willingness of organic production in Ukraine to implement the conditions defined by the Council of Europe regulations). Research results. The problems of Ukrainian legislation in the sphere of production and sale of organic products are analysed, and the ways and sequence of elimination of the existing shortcomings are outlined for the decision in the EU countries to significantly increase the area under organic production by 2030, the question of the impact of such a decision on the further prospects of development of this field in Ukraine in the long term is raised. Therefore, the market aspect was analysed, reflecting the existing indicators of the market situation of organic food, strengths and weaknesses were identified from the standpoint of production and market. In addition, the key provisions of the Council of Europe resolution on the adoption of the “green course” were assessed. In this regard, the advantages and disadvantages of Ukraine as one of the largest exporters to the European Union countries were established. The opportunities that the country has received for further development of organic agriculture and its efficient functioning have been identified. Elements of scientific originality. The algorithm for achieving the purposes of the Green Deal in

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the European Union, and the degree of willingness of Ukraine in the institutional and industrial aspects to implement the provisions of the adopted resolution. Practical significance. Despite the positive individual changes in organic production in Ukraine, there are serious institutional problems that require immediate and efficient solutions, in particular, in the field of legislation and standardisation of organic products

► **Keywords:** organic production, green course, European Union, agriculture, balanced development, environmental economics

► Problem statement

The European Green Deal is now distinguished as a priority aspect of the European Commission's policy. Its main purpose is a sustainable, climate-neutral Europe by 2050, which is a tool for attracting investment and growth, and increasing investment in environmentally oriented industries, including organic production (European Green Deal, 2021).

In the "green course", the justification of a specific state model of governance is a key factor in the reorientation to a more sustainable food system of society, in particular in the context of strengthening the importance of small farms in the fight against climate change, environmental protection and biodiversity conservation. Organic agriculture is essential for achieving such purposes. Farmers are the first to feel the consequences of climate change and biodiversity loss. After all, the unstable and unreasonable use of intensive agricultural methods remains one of the main causes of biodiversity loss. Organic farms provide a significant contribution to achieving sustainable agriculture of the future (Khodakivska, Shpykuliak, & Suprun, 2017).

According to available data, the EU countries are expected to significantly expand the area under organic production, which will increase the production of organic food on their production, which will determine developments in the global organic market.

Analysis of recent studies and publications. The problems of organic production development in Ukraine were addressed by such well-known scientists as N.V. Zinovchuk (Zinovchuk, & Rashchenko, 2015), V.V. Kyporenko (Kyporenko,

2014), V.I. Lazarenko (Lazarenko, 2018), V.O. Melnyk (Melnyk, 2014), Ye.V. Mylovanov (Mylovanov, 2009), V.A. Savchuk (Savchuk, 2017), P.M. Skrypchuk (Skrypchuk, 2018), V.V. Tarasova (Tarasova, 2010), V.A. Tkachuk (Tkachuk, 2012), N.H. Toma (Toma, 2012), O.I. Furdychko (Furdychko, 2011), O.V. Khodakivska (Khodakivska, *et al.*, 2020; Khodakivska, Kireytseva, & Zhylin, 2020). Giving proper credit to the scientific achievements of these scientists, it should be noted that current changes in the environmental policy of the European Union require substantiation of new scientific approaches to the development of organic production in Ukraine.

The purpose of the research – is to perform a comprehensive description of the general state of development of organic agriculture in Ukraine in the context of the new green course of the European Union and to substantiate possible prospects.

Outline of the main material. In European countries, organic production at the present stage of design has achieved both the development prospects and has become a necessity, especially in the context of meeting environmental requirements.

Organic production in Ukraine in recent years has demonstrated steady growth both in terms of the number of new operators and exports to different countries of the world, especially to the EU, where Ukraine is one of the leaders in the import of organic raw materials. Despite this, the scale of organic production in Ukraine remains insignificant. Thus, the domestic organic market in Ukraine is just beginning to develop, at the present stage for the country there is a necessity to develop new approaches in the aspect of the institutional

component in the formation of favourable conditions for the development of organic agriculture as a foundation for providing its population with quality environmentally safe products.

As for the institutional component, its main factor is the regulatory aspect. As known, in 2014 Ukraine and the EU signed the Association Agreement. And the text of the mentioned agreement addresses the issue of agricultural development, regulated by Chapter 17 “Agriculture and Rural Development”, where it is noted that “the parties shall cooperate to promote the development of agriculture and rural areas, in particular through the gradual approximation of policies and legislation (Article 403)”. In addition, the prescribed provisions include assistance in the development of modern and sustainable agricultural production, considering the necessity to protect the environment, in particular concerning “the spread of the application of organic production methods and using biotechnologies, including through the introduction of best practices in these areas (Article 404)” (Association Agreement between Ukraine..., 2014).

As it was identified, today the legal framework of Ukraine has several disadvantages, which are manifested by low efficiency in the development of organic production, and the implementation of the provisions specified in the text of the Association Agreement. For example, for a long time, the production and circulation of organic agricultural products in Ukraine were not regulated in the legal field. And this had a corresponding adverse effect on the market of organic products, namely: this market was oversaturated with low-quality products that were labelled as organic or ecological, but did not comply with international organic standards (The world of organic agriculture, 2020). Thus, consumer confidence remains low, which resulted in the loss of market share and the exit of some companies from the market. In this regard, a positive development was the adoption of the Law of Ukraine “On Basic Principles and Requirements for Organic Production, Circulation, and Labeling of Organic Products” of July 10, 2018, No. 2496-VIII (Law of Ukraine № 963-IV, 2003). This Law defines

the basic principles and requirements for organic production, circulation, and labelling of organic products, the principles of legal regulation of organic production, circulation of organic products and the functioning of the organic market, the legal framework for the activities of central executive authorities, subjects of the organic market and the areas of national policy in these areas.

Notably, international cooperation in organic production has gained significant importance, which was facilitated by: the project “German-Ukrainian cooperation in organic farming”; the EU project “Support for the implementation of agricultural and food policy in Ukraine”; Swiss-Ukrainian project “Organic Market Development in Ukraine”, implemented by the Research Institute of Organic Agriculture (FiBL, Switzerland) with the financial support of the Swiss Confederation through the Swiss State Secretariat for Economic Affairs (SECO) (until 2018); Swiss-Ukrainian programme “Higher Value Added Trade Development in the Organic and Dairy Sectors of Ukraine”, funded by Switzerland and implemented by the Research Institute of Organic Agriculture (FiBL, Switzerland) in partnership with SAFOSO AG (Switzerland) and other international projects and programmes (Legislative regulation of the..., 2021; Department of agricultural development..., 2020). However, despite the adoption of the Law of Ukraine “On the Basic Principles and Requirements for Organic Production, Circulation, and Labelling of Organic Products”, a large number of by-laws and regulatory frameworks related to the full functioning of the law have not yet been developed or approved, including procedures for control and registration of both organic production operators and accreditation of certification bodies.

In addition, the Law of Ukraine “On State Control over the Use and Protection of Land” (Law of Ukraine № 963-IV, 2003) provides for mandatory agrochemical certification of land. The result of such certification is an agrochemical passport of the field, and agricultural land, the development of which is performed for state control over changes in fertility, soil contamination with

toxic substances and radionuclides, and rational use of agricultural land.

Thus, the certification of agricultural land results in the key problem of the European organic sector – environmental safety. Quality and safe food is now considered to be the main problem for European citizens. However, over the past decade, the share of ordinary consumers' spending on quality and safe food has been decreasing, which has resulted in lower food prices and, consequently, low incomes for farmers. Organic farming is characterised by a relatively high cost, as organic farmers operate their activities with natural processes and substances without using synthetic products. However, even in European countries with a relatively high level of public awareness, some enterprises apply unfair “rules of the game”, calling their products organic. Although in reality, it does not comply with any standards of organic production.

This problem is relevant for Ukraine, where such producers use the existing gaps in

the legislation, artificially inflating the price of “quasi-organic” products. Considering this, the developed project is designed to solve the existing problem, which Ukraine can use as an undeniable opportunity. According to the product development project, the European Union intends to develop in three areas:

- 1) increase the consumption of organic products;
- 2) increase production and consumption of organic products, allocate 25% of agricultural land for organic farming by 2030, and significantly increase organic aquaculture;
- 3) to ensure sustainable development and increase the role of organic production in solving environmental problems (Communication from the commission..., 2021).

Regarding the consumption aspect, according to official Eurostat data, among the largest consumers of organic products are such countries as Denmark, Sweden, Luxembourg, Austria, Germany, France, and the Netherlands (Fig. 1).

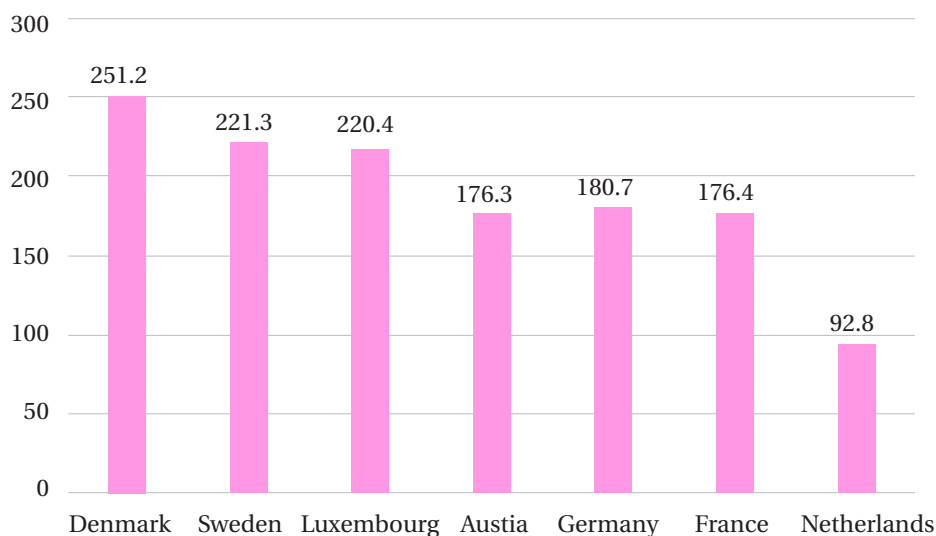


Figure 1. The highest consumption of organic products among EU countries, dollars US per person per year

Source: Based on the authors' data (Eurostat, 2020)

As for Ukraine, according to IFOAM and the Federation of Organic Movement of Ukraine, the volume of the consumer market of organic products in Ukraine in 2020 amounted to 38 million

euros, that is, barely more than 1 euro per person (Federation of Organic Movement in Ukraine, 2021).

According to the analysis of the situation with the development of the organic market in

the EU over the past two decades, it has emerged that by 2020 the growth in consumption of organic

products was more than 2 times ahead of the expansion of land under organic production (Fig. 2).

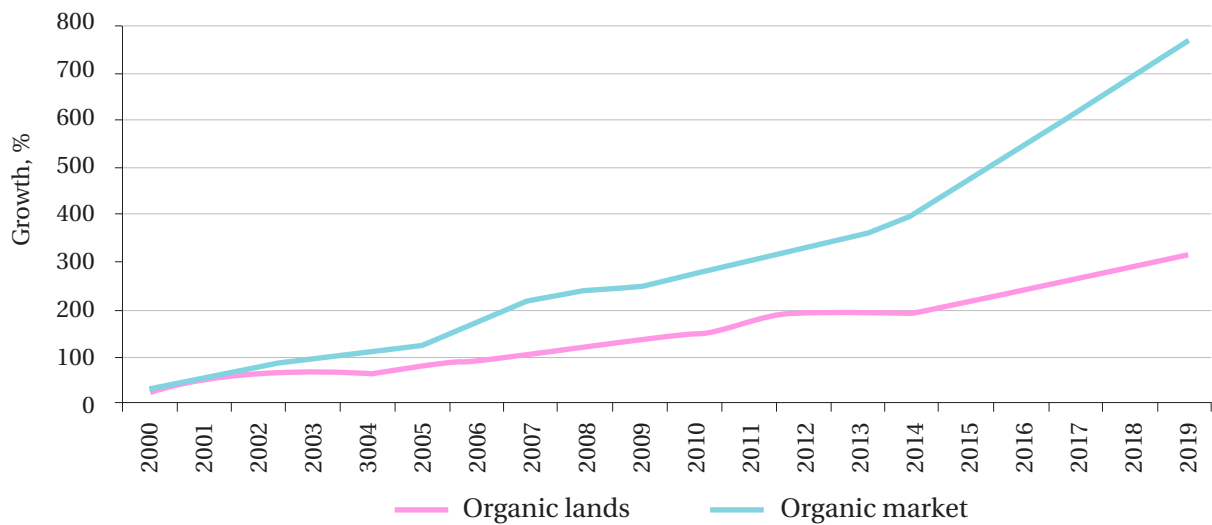


Figure 2. Growth of organic area and retail sales in EU countries in 2000-2019

Source: Based on the authors' data (Federation of Organic Movement in Ukraine, 2021)

Therewith, the detailed situation on the Ukrainian market demonstrated the presence of 597 certified farms. Every year this indicator is growing,

considering the environmental benefits of this way of farming, and economic and market prospects in the context of European integration processes (Fig. 3).

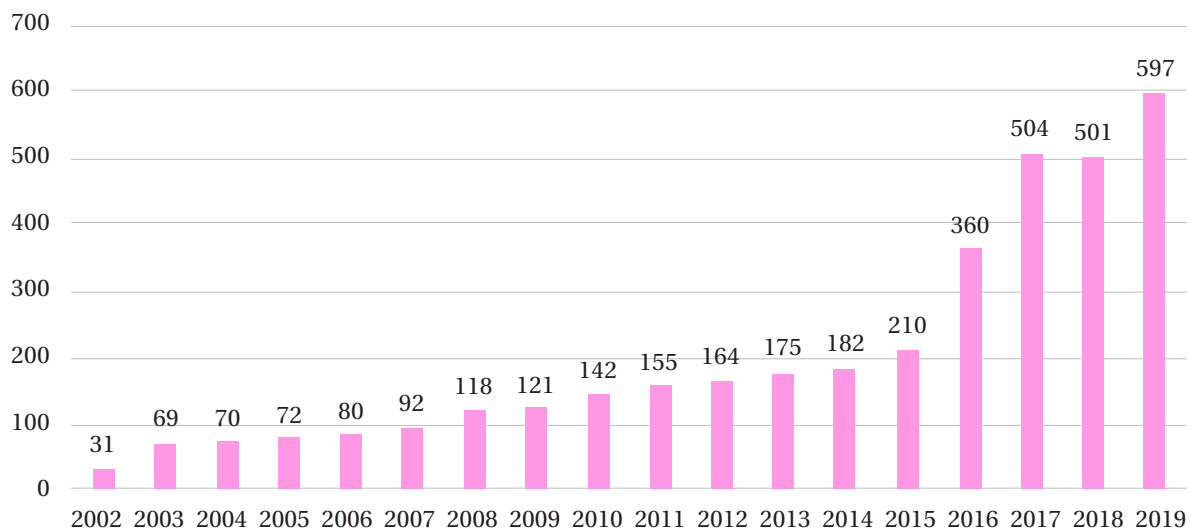


Figure 3. Number of certified organic farms in Ukraine from 2002 to 2019, units

Source: Based on the authors' data (Federation of Organic Movement in Ukraine, 2021)

A significant increase in organic farms may occur in connection with the opening of the land

market in Ukraine. Full owners of the land, recognising the deterioration of natural resources that

belong to them, will have to reorient (at least partially) their production to be less destructive in the environmental aspect.

As it was established, currently in Ukrainian organic agriculture enterprises mostly specialise in the cultivation of grains, legumes and oilseeds, and the production of dairy products. In addition, Ukraine occupies a leading position in the world in terms of honey production. A specific feature of organic agriculture in Ukraine is the concentration of production in its development mainly in fairly large enterprises and holdings specialising in the production of raw materials – grain (corn, soybeans, sunflower, wheat, etc.), vegetables, berries and primary processing products (oilcake).

According to the European Commission, in 2020, Ukraine ranked fourth in the world among suppliers of organic products to this market with a total share of 7.8% (in 2019, it ranked second). Exports of Ukrainian organic products to the

European Union in 2020 decreased by 23.1% compared to 2019, to 217 210 tons. The decline in exports in 2020 was primarily due to a decrease in organic crop yields due to adverse weather conditions.

The main Ukrainian export crops to the organic market of the EU were organic grains (except for wheat and rice), whose exports in 2020 decreased by 44% to 82,900 tons. Despite the recession, Ukraine remained the main supplier to the EU, with a share of 74.4% of total supplies.

In 2020, exports of organic soybeans from Ukraine to the EU increased by 67.8% compared to 2019, to 28.7% (21% of world exports to Europe), organic oilseeds decreased by one-third, to 19 300 tons (14.1%), oilcake – by 9.4%, to 7400 tons (3.2%).

In 2020, Ukraine exported 5.9% more fresh and dried organic vegetables to the EU than in 2019, 15,500 t, while exports of fresh, chilled and dried organic vegetables decreased by 13.2% to 5,400 t (Ministry of Agriculture, 2021) (Fig. 4).

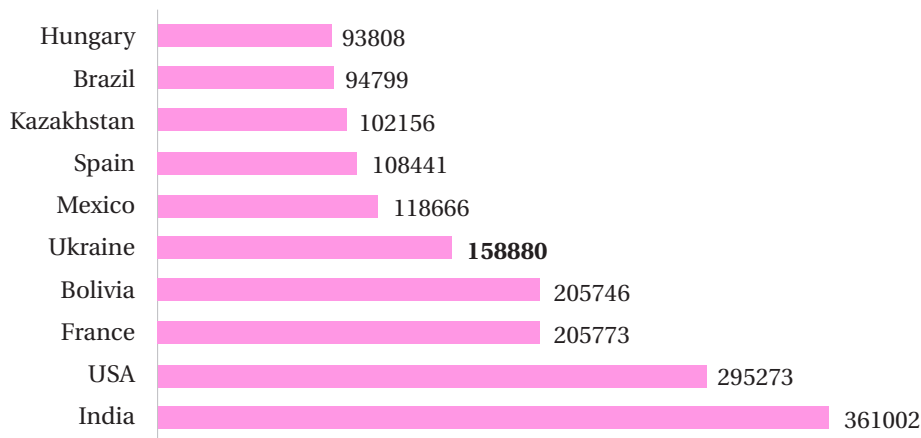


Figure 4: Top 10 countries by areas of organic land in the world, ha

Source: Based on the authors' data (Eurostat, 2020)

Evidently, Ukraine is currently at the initial stage of development of organic production, despite the leading position in exports to the EU countries and a fairly large area under organic production compared to other countries, due to the large area of agricultural land in Ukraine. However, at the present stage, it is impossible to assert that in the coming years the development of organic

production in Ukraine in terms of the area will comply with the requirements of European legislation.

All this is explained by the following factors:

- 1) low level of support for organic production by the state and insufficient promotion of a healthy lifestyle in Ukraine;
- 2) awareness of the population about the features of organic products;

3) low income of the absolute majority of the population in Ukraine;

4) distrust of organic products by consumers and retail chains, conditioned upon a large number of pseudo-organic products and unfair competition of other producers;

5) lack of efficient legislation protecting the rights of producers and consumers of organic products.

► Conclusions

Analysing the situation with the development of organic production in Ukraine, the EU, and other leading countries of the world, it can be stated that in recent years, organic production has begun to play a significant role in providing the population with quality, environmentally friendly food, in particular, children's and dietary food. In addition, a healthy lifestyle is gaining popularity.

Climate change, which is already observed enough, and its catastrophic consequences in the form of floods, droughts, and fires, in particular, in European countries, are additional factors that make paying more and more attention to environmental problems and finding ways to solve them. Hence, the public pressure on the governments of the EU and other highly developed democratic countries of the world is increasing, forcing them to accelerate the adoption of measures to promote green technologies.

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Notably, the growth in demand for organic products in recent years is not compensated by the expansion of the area under organic production in the EU countries. Thus, as it appears, the deficit of organic products in the European and other organic markets becomes an undeniable chance for Ukrainian organic producers to gain a foothold in one of the most dynamically growing markets in the world.

However, it should be considered that the adverse experience of falsification of organic products by domestic enterprises in the past years hurt the Ukrainian reputation in the global organic market. Considering this, it is essential to establish a functional system of monitoring and support for organic producers in Ukraine. Therewith, one of the possible options for such a monitoring system in the current business environment is the establishment of a single digital platform that unites interests at all three levels: state, local, and consumer.

In the context of this monitoring, an essential aspect is the control of integrity both in respect of compliance with the ethical rules of producers who position themselves as organic producers and those who conduct conventional agriculture. After all, conventional business entities, particularly, large producers, have a systemic adverse impact on the environment, using excessive (sometimes even prohibited) chemicals that pollute the soil and transform it into unsuitable for organic agriculture.

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Перспективи розвитку органічного виробництва в Україні в умовах європейського зеленого курсу

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► **Анотація.** Перехід на органічне агровиробництво є вимогою часу з огляду на погіршення екологічної ситуації в світі. Наразі Україна є одним із найпотужніших виробників та експортерів сільськогосподарської продукції в світі, а переорієнтація на органічне сільськогосподарське виробництво дозволить посилити та закріпити свої позиції на світовому ринку. Мета статті – здійснити комплексну характеристику загального стану розвитку органічного сільського господарства України в умовах нового зеленого курсу Європейського Союзу та обґрунтувати можливі перспективи. Методика дослідження. В процесі дослідження застосовано наступні методи: нормативно-правовий аналіз (при здійсненні порівняння між нормативною складовою України та Європейського Союзу); наукової абстракції (при формуванні гіпотези подальшого алгоритму розвитку органічного виробництва в аспекті формально інституційної та практичної складової); наукового аналізу (при оцінці ступеня готовності органічного виробництва України до впровадження умов, визначених регламентом Ради Європи). Результати дослідження. Проаналізовано проблеми українського законодавства у сфері виробництва та реалізації органічної продукції, окреслено шляхи й послідовність усунення існуючих недоліків за прийняття рішення в країнах ЄС про значне збільшення площ під органічним виробництвом до 2030 р., постає питання про вплив такого рішення на подальші перспективи розвитку згаданого напрямку в Україні в довгостроковому періоді. Звідси проаналізовано ринковий аспект з відображенням наявних показників ринкової кон'юнктури органічних продуктів харчування, визначено сильні та слабкі сторони саме з позиції виробництва та ринку. Крім цього, надано оцінку ключових положень резолюції Ради Європи про прийняття «зеленого курсу». У такому контексті встановлено переваги і недоліки України, як одного з найбільших експортерів для країн Європейського Союзу. Визначено можливості, які отримала країна для подальшого розвитку органічного сільського господарства та його ефективного функціонування. Елементи наукової новизни. Сформовано алгоритм досягнення цілей зеленого курсу в країнах Європейського Союзу, а також ступінь готовності України в інституційному і виробничому аспектах до застосування на практиці положень прийнятої резолюції. Практична значущість. В органічному виробництві України незважаючи на позитивні окремі зміни, існують серйозні проблеми інституційного характеру, що потребують негайного та ефективного вирішення, зокрема в сфері законодавства та стандартизації органічної продукції

► **Ключові слова:** органічне виробництво, зелений курс, Європейський Союз, сільське господарство, збалансований розвиток, економіка природокористування



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Methodological and Practical Aspects of Increasing the Capitalisation of Agribusiness

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► **Abstract.** The development of agribusiness in Ukraine at the present stage is characterised by a radical restructuring of the institutional structure of the agrarian economy, which is associated with the processes of capitalisation. The purpose of the research is to analyse the impact of the underestimation of fixed assets of agriculture on the financial and economic indicators of the industry and to develop scientifically based proposals for their improvement. Research methodology. Methods used: monographic (analysis of provision and development of agriculture with basic production means); analysis of series of dynamics, and structural changes (to establish the state and identify trends in the development of the market of material and technical resources); comparison (comparison of economic indicators); tabular and graphical (visual display of research results in the form of tables and graphs), abstract-logical (generalisation and development of conclusions). Research results. The current state of capital intensity and investment support of agriculture in Ukraine is analysed. The level of actual revaluation, the necessity and ways of revaluation of fixed assets of agriculture are determined. Elements of scientific originality. The methodological and practical provisions on innovation and investment development in agriculture were further developed, based on the modernisation of the material and technical base of agricultural enterprises, considering scientific achievements, accelerating the solution of important objectives regarding the further growth of capital intensity of production. Practical significance. The necessity of revaluation of fixed assets is substantiated to adopt objective decisions on state regulation of agriculture and its taxation system and increase the actual capitalisation of enterprises in the industry to attract investment resources

► **Keywords:** fixed assets, investments, profitability, revaluation, logistics, indexation

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► Problem statement

Nowadays, quantitative and qualitative parameters of fixed production assets of agricultural enterprises of Ukraine do not contribute to the achievement of highly competitive positions of domestic farmers, particularly medium and small farms (Werner, 2020). The consequence of the underestimation of fixed assets in agriculture was levelled absolute and relative financial and economic indicators of the industry, in particular depreciation, cost, financial result, and profitability of agricultural production. Considering this, the urgent objective is to determine the regulatory requirement for fixed assets for the production of agricultural products since the existing gap between their actual availability and the estimated amount is critical. The revaluation of fixed assets should be considered as an instrument for preserving the economic value of agricultural assets that reflects their actual market value.

Thus, the actual availability of fixed assets in agriculture in 2020 in value terms amounted to 530.7 billion UAH, while the estimated amount should have exceeded this amount almost twice and reached 923.6 billion UAH.

In this case, depreciation deductions included in the cost of agricultural production would not be 37.5 billion UAH, as stated in the statistical collections, but the real fair value necessary for the expanded reproduction of fixed capital – 64.7 billion UAH (923.6 billion UAH \times 0.07) (Badingatus, Hastuti, Asrori, & Budiyo, 2020; Polyanskaya, 2021).

► Analysis of recent studies and publications

Notably, the significant contribution to the organisation of methodological and methodical principles of simple and expanded reproduction of fixed assets, the assessment of the agricultural property of agricultural enterprises, which is essential for the scientific substantiation of technical and technological renewal of fixed assets of agricultural production and ensuring the efficiency of capital investment, of such well-known

domestic scientists as M.I. He runs (Mohylova, Pidlisetskyi, Herun, & Vasylok, 2011); V.M. Zaiats, Y.S. Bezdushna, M.G. Mikhailov (Zakharchuk, Zaiats, & Mohylova, 2020); M.I. Kisil (Zakharchuk, & Kisil, 2021); M.M. Mohylova (Mohylova, 2007; Mohylova, 2016; Zakharchuk, Voitiuk, & Mohylova, 2019), Herun M.I. (Pidlisetskyi, Mohylova, & Herun, 2013); foreign – M. Azouzi, A. Jarboui (Azouzi, & Jarboui, 2012); G. Iatridis, G. Kilirgiotis (Iatridis, & Kilirgiotis, 2012); F. Missonier (Missonier, 2007) and many others.

The purpose of the research – is to analyse the impact of the underestimation of fixed assets of agriculture on the financial and economic indicators of the industry and to develop scientifically based proposals for their improvement.

► Outline of the main material

The design concerning the development of the market of means of production, determination of their value in conditions of inflation, and establishment of new economic structures are of great scientific and practical significance. In the context of rising prices for material and technical resources, the indicators of cost, income, and profitability of enterprises no longer work as tools of economic analysis, and depreciation charges frequently do not provide sufficient renovation sources for the simple reproduction of fixed assets. Despite the high growth rates of prices for material and technical resources for agriculture, in the current conditions, the assessment is not given proper attention. The conducted studies indicate the absence of periodic revaluation of fixed assets, despite its necessity specifically for the enterprises and the regulation of its implementation by separate regulations.

Methodological support of property valuation is established by national valuation standards, approved methods, procedures, recommendations, and valuation standards of self-regulatory organisations-appraisers. The main of them are National Standard No. 1 – 2003 “General principles of valuation of property and property rights”; National

Standard No. 2 – 2004 “Valuation of real estate”; National Standard No. 3 – 2006 “Valuation of integral property complexes” and National Standard No. 4 – 2007 “Valuation of intellectual property rights”. Since the approval of national standards, the gap between the reflection of the considered international standards of modern evaluation practice and the content of national evaluation standards has increased (Tripti, 2020; Kuzmider, 1974).

Comparison of the evaluation frameworks adopted in IVS-2017 (international), EVS 2016 (European), and Ukrainian standards. Comparison of the international evaluation standards IVS-2017 with the European standards EVS-2016 allows stating the following: by their structure and content, the international evaluation standards IVS-2017 and the European standards EVS-2016 differ significantly from each other. These differences are determined primarily by the specific orientation of the standards themselves. If the international valuation standards IVS-2017 have a universal character and can be considered as the most general, the European valuation standards EVS-2016 are targeted at their application for property valuation, which is associated with the purpose of these standards to be included in the European legislation regulating this field;

- despite all the differences in the structure and content of the IVS-2017 and EVS-2016 standards, there is a similarity and consistency of interpretation of such key elements of valuation as market value, market rent, valuation approaches, valuation methods, reporting requirements, valuation procedure, etc; when considering the most general elements of the procedure, criteria, and requirements of the value assessment, it is advisable to rely on the international standards IVS-2017. If it is required to consider the specifics of property and property rights in more detail, specifically about the European market, the EVS-2016 family of standards should be used;

- in their structure and content, the new versions of the international evaluation standards

IVS-2017 and European standards EVS 2016 have undergone significant changes compared to previous editions, testifying to the accumulated experience of their application and prospects for further development (Lupenko, Zakharchuk, & Vyshnevetska, 2015).

Since the approval of national standards, the gap between the reflection of the considered international standards of modern evaluation practice and the content of national evaluation standards has increased. Thus, when revising the current national valuation standards, it is necessary to be guided by the structure and content of the most prominent international valuation standards under consideration, considering

- The specifics of their implementation in the legislative and regulatory field of Ukraine.

- All property on the balance sheet of enterprises should be subject to revaluation, regardless of the time of commissioning, and technical and physical condition. After all, the balance, validity, and efficiency of the state regulatory policy depend on the reliability and scale of the information base on the status of the agricultural sector, and the impact of macroeconomic indicators of the state.

- Essential economic elements that determine the performance of agricultural production are fixed and current assets, in particular, their cost parameters. The actual value of fixed assets determines the financial and property status of the enterprise. Instead, the volume of working capital indicates the extent to which economic entities are provided with financial resources to service current production and commercial activities. The cost of fixed assets in terms of depreciation is a component of the cost of agricultural production, which affects the financial results and profitability of agricultural production. Current assets ensure the profitable use of fixed assets of the enterprise.

- The ratio between current and fixed assets in agriculture, forestry, and fisheries in 2010-2020 was as follows (Fig. 1).

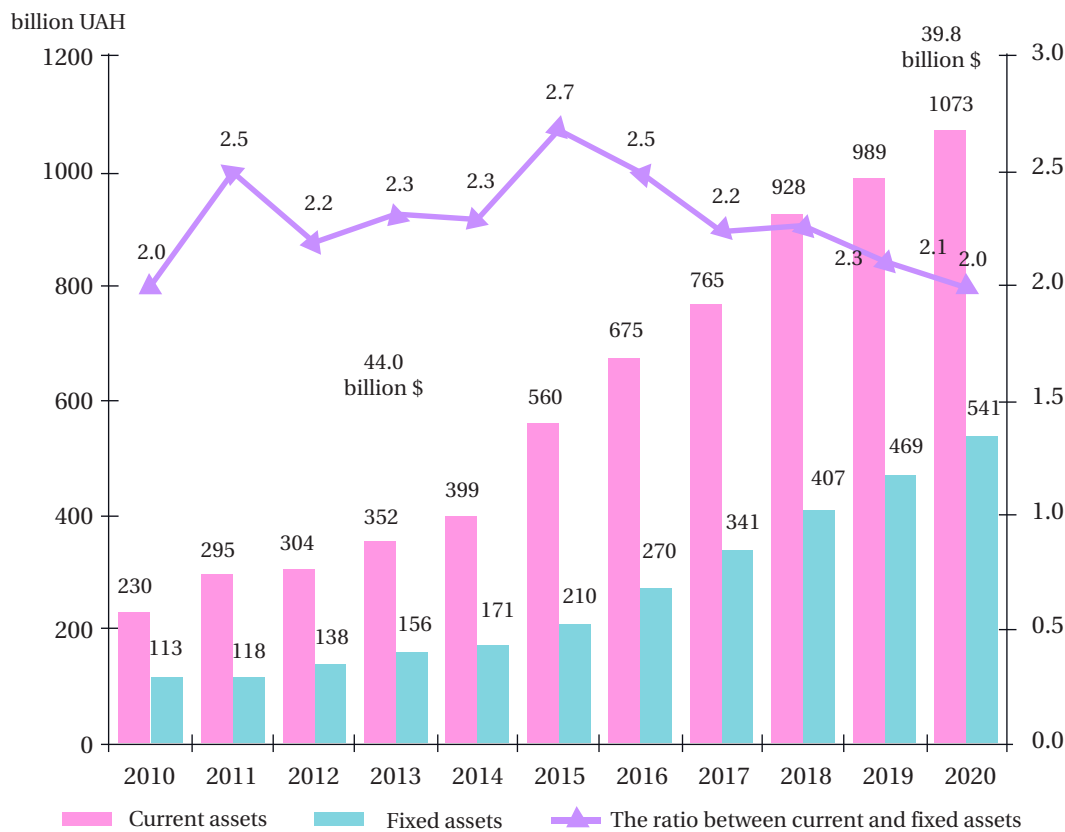


Figure 1. Ratio between current and fixed assets in agriculture, forestry and fisheries

Source: Based on data (Werner, 2020; Fixed assets of Ukraine, n.d.; Agriculture of Ukraine, n.d.)

According to these data, in 2020, compared to 2010, the cost of fixed assets of agriculture, hunting and related services increased by more than 4.8 times, and working capital – by 4.7 times. Therewith, the value of working capital in dollar terms in 2020 is 9.5% lower and amounts to 39.8 billion US dollars compared to 2013 – 44 billion US dollars, that is, the level of capital availability in 2013 has not yet been reached. The ratio between current and fixed assets at the beginning and end of the analysed period remains the same – 2 UAH/USD. Sectoral disproportionality of accumulation and reproduction of fixed assets is due to the reorientation of investment processes in the national economy of Ukraine.

During the period of the general investment crisis from 1991 to 1997, the decline in capital investments occurred in the country's economy in general. Therewith, the rate of decline in investment in fixed capital in agriculture exceeded the

overall rate of decline in investment in the national economy: if in the country's economy the investment index to the previous year was in the range of 0.63-0.91, then in agriculture – 0.46-0.95. Since 1998, the Ukrainian economy, in general, has been experiencing an intensification of investment activity, as evidenced by investment growth rates: in 1998-2000, the index of investment in fixed assets of the national economy exceeded 1, while in agriculture the annual decline in investment continued to be in the range of 9-24%. And only since 2001 investment processes have been activated in the agricultural sector. In 2001-2008, the index of investment in fixed capital in agriculture was 1.05-1.53, respectively in the national economy 1.02-1.31, except for 2008: 2008-2010 – by 1-41% in the economy in general, in 2008 – by 50% in agriculture (Irwan, 2014).

The trend of capital investment dynamics in agriculture is characterised by unevenness, and

changes in it are determined mainly by foreign economic and other factors. The investment decline in 2014-2015, caused by external aggression and military events in the South and East of the country, resulted in agricultural investment reaching the level of 2012-2013 only in 2017.

After a surge in investment activity in Ukrainian agriculture in 2016-2018, the volume of capital investments in 2019 decreased by 5% compared to the previous year, and in 2020 – by 21% compared to the maximum of USD 2.4 billion in 2017 and 2018. USD in 2017 and 2018 (Fig. 2).

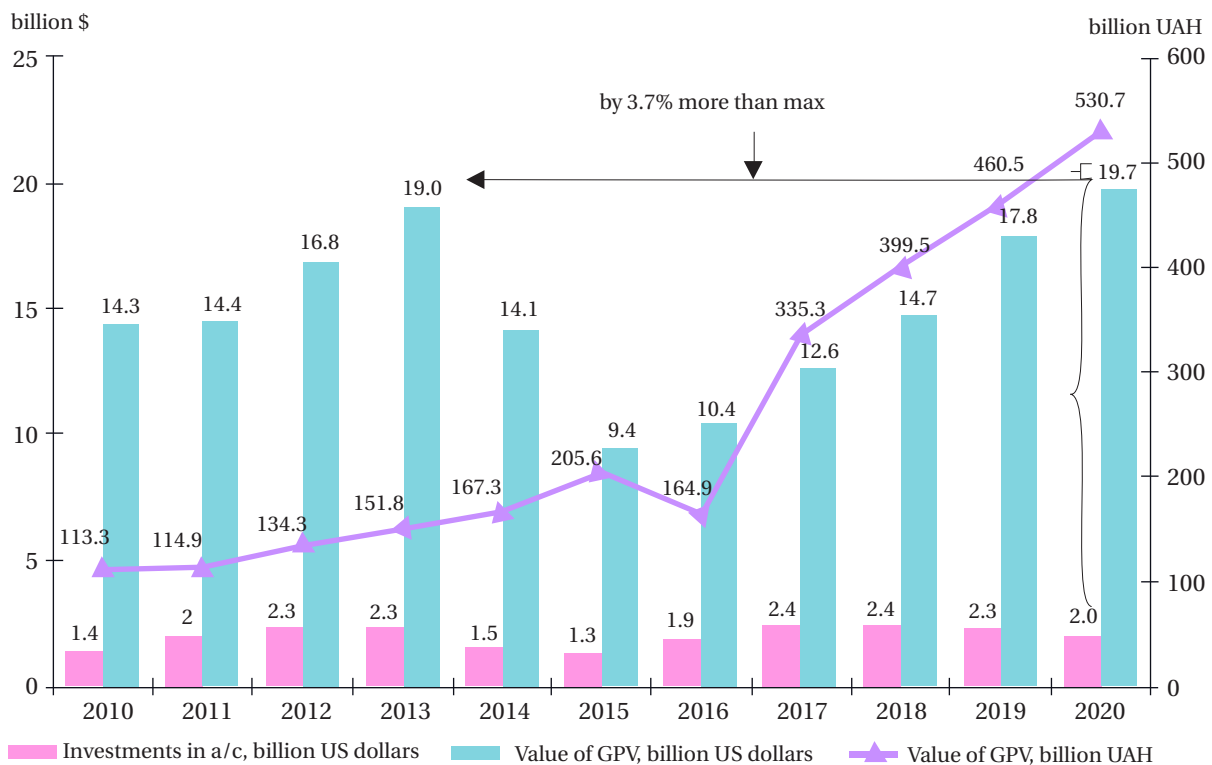


Figure 2. Dynamics of the value of fixed assets and investments in agriculture

Source: Based on data (Werner, 2020; Fixed assets of Ukraine, n.d.; Agriculture of Ukraine, n.d.)

The situation in agriculture demonstrates that, despite the decline in investment flows, the value of fixed assets grew by 21% and 10.7%, respectively, during the same period. The positive side of this situation is that in 2020, for the first time in the last 10 years, the value of fixed assets exceeded the maximum figure of 2013 by 3.7% and reached almost 19.7 billion USD.

Currently, in agriculture, compared to the national economy, each hryvnia of capital investment provides more added value, which indicates the necessity of financing the renewal of sectoral fixed assets.

The growing significance of objective valuation of agricultural property by the market situa-

tion is conditioned upon macroeconomic requirements, in particular, in the information support of the justification of the national regulatory policy. At the present stage, the issue of value measurement of fixed capital of agricultural producers is extremely relevant. Operating with reliable information on the cost and condition of the sectoral fixed capital allows for determining the number of necessary investments for the development of a modern material and technical base of agriculture. An objective assessment of the necessity for investments serves as an information foundation for the justification and implementation of the state depreciation, investment, credit and technical policies that determine the conditions for the reproduction

and renewal of fixed assets in the agricultural sector (Zakharchuk, 2021).

Disadvantages of the practice of valuation of sectoral fixed assets cause problems of validity of economic levers used by state authorities in the performance of stimulating, distributive and other functions. The main mechanisms of state regulation of the market economy include fiscal policy. Since 1999, to stimulate the development of domestic agricultural production, Ukraine has established a preferential tax regime for agricul-

tural producers. However, recently the financiers of the country have raised the issue of the abolition of tax benefits and state support for agricultural producers. One of the main arguments in favour of this is the relatively high level of profitability of agricultural production. According to the data of statistical reporting for 2010-2020 on the country's economy, this level ranged from unprofitability of 4.1% to profitability at the level of 10.4%, while the profitability of agricultural production – was 11.2-41.7% (Table 1).

Table 1. The level of profitability of various types of economic activity in Ukraine according to statistical reporting, %

Type of activity	Year											
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Operational activity:												
- national economy	4.0	5.9	5.0	3.9	-4.1	1.0	7.4	8.9	9.1	10.4	10.7*	
- agriculture, forestry, fishery	22.9	23.2	21.7	11.3	20.6	41.7	32.4	22.7	18.3	18.7	29.7*	
Production of agricultural products in agricultural enterprises:												
total	21.1	27.0	20.5	11.2	25.8	45.6	37.3	26.8	22.8	11.8	19.0	
crop production	26.7	32.3	22.3	11.1	29.2	50.6	44.4	30.0	25.5	14.2	22.3	
cattle breeding	7.8	13.0	14.3	11.3	13.4	22.1	7.7	12.7	9.7	0.1	-4.7	

Notes: *Expected

Source: Calculated based on (Werner, 2020; Agriculture of Ukraine, n.d.)

However, a deeper analysis demonstrates the illusory nature of such profitability in agriculture. The reason for this is the discrepancy between the consumed fixed capital and the accrued depreciation charges, which should ensure its reproduction. In turn, underestimated depreciation charges similarly affect the cost of production, which results in artificially inflated financial results and profitability of agricultural activities.

The discrepancy between depreciation deductions and the costs of fixed agricultural capital

and the requirements for its reproduction is conditioned upon the absence of an efficient practice of revaluation of agricultural fixed assets, while economic entities in other sectors revalue their property. Thus, over the past 15 years, fixed assets in agriculture have been revalued only by 53%, while in other sectors of the national economy (without agriculture) – by 12.3 times. The issue of revaluation of agricultural property is actualised in conditions of constant inflation with rather high growth rates of prices for sectoral fixed assets (Table 2).

Table 2. Actual revaluation of fixed assets in agriculture of Ukraine and price growth in 2005-2020 (at the beginning of the year), *indices* *

Year	Level of actual revaluation		Producer price index		
	National economy without agriculture	Agriculture	Tractors and agricultural vehicles	Vehicles	Construction and installation works
2005	1.06	1.04	1.179	1.002	1.256
2006	1.14	1.01	1.183	0.956	1.235
2007	1.18	1.02	1.089	1.048	1.231
2008	1.44	1.08	1.138	1.087	1.353
2009	1.19	1.02	1.112	1.305	1.113
2010	1.68	1.02	1.092	1.048	1.158
2011	n/a	n/a	1.204	1.017	1.194
2012	1.2	1.02	1.039	1.009	1.126
2013	1.12	1.01	1.021	1.002	1.056
2014	1.41	1.06	1.126	1.2	1.095
2015	1.16	1.09	1.497	1.479	1.271
2016	n/a	n/a	1.145	1.094	1.092
2017	1.05	1.02	1.117	1.085	1.134
2018	1.19	1.02	1.103	1.094	1.2
2019	1.02	1.01	1.046	0.998	1.1
2020	1.07	1.02	0.989	1.034	1.097
During the period 2005-2020	12.3	1.53	6.59	3.71	11.65

Source: (Werner, 2020; Fixed assets of Ukraine, n.d.)

The studies conducted on the revaluation of sectoral fixed assets have established the priority of compliance in practice with the tax revaluation scheme that was in force until 2015. The application of the tax approach introduced in 1997 in the revaluation practice affected the level of undervaluation of agricultural fixed assets: from 2005 to 2020, tractors and agricultural machinery rose in price by 6.6 times, construction and installation works – by 11.7 times, motor vehicles – by 3.7 times.

This situation is paradoxical since this scheme was provision only for income taxpayers. The application of the tax approach to the revaluation of

fixed assets by agricultural enterprises is explained by the following: conservative accounting practice with the habit of accounting according to clearly regulated rules; uncertainty in the stability of the “rules of the game”.

Starting in 2015, the tax provision on the indexation of fixed assets using the adjusted inflation index was abolished. However, this did not contribute to the efficiency of the practice of revaluation of fixed assets in agriculture. Thus, in 2013-2020, agricultural fixed assets were revalued by only 31%, while industrial enterprises – by more than 2.8 times (Table 3).

Table 3. Level of actual revaluation of fixed assets of individual sectors of the national economy of Ukraine in 2013-2020, *indices**

Type of economic activity	Years								
	2013	2014	2015	2016	2017	2018	2019	2020	2013-2020
Agricultural sector	1.01	1.06	1.09	1.05	1.02	1.02	1.01	1.02	1.31
Industry	1.10	1.13	1.95	0.78	1.07	1.3	1.06	1.07	2.79
Production of oil and natural gas	1.95	1.00	1.42	1.01	0.9	1.0	1.01	1.01	2.57
Recycling industry	1.02	1.37	2.03	1.05	1.18	1.04	1.01	1.16	4.28
Production of transport vehicles	1.02	1.04	20.05	1.0	1.21	1.02	1.0	1.0	26.25
Transport, storage facility, postal activity	1.16	1.60	1.02	1.07	0.92	1.34	0.89	1.07	2.37
Supply of electricity, gas, steam and air conditioning	1.15	0.99	2.27	0.45	0.98	1.75	1.12	1.01	2.41

Source: calculated based on (Fixed assets of Ukraine, n.d.)

Currently, the lack of an efficient practice of revaluation of fixed assets in agricultural enterprises is explained by the shortcomings of the regulation of this process, in particular, the obligation of an independent expert assessment of fixed assets for their revaluation in accounting.

The important macro indicators to be analysed to assess socio-economic processes in the agricultural sector are resource availability, financial results, and profitability of agricultural production. One of the economic elements affecting the performance of agricultural production is the cost parameters of fixed assets. The cost of fixed assets in terms of depreciation is a component of the cost of production, which affects the absolute and relative financial and economic performance of agricultural activities. The value of property, plant and equipment and intangible assets changes due to the long-term nature of their participation in economic turnover, in particular under the influence of physical and moral wear and tear, reduction and restoration of the utility of objects, and inflationary processes and changes in the market conditions of material

and technical resources. The latter necessitates constant revaluation of long-term production assets.

The consequence of the underestimation of sectoral fixed assets is the levelled absolute and relative financial and economic indicators of agricultural activity, in particular depreciation, cost, financial result and profitability. The revised calculation of the main financial and economic indicators of economic activity of agricultural enterprises, considering the actual underestimation of sectoral fixed assets in 2015-2020, demonstrated that they are overestimated. In 2015, at the level of profitability of agricultural production of 45.6% according to the official statistical reporting (form No. 50-ag), the estimated indicator, considering the revaluation of fixed assets at the beginning of the year was 34.8%, not considering the further impact of the growth of prices for fixed assets in the current year at 25.5%. In 2020, with the profitability of 29.8% according to statistical reporting, the adjusted level of profitability by the actual undervaluation of fixed assets was 20.8%, which does not consider the inflationary increase in prices for

sectoral fixed assets in the reporting year (Table 4).

In 2015-2020, the amount of underestimated depreciation reached UAH 140 billion,

which affected the calculation of profitability and determination of the level of profitability of agricultural enterprises in Ukraine.

Table 4. Financial and economic indicators of agricultural enterprises of Ukraine according to statistical data and considering underestimation of sectoral main assets in 2015-2020*

Indicator	Year											
	2015		2016		2017		2018		2019		2020	
	stats. data	Calculated with revaluation	stats. data	Calculated with revaluation	stats. data	Calculated with revaluation	stats. data	Calculated with revaluation	stats. data	Calculated with revaluation	stats. data	Calculated with revaluation
Net income (revenue) from the sale, billion UAH	279.8		377.7		473.3		513.5		553.5		586.9	
Accrued depreciation, UAH billion	8.7	24.1	16.4	35.9	19.0	44.1	27.9	64.7	37.5	46.9	40.1	73.9
Full cost price, billion UAH	192.1	207.5	288.4	307.9	405.0	430.1	443.0	479.8	463.3	487.3	452.2	486
Income (loss), billion UAH	87.7	72.3	89.3	69.8	68.3	43.2	70.5	33.75	90.2	66.2	134.7	100.9
The level of profitability, %	45.6	34.8	30.9	22.7	16.9	10.0	15.9	7.0	19.4	13.6	29.8	20.8

Source: calculated according to the statistical bulletin “Main economic indicators of agricultural production in agricultural enterprises”

The dynamism of the economic environment, the growth of competitive risks and the specifics of the development of the agricultural sector require constant improvement of the methodological aspects and practical principles of the implementation of mechanisms for increasing the capitalisation of agribusiness, which would ensure the solution of strategic objectives – increasing the level of competitiveness of business entities in agricultural production, maximising the market value of agribusiness based on objective information on the condition and value of fixed assets in agriculture, adaptation to the main methods and standards for the valuation of fixed assets in national agriculture. The proposals and practical recommendations can ensure fair financial results, which would provide a new impetus for the development of the agricultural sector of the Ukrainian economy.

► Conclusions

Underestimation of fixed assets of the agricultural sector results in artificial overestimation of the efficiency of agricultural activity. Therewith, the level of revaluation (indexation) of fixed assets in other sectors of the national economy is several times higher than in agriculture, respectively, affecting the “relative” understatement of the profitability of operating activities of enterprises in other sectors (“relative” to the indicators of agriculture).

The bias of microeconomic indicators and, as a consequence, the information base of macroeconomic nature cause insufficient validity of the national regulatory policy in terms of agricultural development. As a result, biased decisions regarding the state regulation of agriculture and its taxation system are adopted, and the actual capitalisation of agricultural enterprises is underestimated,

which limits, in particular, their ability to attract credit resources.

To substantiate the national agrarian policy, relevant objective information is required, including the condition and value of fixed assets. It is essential to initiate the development of a sectoral methodology for the mass revaluation of fixed assets in agriculture, which will provide an opportunity to assess the overall financial and economic

condition of the agricultural sector and will determine the priorities of national investment policy in agriculture.

Thus, there is a necessity for the revaluation of fixed assets of agriculture, which is proposed in two ways: a one-time industry-wide indexation of the book value of fixed assets and mass revaluation of fixed assets at fair value by the methodology of property valuation.

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Методичні та практичні аспекти підвищення капіталізації агробізнесу

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► **Анотація.** Розвиток агробізнесу в Україні на сучасному етапі характеризується докорінною перебудовою інституціональної структури аграрної економіки, що пов'язано із процесами капіталізації. Мета статті – проаналізувати вплив недооцінки основних засобів сільського господарства на фінансово-економічні показники галузі та розробити науково обґрунтовані пропозиції щодо їх поліпшення. Методика дослідження. Використано методи: монографічний (аналіз забезпечення та розвитку сільського господарства основними виробничими засобами); аналізу рядів динаміки, структурних зрушень (для встановлення стану й виявлення тенденцій розвитку ринку матеріально-технічних ресурсів); порівняння (зіставлення економічних показників); табличний і графічний (наочне відображення результатів дослідження у вигляді таблиць та графіків), абстрактно-логічний (узагальнення та формулювання висновків). Результати дослідження. Проаналізовано сучасний стан капіталоемності та інвестиційного забезпечення сільського господарства в Україні. Визначено рівень фактичної переоцінки, необхідність і шляхи дооцінки основних засобів сільського господарства. Елементи наукової новизни. Набули подальшого розвитку методичні й практичні положення щодо інноваційно-інвестиційного розвитку в сільському господарстві, в основу яких покладено модернізацію матеріально-технічної бази сільськогосподарських підприємств з урахуванням наукових досягнень, прискорення вирішення важливих завдань стосовно подальшого зростання капіталомісткості виробництва. Практична значущість. Обґрунтовано необхідність переоцінки основних засобів з метою прийняття об'єктивних рішень щодо державного регулювання сільського господарства та системи його оподаткування, підвищення фактичної капіталізації підприємств галузі з метою залучення інвестиційних ресурсів

► **Ключові слова:** основні засоби, інвестиції, рентабельність, переоцінка, матеріально-технічне забезпечення, індексація



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Foreign Trade in Agri-Food Products of Ukraine in the Context of the COVID-19

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► **Abstract.** The research results obtained during the implementation of the project "Assessment of the impact of quarantine measures related to COVID-19 on the agricultural sector and food security of the state and development of an algorithm for minimising the adverse consequences" No. 2020.01/0313 of the competition "Science for Human and Society Security" at the expense of grant support from the National Research Foundation of Ukraine. The purpose of the research – to analyse the impact of restrictive quarantine measures in 2020-2021 related to the spread of the COVID-19 pandemic on foreign trade activities in the agricultural sector of Ukraine. In generalising the theoretical and methodological aspects of the research, the methods of the abstract and logical method, analysis and synthesis, induction and deduction, analogy and comparison were used. To diagnose the dynamics of exports and imports of agro-food products, economic and statistical methods (comparative analysis, average and relative values, statistical groupings, trend analysis, graphical method, index, coefficient analysis, etc.) Several techniques of abstract and logical tools allowed the development of intermediate conclusions and proposals. It is established that the domestic agrarian sector, considering its current raw material and export orientation, depends on the foreign economic situation of market demand, which was affected by restrictions related to the spread of the COVID-19 pandemic and the introduction of quarantine measures during the global level, namely: restrictions on trade transactions between states, restrictive measures on the movement of goods, closure of agro-food markets, etc. It is confirmed that since the beginning of the spread of COVID-19, the conditions for trade in agri-food products in Ukraine have deteriorated. It was determined that the volume of exports of agro-food products in 2020 compared to 2019 remained practically unchanged – an increase of 0.2%. Therewith, imports of such products for the same period increased by 13.3%. The excess of import growth over exports resulted in a significant deterioration in the foreign trade balance of agri-food products – a decrease of 4.4%, which indicates the adverse impact of the spread of the pandemic and the introduction of restrictive quarantine measures on foreign trade in domestic agri-food products. The most unfavourable trends were inherent in foreign trade in meat and dairy products. Scientific and methodological approaches to assessing the impact of quarantine restrictions related to the spread of the COVID-19 pandemic on foreign trade in agri-food products in Ukraine were further developed. The results of the impact of restrictive quarantine measures on the state of foreign trade in agri-food products in 2020-2021 can be considered in the development of

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an efficient targeted national policy designed to increase the competitiveness of the agricultural sector, ensure Ukraine's stable position in the global agri-food market, and the socio-economic development of the country in a pandemic

► **Keywords:** agricultural sector, foreign trade, agri-food products, quarantine measures, Ukraine

► Problem statement

The decline in the global economy caused by the spread of the COVID-19 pandemic has led to significant changes in all spheres of life and all types of economic activity, including in the foreign economic activity of the domestic agricultural sector. Relatively low external demand and protectionism of some trading partners in the context of the fight against the COVID-19 pandemic have exacerbated problems in the foreign economic activity of the agricultural sector of Ukraine's economy, considering its foreign market orientation: the proportion of agriculture and food industry in the total structure of exports of goods from Ukraine in 2020 reached 45.1% against 19.4% in 2010 (Kryukova, Kalyna, Panteleiev, & Minakova, 2018; Commodity structure of Ukraine's..., 2020). The maximum adverse effect of strict anti-epidemiological measures in Ukraine was most noticeable during the first lockdown – in April-May 2020. To this was added the factor of a smaller crop harvest and deterioration of the foreign economic situation for some types of Ukrainian exports.

Analysis of recent studies and publications. The issues of the development of foreign economic activity and access of Ukrainian producers of agro-food products to foreign markets in the scientific literature and practice conventionally receive considerable attention. In particular, they are covered in the works of O.M. Borodina, V. Krupin (Borodina, & Krupin, 2018); Ye.V. Havaza (Havaza, 2015); M.Yu. Harbuz (Harbuz, 2012); M.A. Horlachuk (Horlachuk, 2013); V.I. Jemcev (Jemcev, 2013); I.M. Zhylenkova (Zhylenkova, 2015); N. Karasova (Karasova, 2016); I.O. Kryukova, T.Ye. Kalyna, S.M. Minakova (Kryukova, Kalyna, Panteleiev, & Minakova, 2018); A.V. Rjabchyk and O.P. Volynecj (Rjabchyk, & Volynecj, 2014); I.Ju. Saljman and M.I. Ibatullin (Saljman, & Ibatullin, 2015);

S.V. Tyvonchuk and Ya.O. Tyvonchuk (Tyvonchuk, & Tyvonchuk, 2014), etc.

For the most part, the attention of scientists is devoted to entering the world market in general or to Ukraine's positions in its product segments. Naturally, the most explored of these segments is the grain market, the investigation of which is the subject of the works of N.M. Hurzhii, A.S. Svierchkova (Hurzhii, & Svierchkova, 2013), I.Y. Salkova (Salkova, 2014), L.O. Franchenko (Franchenko, 2013), V.M. Chornyi (Chornyi, 2017) etc. For these authors, the grain market is and will remain the priority of Ukraine's foreign economic expansion, as it has the greatest technical and technological, transport and logistics, land and resource, and other potential for this. In some publications, the place of Ukraine in the world market of oilseeds is explored. In particular, I.V. Chekhova notes that currently "the general trend in the domestic and world markets of oilseeds coincides, and the differences relate to the rate of increase in the production of sunflower, oil flax, and the rate of decline in rapeseed production" (Chekhova, 2017). The most explored by far has been the market of milk and dairy products, including in terms of the development of export commodity flows (Havaza, 2015; Harbuz, 2012; Tyvonchuk, & Tyvonchuk, 2014). Some publications by scientists (Jemcev, 2013, Rjabchyk, & Volynecj, 2014) and practitioners (Saljman, & Ibatullin, 2015) cover the meat market.

There are numerous scientific publications on the specific features of Ukraine's participation in the world market of agricultural products, motives, methods, and strategic directions of domestic enterprises entering foreign markets, the development of competitive positions on them, etc.

Although the COVID-19 pandemic is a fairly new phenomenon, however, the scientific

literature has already paid considerable attention to identifying and systematising the factors of its impact on the economies of countries, regions, industries, economic entities, foreign economic activity, the welfare of the population, etc. Thus, the impact of the COVID-19 pandemic on fruit and vegetable exports was assessed by P. Joshi *et al.* (2019) (Kliuchnyk, & Baryshnyk, 2016; Joshi, Kulkarni, Munje, & Kulkarni, 2019). Using a standard macroeconomic model, proved the serious damage of the COVID-19 pandemic to global supply chains (Barua, 2020). The authors of the study “Prospects for Commodity Markets: Impact of COVID-19”, conducted by representatives of the World Bank, draw attention to the impact of quarantine measures on the price situation in the global agricultural market (Commodity Markets Outlook: Implications..., 2020).

Together with his colleagues, D. Zaha, in an analytical study, identifies a decrease in demand for exports of goods and services as external shocks affecting the Ukrainian economy resulting from the spread of the COVID-19 pandemic (Zakha, Movchan, Kravchuk, Kirkhner, & Polushkin, 2020). One of the most significant factors of influence associated with the spread of the COVID-19 pandemic and the restrictive measures introduced, V. Movchan determines the change in demand of partner countries (Ukraine can feed not..., 2020). According to A.I. Kondratenko, D.I. Babmindra, and I.M. Slobodanyk, “the COVID-19 pandemic has caused both adverse and positive changes in Ukraine’s foreign trade” (Kondratenko, Babmindra, & Slobodanyk, 2021). Therewith, despite the existence of several scientific works covering various aspects of foreign economic activity and the functioning of world agro-food markets, determining Ukraine’s place in them, there are currently completely different problems compared to the previous ones regarding the provision of export supplies in the domestic agricultural sector, the increase in imports of agro-food products caused by the COVID-19 pandemic caused by the SARS-CoV-2 coronavirus. More thorough research is required to identify the degree of impact of quarantine restrictive measures on export-import activities in

the agricultural sector. This is required to develop in the future an efficient targeted national policy designed to increase the competitiveness of the agricultural sector, and ensure Ukraine’s stable position in the global agri-food market, and the country’s socio-economic development in the context of the pandemic.

The purpose of the research – is to analyse the impact of restrictive quarantine measures in 2020-2021 related to the spread of the COVID-19 pandemic on foreign trade activities in the agricultural sector of Ukraine.

Materials and methods. The methodological foundation of the research was a systematic approach to the study of the explored phenomena and processes and a dialectical method of cognition, which allowed a comprehensive consideration of the processes related to the impact of the spread of the COVID-19 pandemic and quarantine measures on foreign trade activities in the agricultural sector of Ukraine.

In generalising the theoretical and methodological aspects of the research, the methods of the abstract and logical method, analysis and synthesis, induction and deduction, analogy and comparison were used. To diagnose the dynamics of exports and imports of agro-food products, economic and statistical methods (comparative analysis, average and relative values, statistical groupings, trend analysis, graphical method, index, coefficient analysis, etc.) It was done to establish specific relationships such as identity, similarity, or difference between characteristics and facts. Several techniques of abstract and logical tools allowed the development of intermediate conclusions and proposals. The reliability of the results and conclusions is confirmed by calculations using statistical observations.

The information base of the study was: data from the State Statistics Service of Ukraine, the Ministry of Agrarian Policy and Food of Ukraine, the Ministry of Economy of Ukraine, regulations of the state; scientific publications; information from Internet resources. Notably, the collection of statistical information and the development of the database cover: exports and imports of agri-food

products in value and volume terms, including commodity and geographical structure of foreign trade, world prices for agri-food products, and other macroeconomic indicators. The research period covers 2019-2021.

Outline of the main material. The domestic agricultural sector, as one of the determinants in the development of national GDP, is largely a raw material export industry, thus, it depends on the foreign economic situation of market demand, which was affected by restrictions related to the spread of the COVID-19 pandemic and the introduction of quarantine measures at the global level. First of all, these are restrictions on trade transactions between states, restrictive measures on the movement of goods, closure of agro-food markets, etc.

The first half of 2020 experienced an unprecedented decline in the price of oil on world markets. In 2021, this trend continued. As a result, expectations for global oil demand have deteriorated. And although fuels and lubricants are significant items of expenditure for agricultural producers, this phenomenon should be assessed as an adverse factor.

The decline in oil prices caused a sharp decrease in imports, including agri-food products, by countries that received foreign currency through oil production and exports. Among such countries are large importers of Ukrainian agricultural products and food, for example, Egypt, UAE, etc. Due to the decrease in foreign exchange earnings from the sale of oil and even more significantly from the curtailment of the tourism industry, the consumption of agricultural and food products in these countries has decreased.

In addition to external impacts, it is essential to highlight the factors of internal impacts, such as changes in consumer sentiment and the structure of consumer demand, a decrease in effective demand, a reduction in production, including from suppliers of inputs for agriculture, rising prices for resources and raw materials, forced removal from work of infected workers or workers who have been in contact with the infected – which in turn resulted in a decrease in production, etc. These factors, uncertainty in agri-food supply chains, and the general economic decline threatened foreign trade revenues (Table 1).

Table 1. Dynamics of foreign trade of Ukraine in agri-food products (groups 1-24), million US dollars

Indicator	January-June 2019	January-June 2020	January-June 2021	January-June 2020, %, by January-June 2019	January-June 2021%, by January-June 2020	2019	2020	2020, %, by 2019	For reference: 2019, %, by 2018
Export	12175	12278	12614	100.8	102.7	22144	22179	100.2	119
Import	4670	5052	5503	108.2	108.9	5736	6498	113.3	92.4
Export-import balance	9524	9246	9132	97.1	98.8	16408	15681	95.6	121

Source: calculated by the author based on the data of the State Statistics Service of Ukraine (Commodity structure of Ukraine's..., 2020)

According to the above data, the volume of exports of agro-food products in 2020 compared to 2019 remained almost unchanged – an increase of only 0.2% or 35 million US dollars. Therewith, from 2015-2019, the average annual export growth rate was 11.2%, and in 2019 – 19.0% (Commodity structure of Ukraine's..., 2020).

Opposite trends in the analysis period were observed in the import area. In 2020, the volume of imports of agro-food products increased by 13.3% compared to the previous 2019. And this is when the average annual growth rate of imports in 2015-2019 was 8.0%, and in 2019 there was a significant decrease of 7.6% (Commodity structure

of Ukraine's..., 2020). Such an unprecedented increase in imports and deceleration in exports resulted in a significant deterioration in the foreign trade balance of agri-food products – for the first time in the last decade, the balance of foreign trade in agri-food products decreased, although it remained positive. Such import growth rates indicate dissatisfaction with domestic consumer demand by domestic producers of agri-food products in terms of quantity, quality and price. Such trends in the future can result in a decrease in the competitiveness of domestic producers, and loss of market share, which in turn will have even more adverse long-term consequences, such as a decrease in production due to lower demand, and therefore revenues, profits, layoffs, increased social tension, etc. The increase in exports of agri-food products by 0.2% in 2020 was largely provided by processed agricultural products, namely fats and oils of animal or vegetable origin (up 21.4%) and prepared foods (up 4.4%) (Foreign trade in certain..., 2021).

As for raw (agricultural) products, there is a significant decrease in exports of both animal and plant products. The increase was registered only in fish and crustaceans (26.0%), and natural shellac (57.4%). For the rest of the names of agricultural products, there was a decrease in export supplies. The largest losses of exports were characteristic of seeds and fruits of oilseeds (28.1%), products of the flour and grains industry (23.6%), live animals (17.6%), live trees and other plants (11.7%), vegetables (8.8%), meat and edible offal (by 8.4%). In 2021, the upward trend compared to 2020 resumed, but compared to the corresponding period of 2019, there was a further aggravation of the problem of reducing agricultural exports (groups 1-14) (Foreign trade in certain..., 2021).

The growth of imports of agri-food products by 13.3% in 2020 was provided by both agricultural products and processed products. In particular, the volumes of imports of milk and dairy products increased (growth by 81.9%), meat and fish products (26.1%), vegetables (23.6%), ready-made products from grain (20.3%), live trees and other plants (19.1%), edible fruits and nuts (18.2%), fats and oils of animal or vegetable origin

(growth by 17.4%), etc. The decrease in imports, and then insignificant, was characteristic only for crops (by 1.2%), seeds and fruits of oilseeds (3.2%), and natural shellac (0.2%) (Foreign trade in certain..., 2021). In the first half of 2021, the growth rate of imports increased significantly compared to the corresponding period of 2020 and 2019, which indicates a further aggravation of the problem of import dependence on agro-food products (groups 1-24). Thus, the largest increase was in milk and dairy products – more than 2.5 times compared to the first half of 2019, products of the flour and grains industry – 2.47 times, sugar and sugar confectionery – 2.84 times, finished grain products – 60.5%, fats and oils of animal or vegetable origin – 60.2%, meat and fish products – 56.1%, vegetables – 48.0%.

In the structure of exports, the largest share continues to be occupied by products of plant origin, although, during the year, their share decreased slightly – from 58.3% in 2019 to 53.6% in 2020 (a decrease of 4.7 percentage points), of which crops – 43.5 and 42.4%, respectively. The second place is occupied by fats and oils of animal or vegetable origin with a share of 21.4% in 2019 and 25.9% in 2020 (an increase of 4.5 percentage points over the year). Finished food products ranked third with 14.5% in 2019 and 15.2% in 2020 (up 0.7 percentage points). In the structure of exports of animal products of Ukraine, the largest shares are meat and edible offal (more than half (54.9%) in 2020 and 55.7% in 2019), and milk and dairy products (35.0%). Therewith, live animals are exported in small quantities, and their share in the structure of livestock exports ranges from 3-4%. The share of fish and crustaceans is not significant and does not exceed 1-3% (Foreign trade in certain..., 2021).

The structure of imports of agro-food products has not changed significantly – the largest share continues to be held by ready-made food products, their share for the year increased by only 0.1 pp – from 45.6% in 2019 to 45.7% in 2020. The highest increase in the share in total imports of agri-food products was noted for products of animal origin, mainly by increasing the share of milk and dairy products – by 1.7 pp (from 3.0% in 2019 to 4.7% in 2020) (Foreign trade in certain..., 2021).

Foreign trade in meat and dairy products has undergone the greatest changes. In particular, for the period from 2019 to 2020, there are two opposite trends in foreign trade in milk and dairy products: an increase in imports and a decrease in exports. Thus, the volume of exports of milk and cream decreased by 26.0% from 25,206 tons to 18,642 tons in 2020, condensed milk – by 23.4% from 35,805 tons to 27,417 tons, animal butter – by 38.6% from 18,283 to 11,234 tons, cheese – by 11.6% from 7,191 to 6,358 tons. The only dairy product that demonstrated growth was whey (growth rate of 11.4%). Instead, imports of milk and dairy products in 2020 increased significantly. Thus, the volume of imports of milk and cream increased 3.6 times from 3,598 tons in 2019 to 12,969 tons in 2020, condensed milk – 1.6 times from 2,564 tons to 6,144 tons, animal butter – 2.9 times from 3,406 tons to 10,012 tons, cheeses – almost doubled from 23,724 tons to 46,767 tons, fermented milk products – 1.6 times from 6,167 tons to 9,921 tons. In general, the manifestation of these two trends resulted in a significant deterioration of the export-import

balance. In 2021, the situation deteriorated even further (Fig. 1).

Considering the above, it can be stated that imported goods have become more in demand in the dairy sector. It is connected both with insufficient domestic production, high prices for domestic milk and dairy products, especially cheeses, and loud history of safety of domestic dairy products, etc. Through the production of dairy products in regions remote from the places of its main consumption and insufficiently developed logistics, the import of liquid milk for long-term storage is widespread. Demand for whole milk powder is growing, mainly driven by increased consumption of products made from reconstituted milk. Another factor in the growth of reconstituted milk consumption is the cost. It is cheaper than fresh and often sold at promotional prices. In the conditions of the spread of the COVID-19 pandemic and the decline in incomes of citizens, cheaper imported dairy products proved to be more competitive and pushed domestic producers out of the market.

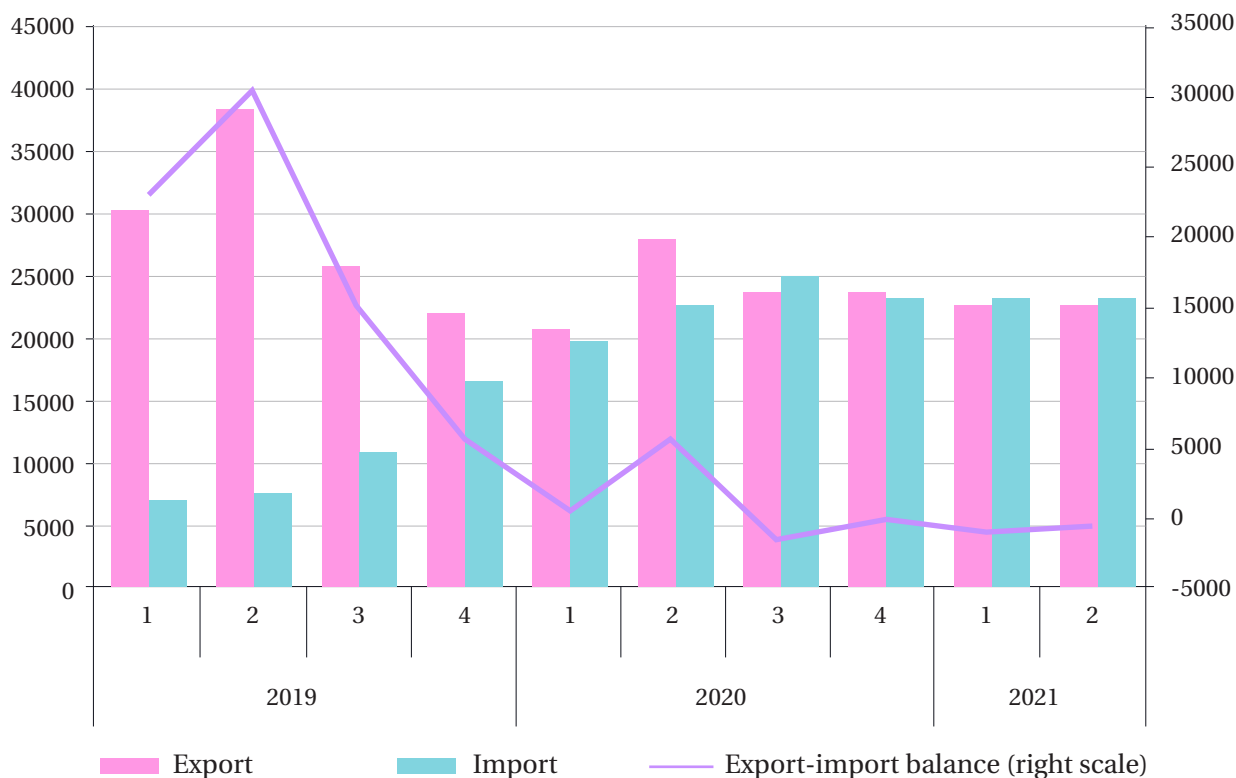


Figure 1. Dynamics of export-import balance of milk and dairy products in Ukraine for 2019-2021, thousand tons
Source: Developed by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

In foreign trade in meat and meat products, trends opposite to milk can be traced: import volumes are marked by diverse trends: there was both an increase in meat imports in some periods and a decline. However, according to the results of 2020, the volume of imports of meat and meat products decreased by 13% from 228.5 to 198.9 thousand tons compared to 2019. In 2021, there is an upward trend again. Instead, exports are characterised

by stable volumes – in 2020 the growth was only 0.7 pp compared to 2019. In the first quarter of 2021, a significant decline in the supply of meat and meat products to foreign markets was recorded compared to the same period of previous years, but in the second quarter, there is an active growth (by 45.2% compared to the first quarter). It contributed to the improvement of the export-import balance (Fig. 2).

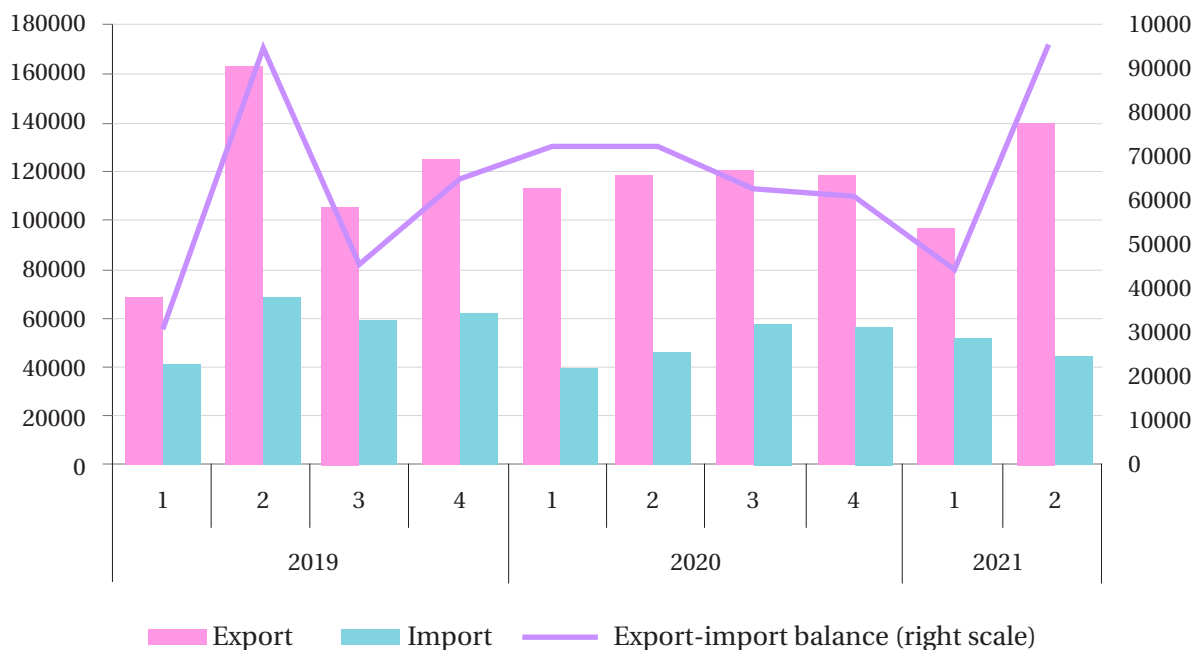


Figure 2. Dynamics of export-import balance of meat and meat products in Ukraine for 2019-2021, tons
Source: Developed by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

To continue analysing the impact of the spread of the COVID-19 pandemic and restrictive measures on the results of foreign trade in agri-food products, it is advisable to analyse the indices of physical volume (Laspeyres index), Paasche prices and terms of trade.

The physical volume index (Laspeyres) describes the price ratio of goods sold in the current period compared to the previous one in the unchanged volume of the base period. Paasche price index is a price level indicator that describes the dynamics of the general price level of a specific group of goods. The index allows estimating how many times the actual costs of acquiring goods are more (less) than the amount of money that the country would have to pay for

the same goods if the prices and structure of exports and imports remained at the level of the base period.

The terms of trade are the number of imported goods that a country receives in exchange for a given quantity of exported goods of its production. The indices of terms of trade “price” and “quantity” describe the extent to which a country gains or loses due to changes in prices or quantities of goods in foreign trade with a particular country (countries) for the relevant period. The term trade index is one of the most important indicators used in the analysis of foreign trade trends. It allows for determining how favourable or unfavourable the country’s terms of trade were in the period under study compared to the reference period.

The values of indices of physical volume, prices and terms of trade for the analysed period further confirm and specify the conclusions developed in the study earlier. In particular, in 2020, compared to 2019, prices for exported agri-food products from Ukraine grew faster than for imported ones – 104.6% against 99.6%, respectively (Indices of physical volume..., 2021). Thus, there is evidence of an increase in export revenues, but at the same time – of cheaper imports, the displacement of domestic producers from the domestic market of some agro-food products, and the replacement of domestic products with imported ones. First of all, it concerns dairy, alcohol products, fish and crustaceans.

The physical volume index demonstrates a decrease in exports in 2020, expressed in 2019 prices, and a significant reduction in the price of imported products against the background of an increase in imports.

The quantitative index of terms of trade in agri-food products, although improved in 2020 (105.2), but for a small list of products. In particular, only for 7 out of 24 groups: natural shellac (125.1), plant materials for manufacturing (124.9), other products of animal origin (119.5), fats and oils of animal or vegetable origin (113.0), fish and crustaceans (113.1), crops (102.4). For other commodity groups, the terms of trade deteriorated (Indices of physical volume..., 2021).

The price index of terms of trade demonstrates an even worse situation - prices for export goods grew at a slower pace than prices for import goods. For the price index, a positive value was observed only in the group of coffee and tea (117.8) – but in this case, it is re-export; in the group of milk and dairy products, poultry eggs, natural honey (111.2) and in the group of alcoholic and non-alcoholic beverages and vinegar (108.1) – here the loss

of the market by domestic producers due to lower production volumes and cheaper imported products. Thus, the unfavourable conditions for trade in agri-food products in Ukraine in 2020 compared to the base year 2019 should be noted (Indices of physical volume..., 2021).

Thus, the deterioration of trade conditions began with the spread of the COVID-19 pandemic and the introduction of restrictive quarantine measures by Ukraine and other countries. The situation with physical volumes of exports and imports, prices for export and import goods have deteriorated rapidly. Export volumes, both in terms of quantity and value, suffered significant losses, while imports gained weight.

In May 2021, compared to the corresponding month of 2020, the situation improved slightly, in particular, export volumes even increased slightly, while prices for agri-food products on world markets increased significantly (Indices of physical volume..., 2021). However, the terms of the trade index demonstrate that despite the improvement in exports, the more dynamic growth of imports deteriorated its value. Assessing the impact of pandemic restrictions due to the spread of the infectious disease COVID-19 on foreign trade in agri-food products will not be complete without analysing changes in the geographical structure.

According to the Ministry of Agrarian Policy and Food of Ukraine (Official website of the..., n.d.), the country exports agricultural products and food to more than 190 countries. China, India, the Netherlands, Egypt and Turkey are the leaders among the importing countries of Ukrainian agri-food products (Table 2). The important role of Ukraine in the world agro-food markets has become particularly evident with the onset of the pandemic when global supply chains were disrupted.

Table 2. Rating of countries-importers of agro-food products from Ukraine

No. s/n	Country	2019		No. s/n	Country	2020	
		Export value, mln dollars US	%			Export value, mln dollars US	%
1	China	1955.1	8.7	1	China	3554.0	15.9
2	Egypt	1674.5	7.5	2	India	1498.0	6.7
3	India	1546.9	6.9	3	Netherlands	1421.6	6.3

Table 2. Continued

No. s/n	Country	2019		No. s/n	Country	2020	
		Export value, mln dollars US	%			Export value, mln dollars US	%
4	Turkey	1544.3	6.9	4	Egypt	1366.9	6.1
5	Netherlands	1476.0	6.6	5	Turkey	1068.6	4.8
6	Spain	1198.6	5.4	6	Spain	984.7	4.4
7	Germany	870.7	3.9	7	Poland	849.7	3.8
8	Poland	785.0	3.5	8	Italy	584.0	2.6
9	Italy	716.0	3.2	9	Germany	581.0	2.6
10	Belarus	604.7	2.7	10	Indonesia	566.2	2.5
	Total for selected countries	12371.8	55.3		Total for selected countries	12474.7	55.7

Source: Calculated by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

In 2020, there were some changes in the ranking of importing countries of Ukrainian agri-food products. According to available data, the countries that have actively increased the volume of trade in agri-food products with Ukraine include China – the growth rate in 2019-2020 was 7.2 pp, thus increasing its share to 15.9% in total exports

from Ukraine, a slight increase in the share was observed in the UK – by 0.4 pp and Morocco – by 0.3 pp. The share of imports of Ukrainian agri-food products decreased the most in such countries as Turkey – by 2.1ppt, Egypt – by 1.4ppt, Germany – by 1.3ppt, Spain – by 1.0ppt, Italy and Belgium – by 0.6ppt (Fig. 3).

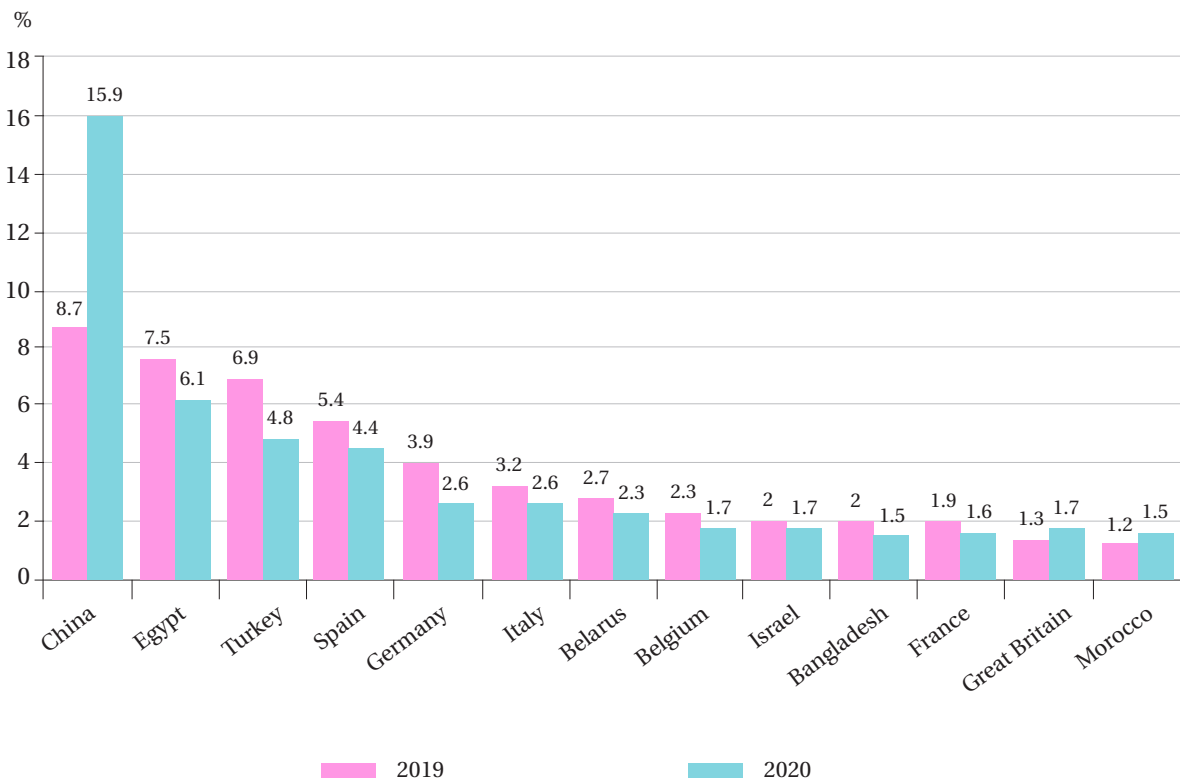


Figure 3. Countries-importers of agri-food products from Ukraine, which have changed their share the most, %

Source: Developed by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

Thus, as the above data demonstrate, the main importers of Ukrainian goods remain in the same countries as before the pandemic, but the volume of exports to them has slightly decreased (except for the main importer of Ukrainian goods –

China). As for the main countries-suppliers of agro-food products to Ukraine, in 2020 the top five remained unchanged. These are such countries as Poland, Germany, Italy, Turkey, USA (Table 3). However, there have been some changes among them.

Table 3. Rating of countries-exporters of agro-food products to Ukraine

No. s/n	Country	2019		No. s/n	Country	2020	
		Import value, mln dollars US	%			Import value, mln dollars US	%
1	Poland	658.8	10.7	1	Poland	828.3	12.0
2	Germany	510.5	8.3	2	Germany	503.6	7.3
3	Turkey	416.0	6.8	3	Italy	498.1	7.2
4	Italy	393.9	6.4	4	Turkey	485.4	7.0
5	United States of America	274.9	4.5	5	United States of America	299.6	4.3
6	France	269.2	4.4	6	France	295.6	4.3
7	Netherlands	248.5	4.0	7	Netherlands	284.1	4.1
8	Norway	210.7	3.4	8	Norway	228.4	3.3
9	Spain	190.1	3.1	9	Spain	214.5	3.1
10	China	167.6	2.7	10	China	199.4	2.9
	Total for selected countries	3340.2	54.3		Total for selected countries	3836.8	55.5

Source: Calculated by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

Thus, Poland and Italy during the analysed period (2019-2020) increased sales of agri-food products to Ukraine, in particular, Poland by 1.3ppt, thus increasing its share to 12.0% in total imports to Ukraine, Italy – by 0.8ppt. Ecuador

increased its presence in the domestic agro-food market by 0.3 percentage points. Such countries as Germany – by 1.0ppt and Hungary – by 0.3ppt reduced the share of agri-food exports to Ukraine the most (Fig. 4).

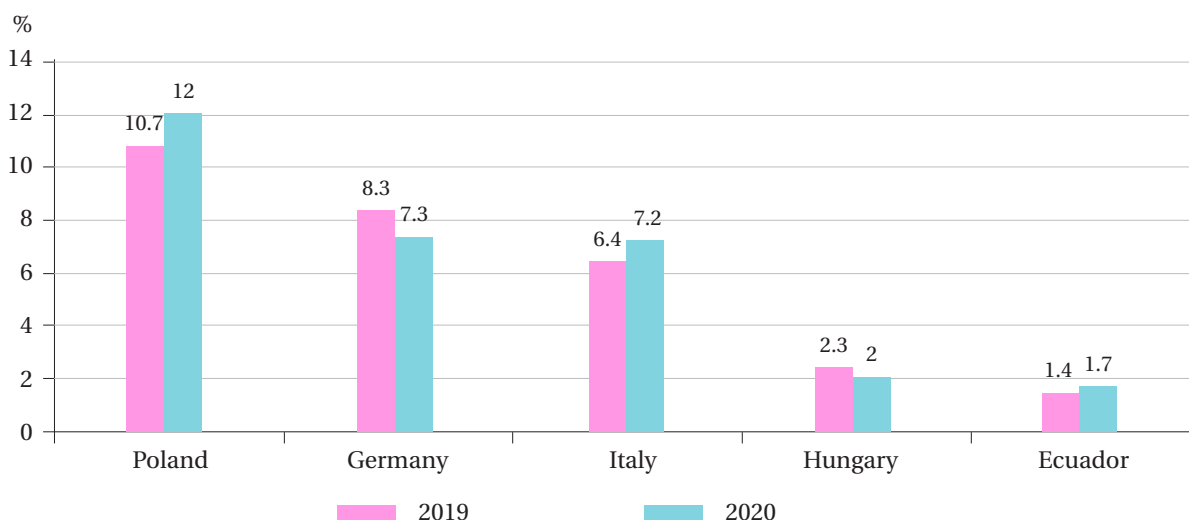


Figure 4. Countries-exporters of agri-food products from Ukraine, which have changed their share the most, %

Source: Developed by the author based on the data of the State Statistics Service of Ukraine (Foreign trade in certain..., 2021)

► Conclusions

Thus, according to the analysis, the main exporters of agro-food products to Ukraine remain the same countries they were before the pandemic, but their shares in total imports of agro-food products to Ukraine and the main product groups have changed slightly.

Considering the decline in export growth and the unprecedented increase in imports over the past year and a half, the deterioration of the terms of trade, including due to the pandemic, notably, the deterioration of the situation in foreign trade in agri-food products in Ukraine.

1. Based on the results of the study on the impact of the spread of the COVID-19 pandemic and quarantine restrictions related to it on foreign trade activities in the agricultural sector, the following conclusions can be developed.

2. The domestic agricultural sector, being one of the determinants in the development of national GDP, given the current raw materials and export areas, depends on the foreign economic situation of market demand, which was affected by restrictions related to the spread of the COVID-19 pandemic and the introduction of quarantine measures at the global level. In particular, these are restrictions on trade transactions between states, restrictive measures on the movement of goods, closure of agro-food markets, etc.

3. The volume of exports of agro-food products in 2020 compared to 2019 remained almost unchanged – an increase of 0.2% or 35 million US dollars. For comparison: from 2015-2019, the average annual export growth rate was 11.2%, and in 2019 – 19.0%. The increase in exports of agri-food products by 0.2% in 2020 was largely provided by processed agricultural products, namely fats and oils of animal or vegetable origin and prepared foods. As for agricultural products of both animal and plant origin, there is a significant decrease in exports. Thus, it can be stated the adverse impact of the spread of the pandemic and the introduction of restrictive quarantine measures on the export of domestic agro-food products.

4. In 2020, the volume of imports of agro-food products increased by 13.3% compared to the

previous year 2019. For comparison: in 2015-2019, the average annual growth rate of imports was 8.0%, while in 2019, there was a significant decrease of 7.6%. The increase in imports of agri-food products by 13.3% in 2020 was provided by both agricultural products and processed products. In the first half of 2021, the growth rate of imports increased significantly compared to the corresponding period of 2020 and 2019, which indicates a further aggravation of the problem of import dependence on agri-food products. The increase in imports and deceleration of exports resulted in a decrease in the balance of foreign trade in agri-food products by 4.4%.

5. Foreign trade in meat and dairy products has undergone the greatest changes. In particular, during the period from 2019 to 2020, there were two opposite trends in foreign trade in milk and dairy products: an increase in imports and a decrease in exports. Thus, exports of milk and cream decreased by 26.0%, condensed milk – by 23.4%, animal butter – by 38.6%, and cheese – by 11.6%. The volume of imports of milk and cream increased by 3.6 times, condensed milk – 1.6 times, animal butter – 2.9 times, cheese – almost twice, and fermented milk products – 1.6 times.

According to the results of 2020, the volume of imports of meat and meat products decreased by 13% compared to 2019. Exports are characterised by stable volumes – in 2020, an increase of only 0.7 percentage points compared to 2019. In the first quarter of 2021, there was a significant decrease in the supply of meat and meat products to foreign markets compared to the same period of previous years. However, in the second quarter, their active growth began (by 45.2% compared to the first quarter), which contributed to the improvement of the export-import balance.

1. High rates of import growth indicate dissatisfaction with domestic consumer demand by domestic producers of agri-food products in terms of quantity, quality, and price. In the future, such trends will harm the development and functioning of the industry – a decrease in the competitiveness of domestic producers, and loss of market share, which in turn will lead to even worse long-term consequences, such as a decrease in production

due to lower demand, and therefore revenues, profits, dismissal of employees, increased social tension, etc.

2. It is confirmed that with the spread of the COVID-19 pandemic and the introduction of restrictive quarantine measures by Ukraine and countries of the world in response, the terms of trade have deteriorated. The quantitative index of terms of trade in agri-food products for most commodity groups (17 out of 24) decreased. The price index of terms of trade demonstrates an even worse situation – prices for export goods increased at a slower pace than for imports. For the price index, a positive value is observed only in the groups of coffee and tea, milk and dairy products, poultry eggs; natural honey, and alcoholic and non-alcoholic beverages and vinegar – here, the loss of the

market by domestic producers due to a decrease in domestic production and cheaper imported products.

3. The main importers of Ukrainian goods remain the same countries that were before the pandemic (China, India, the Netherlands, Egypt and Turkey), but exports to them have decreased slightly (except for China, whose growth rate in 2019-2020 was 7.2 pp). The main countries supplying agri-food products to Ukraine in 2020 remained unchanged. These are Poland, Germany, Italy, Turkey, USA.

Promising areas for further research in this area should include the identification of measures to minimise risks and improve the results of foreign economic activity of the domestic agricultural sector during and after the COVID-19 pandemic.

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Зовнішня торгівля агропродовольчою продукцією України в умовах поширення пандемії COVID-19

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► **Анотація.** У статті представлено результати дослідження, отримані в процесі виконання проєкту «Оцінювання впливу карантинних заходів, пов'язаних з COVID-19 для аграрного сектору й продовольчої безпеки держави та розроблення алгоритму дій щодо мінімізації негативних наслідків» № 2020.01/0313 конкурсу «Наука для безпеки людини та суспільства» за рахунок грантової підтримки Національного фонду досліджень України. Мета статті – проаналізувати вплив обмежувальних карантинних заходів 2020-2021 рр., пов'язаних із поширенням пандемії COVID-19, на зовнішньоторговельну діяльність в аграрному секторі України. При узагальненні теоретичних і методичних аспектів дослідження використано прийоми абстрактно-логічного методу, аналіз і синтез, індукцію й дедукцію, аналогію та порівняння. З метою діагностики динаміки експорту й імпорту агропродовольчої продукції в аналітичних дослідженнях застосовано економіко-статистичні методи (порівняльного аналізу, середніх і відносних величин, статистичних групувань, трендовий аналіз, графічний метод, індексний, коефіцієнтний аналіз тощо). Низка прийомів абстрактно-логічного інструментарію дозволили сформулювати проміжні та прикінцеві висновки й пропозиції. З'ясовано, що вітчизняний аграрний сектор, зважаючи на його нинішнє сировинно-експортне спрямування, залежить від зовнішньоекономічної кон'юнктури ринкового попиту, на який вплинули обмеження, пов'язані з поширенням пандемії COVID-19 та запровадженням карантинних заходів на глобальному рівні, а саме: обмеження торгових трансакцій між державами, обмежувальні заходи щодо переміщення вантажів, закриття агропродовольчих ринків тощо. Доведено, що з початком поширення COVID-19 умови торгівлі агропродовольчою продукцією в Україні погіршилися. Визначено, що обсяги експорту агропродовольчої продукції в 2020 р. порівняно з 2019 р. практично не змінилися – ріст на 0,2 %. При цьому обсяги імпорту такої за аналогічний період збільшилися на 13,3 %. Перевищення темпів росту імпорту над експортом призвело до суттєвого погіршення зовнішньоторговельного балансу агропродовольчої продукції – зменшення на 4,4 %, що свідчить про негативний вплив поширення пандемії та запровадження обмежувальних карантинних заходів на зовнішню торгівлю вітчизняною агропродовольчою продукцією. Найнесприятливіші тенденції були притаманні зовнішній торгівлі м'ясо-молочною продукцією. Набули подальшого розвитку науково-методичні підходи до оцінювання впливу карантинних обмежень, пов'язаних із поширенням пандемії COVID-19, на зовнішню торгівлю агропродовольчою продукцією в Україні. Результати впливу обмежувальних карантинних заходів на стан зовнішньої торгівлі агропродовольчою продукцією у 2020-2021 рр. можуть бути враховані при розробленні ефективної адресної державної політики, спрямованої на підвищення конкурентоспроможності аграрного сектору, забезпечення стабільних позицій України на світовому ринку агропродовольчих продуктів, а також соціально-економічного розвитку країни в умовах пандемії

► **Ключові слова:** аграрний сектор, зовнішня торгівля, агропродовольча продукція, карантинні заходи, Україна



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Agricultural Land Use Management in the Context of a Non-Linear Approach

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► **Abstract.** Using land resources does not comply with the requirements of balanced nature management. Much of the land has lost its economic fertility through excessive cultivation and intensive degradation processes. The ecological condition of the land involved in agricultural use has deteriorated to such an extent that currently since land resources in agribusiness are used as a means of production, the economic condition of economic entities and the food security of the country depend on them. The purpose of the research – to develop a scientific vision of strategic land use management in the context of nonlinear changes based on the investigation of qualitative and quantitative features of soil processes, possible risks and modelling of development scenarios. A combination of methods, principles and techniques of scientific cognition was used: statistical analysis – in the description of long-term regional target programs for the protection and rational land use (environmentally friendly) on the example of the Black Sea region; comparative analysis – in determining the level of provision of the regions of Ukraine with ecologically safe lands, the state of the environment in the zone of ecologically safe land use, the provision of ecological areas and areas suitable for transformation, comparing the target values of agricultural land use areas under organic production; graphical – for visual display of the model of non-linear two-stage management of agricultural land use in conditions of uncertainty of its components. Proposed: ways to develop ecologically safe lands (organic) about target values, provisions and state of land use; interrelation of plans of target and existing state of land use; accounting of benefits and losses of achieving target values with an appropriate number of ecologically suitable land uses. The strategic vectors, areas and expected results of agrarian land use management in the context of a non-linear approach are determined. The scientific originality of the research lies in the substantiated algorithm of the model of nonlinear two-stage agrarian land use management under uncertainty. The miscalculations of state management of land resources as a prerequisite for strategic management of agrarian land use are substantiated. The model of nonlinear two-stage agrarian land use management under uncertainty is presented. The strategic vectors of agrarian land use management in the context of a non-linear approach are developed

► **Keywords:** strategic management, nonlinearity, strategising, sustainable development purposes, and modelling

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► Problem statement

One of the most significant objectives currently confronting the management of economic and ecological systems is the development of efficient management strategies to cope with the growing potential of complex and unexpected changes and at the same time preserve ecosystems (natural – marine, terrestrial, freshwater or artificial and anthropogenically modified ecosystems as a result of human economic activity, which can exist only with the support of the latter, as they are not self-sufficient and self-regulating and quickly collapse in the absence of such support).

In the economics of nature management, there is an understanding of such a category as “economic and ecological system”. Economic-ecological systems are a specific class of systems where the main components are the economy and the environment. They are considered the integrity of ecological and economic systems, characterised by the presence of internal links and emergent properties.

The economic-ecological system is a naturally open, complex dissipative dynamic system with inherent properties of nonlinearity. According to the theory of complex systems, the main driving force for the development of economic and ecological systems is the conflict between its subsystems and elements. This conflict is constantly growing and is conditioned upon a large number of connections and functions, i.e., their complex hierarchy. However, the main conflict is the contradiction between the model of economic growth and resource consumption.

Nonlinearity is characterised by two processes. It is a stable disequilibrium of the entire system and a stable equilibrium of its subsystems. The first state is more difficult to maintain than the second. And this is the foundation for the development of managerial influences in the system of management hierarchy.

The necessity of changing the management paradigm is obvious, as anthropogenic pressure is growing, and economic activity significantly violates the stability of natural ecosystems. Thus, the objective is to switch to applying management strategies that consider the nonlinearity and non-equilibrium of such systems. However, the development of management strategies involves diagnosing the nonlinear dynamics of such systems, analysing their

functioning and identifying trends that were not properly considered in conventional management approaches. It is the non-linear approach that can improve understanding and better organise sustainable management of economic and ecological systems for more efficient use of natural resources and improvement of living conditions of the population.

Although the predominance of mainly nonlinear and chaotic processes in the natural world is now established, the inclusion of these types of dynamics in management is still not considered. Ignoring these approaches can result in unexpected economic, environmental and social consequences.

Thus, the diagnosis of nonlinear processes is a prerequisite for the definition of new management approaches that can consider this type of dynamics.

The analysis of the development of economic-ecological systems has long identified the constraints between growth and the environment. Practice demonstrates the necessity of developing a new systemic understanding of the complexity of the economy and ecology, which, like any complex system, constantly reconfigures itself in response to any impacts, often with unforeseen or undesirable consequences. Complexity is a common feature of modern economic and environmental policy, which is developed in the context of growing consumption, the complexity of technologies and limited resources. The complexity of economic-ecological systems demonstrates nonlinear development and is manifested by unpredictable dynamics and uncontrolled behaviour.

The lack of consideration of the non-linear structure of agroecosystem development should be mentioned as the main drawback of the agricultural sector management system. Changing reactions in the structure of the agroecosystem occur unexpectedly, depending on the variety of natural factors that arise according to their unique laws. The unexpectedness of the reactions is due to long-term anthropogenic intervention that causes warming, environmental pollution, etc. Nonlinearity is an essential component of agroecosystem dynamics during the period when the system is between alternative states. The system is described by two influences – exogenous and endogenous, namely: internal laws of agroecosystems and external anthropogenic factors. The nonlinear system is indeterminate and

chaotic and requires substantiation of scenario options for adaptation of management and development of models of changes in agroecosystems by exogenous and endogenous influences. Models, in turn, require consideration of a wide range of components, a range of possible conditions, multiple development trajectories, adaptability, unpredictability, and variability in time and space.

The establishment of the land market and other transformations in the system of land ownership means a long-term process of development of even the most successful sectors, including agriculture. It requires the development of a global agricultural strategy highlighting potential participants and trends in the industry in the context of global challenges.

Management of the agrarian sector as a system has several disadvantages and causes, accordingly, the emergence of miscalculations: lack of proper development of mechanisms to stimulate landowners and land users in the rational and environmentally oriented use of land resources; land valuation without involving the environmental component; due to the universality of land use for all types of land, without regard to the specifics or local conditions of their use; neglect of the interests of land users, traditions, environmental experience.

Strategic management of agrarian land use in the context of a non-linear approach requires a preliminary assessment of current practices, the necessity of achieving the targets of the Sustainable Development Objectives and ecologically oriented land use.

► Analysis of recent studies and publications

According to the definition of A.I. Soloviyov, the management of agricultural production is a complex, nonlinear multifactorial process, the modeling of which it is required to use modern tools and powerful nonlinear multidimensional methods based on artificial intelligence, based on neurotechnologies. It provides high reliability of approximation of highly complex processes in space and time, which are reflected in the universal scheme of the neural network (Soloviyov, 2015).

According to A.O. Gutorov, most quantitative dependencies in the agricultural sector are non-

linear and the variability of parameters is within large limits (Hutorov, 2009). At this stage, there are practically no economic and mathematical models that reflect the specific features of the reproduction process in agriculture, in particular agricultural land use. Declaring the above statement, I.V. Khlivna emphasises its stochastic nature, interconnection of industries, nonlinearity and variability in economic conditions (Khlivna, 2013). Along with other prominent scientists, nonlinear dependence is distinguished by P. Kubach in the investigation of the development of agriculture and rural areas (Kubakh, 2021)

Using the results of nonlinear and global equivalent approximations for solving stochastic problems and comparing their accuracy with conventional linear and local equivalent methods was described in their work by Cai Yongyang, Judd Kenneth, and Steinbuks Jevgenijs (Cai, Judd, & Steinbuks, 2016). The nonlinear concept is chosen as a foundation by scientists Yan Zehao, Li Mo, and Li Zhong to develop a stochastic multi-objective model for irrigation water distribution under uncertain conditions. This approach balances the conflicting goals of maximising net economic benefit and natural resource efficiency. It may reflect the random nature of water availability and response to climate change (Yan, Li, & Li, 2021). Another opinion on using the concept of nonlinearity in the development of a control model for optimal management of agricultural irrigation water under uncertainty was proposed by Zhang C., Yue Q. and Guo P. (Zhang, Yue, & Guo, 2019).

A nonlinear model for optimising the allocation of water resources was developed by scientists: Aljanabi Ahmed A., Mays Larry W., and Fox Peter (Aljanabi, Mays, & Fox, 2018). Predictive management of natural resources based on nonlinearity is proposed in the work of scientists: Wu Z, Zhang Junfeng, Zhang Zhihao, Albalawi Fahad, Durand Helen, Mahmood Maaz, Mhaskar Prashant, Christofides Panagiotis D. (Wu, et al., 2018).

The purpose of the research – to develop a scientific vision of strategic land use management in the context of nonlinear changes based on the investigation of qualitative and quantitative features of soil processes, possible risks and modelling of development scenarios.

► Summary of the main results of the study

Land use as an ecological and economic system is dynamic. Its main element is a society with its economic and social subsystems. As a rule, it is a nonlinear system, with nonlinear interactions and

nonlinear laws of development. Changes in ecosystems increase the probability of nonlinear transformations in the ecosystems themselves (Ministry of Economic Development..., 2017) (Fig. 1).

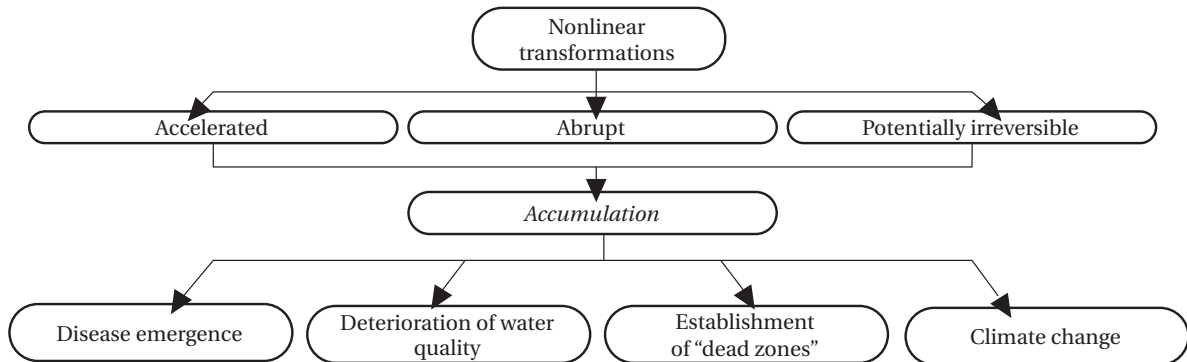


Figure 1. Typification and consequences of nonlinear transformations in land use

Source: Author's development

They are divided into accelerated, abrupt and potentially irreversible. The changes occurring in the system accumulate, as a result of which the system loses stability, moves to another trajectory and further develops within other stability limits. These changes are characterised by serious consequences for human welfare and health. Examples of such changes are the emergence of diseases, deterioration of water quality, the establishment of “dead zones” in coastal

waters, etc. In ecosystems, they tend to occur progressively. When the threshold value is crossed, the system switches to a completely different state. Changes can be rather significant in magnitude, thus making them difficult, expensive or impossible to reverse. To prevent adverse impacts and develop scenarios for the development of agricultural land use, it is necessary to develop possible models of non-linear changes for the components of the agricultural sector (Fig. 2).

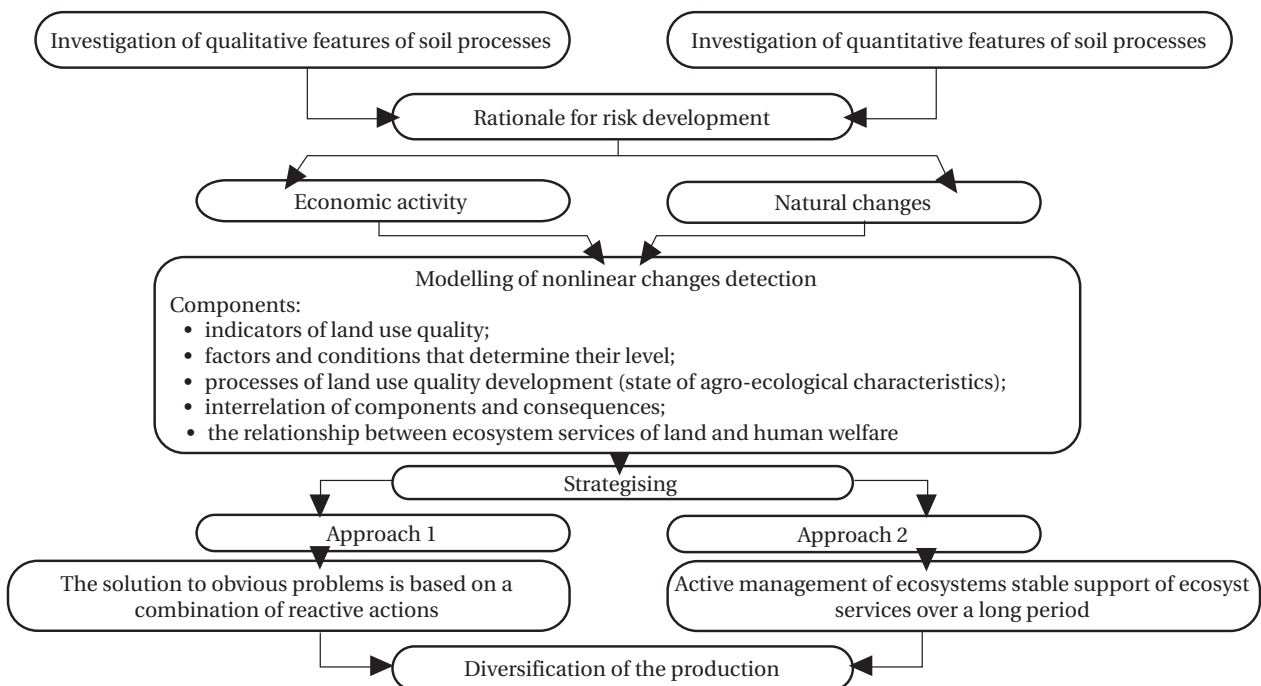


Figure 2. Stages of strategic land use management in the context of non-linear change

Source: author's development

First of all, this concerns land use, which requires a thorough investigation of both quantitative and qualitative characteristics of their development and possible risks. The specific quantitative and qualitative features of soil processes are considered. Natural changes and economic activity have a significant impact on soil processes, and through them on soil properties and fertility, i.e. its quality. It ensures further diversification of production in the relevant zones depending on the quantitative and qualitative characteristics of land resources, the geography of their location, resource capabilities and climatic features of natural zones.

Models for detecting non-linear changes are designed by the established standard of agroecological quality of the land mass, using agrotechnologies to obtain it, constant comparison of the obtained quality with the standard, and in case of deviations – implementation of measures for their transformation. The components of the models are indicators and processes of land use quality development, factors and conditions that determine their level, features and properties that affect the patterns of soil functioning and ensure the vital activity of plants, animals and humans (Tiutiunyk, & Kupinets, 2020).

Strategic management should be based on two various approaches to ecosystem management: the first is developed based on a complex of reactive actions to eliminate adverse results of land use. According to this scenario, the most complicated problems are solved only after they are obvious; the second scenario involves active management of ecosystems with stable support of eco-system services before adverse results (soil development and primary production, water regulation and diseases, etc.) appear for a long period (Khlivna, 2013).

Non-linear management of agrarian land use is limited by the lack of information on the quality of land, imperfection of the cadastral database, and failure to consider the environmental component in land use assessment and economic calculations. The state of agricultural land use is recorded in statistical information collections based on land monitoring data. Strategic land management should be based on purpose setting, planning and forecasting. Accordingly, to improve the

quality of management, predictive assessments of both the general state of the ecosystem and the impact of newly established land use are required, considering the (model) relationships between its components and possible consequences. Such models can be used to develop strategic decisions or adjust existing ones.

Scenario models for the purpose of further strategic management of agricultural land use include links between land ecosystem services and human welfare, which are, therefore, not linear. If ecosystem services are sufficient compared to the demand for them, the marginal increase in ecosystem services, as a rule, provides only a small contribution to the welfare of the population (Khlivna, 2013). However, when ecosystem services are scarce, a small impact in the field of their reduction can significantly reduce the available welfare.

The Resolution of the Cabinet of Ministers of Ukraine “On Development of Forecast and Program Documents of Economic and Social Development and Drafting of the Budget Declaration and the State Budget” of April 26, 2003, No. 621 (Law of Ukraine № 1264-XII, 2021) does not include environmental protection, use of natural resources and environmental safety in the list of economic sectors for which a five-year forecast is developed. However, in the Law of Ukraine “On Environmental Protection” of June 25, 1991, № 1264-XII (Law of Ukraine № 1264-XII, 2021) environmental protection management is defined as the implementation in this area of the functions of observation, research, strategic environmental assessment, environmental impact assessment, control, forecasting, programming, informing and other executive and administrative activities. The state environmental monitoring system is responsible for this (Fig. 3).

Article 22 of the Law of Ukraine “On Environmental Protection” of June 25, 1991, No. 1264-XII determines that state bodies together with relevant scientific institutions ensure the organisation of short-term and long-term forecasting of environmental changes, which should be considered in the development and implementation of programmes and measures for the economic and social development of Ukraine, including environmental protection, use and reproduction of natural resources and ensuring environmental safety.

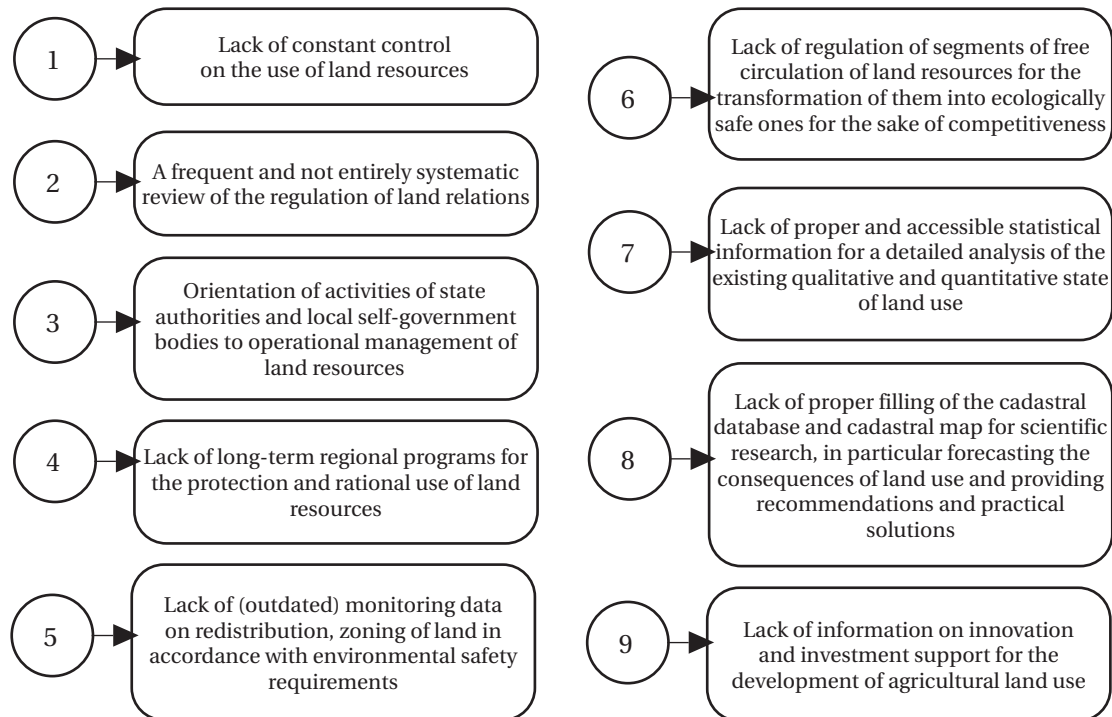


Figure 3. Miscalculations of state management of agrarian land use

Source: author's development

Forecast assessments, planning of rational land use and development of long-term programmes for the protection and rational land

use (environmentally safe) in the Black Sea region have not been performed in recent years (Table 1).

Table 1. Availability of long-term regional target programmes on protection and rational land use (environmentally safe) on the example of the Black Sea region

Region	Number of regional programmes	Title
Odesa	0	-
Mikolaivska	0	-
Kherson	1	Regional programme on use and protection of land in Kherson region for 2020-2024

Source: Developed by the authors based on (List of regional target..., 2021)

It can be stated that there is a necessity to establish the concept of a comprehensive information resource, which contains coordinated information on all-natural properties of economic land use, actual and planned use, and forecast estimates.

Improvement of the land management process, including its institutional component in the short and long term, should consider both sustainable land use and socio-ecological, economic and informational development of agrarian land use. The rational use of land resources determines

both their protection and conservation for the long term and reasonable use of the natural component, which is the key to the environmental stability and competitiveness of the regions and the country in general.

Tabular and illustrative data indicate a high level of provision of countries of the European Union by ecologically safe lands, namely organic ones, and, accordingly, about the low level in Ukraine, namely in the Black Sea region, which will be demonstrated below (Table 2-4, Fig. 4, 5).

Table 2. The level of provision of environmentally safe lands in the example of the Black Sea region, 2019

Region	Share of ecologically safe areas and suitable for ecotransformation in relation to the total area of the country, %.
Odesa	2.39
Mikolaivska	4.75
Kherson	0.56

Source: (Organic production in Ukraine, 2021; Ministry of Ecology..., 2020)

Table 3. The state of the environment in the zone of environmentally safe land use in 2019 on the example of the Black Sea region

Region	Characteristics of the ecological state of land use		
	Coefficient of environmental stability	Score of anthropogenic load	Environmental sustainability
Odesa	0.32	4	Environmentally unstable
Mikolaivska	0.29	4	Environmentally unstable
Kherson	0.34	3	Steadily unsustainable

Source: Developed by the authors based on (Ministry of Ecology..., 2020)

Less than 0.33 – the territory is ecologically unstable; from 0.34 to 0.50 – refers to stable unstable; from 0.51 to 0.66 – passes within the limits of medium stability; if exceeds 0.67 – the territory is ecologically stable.

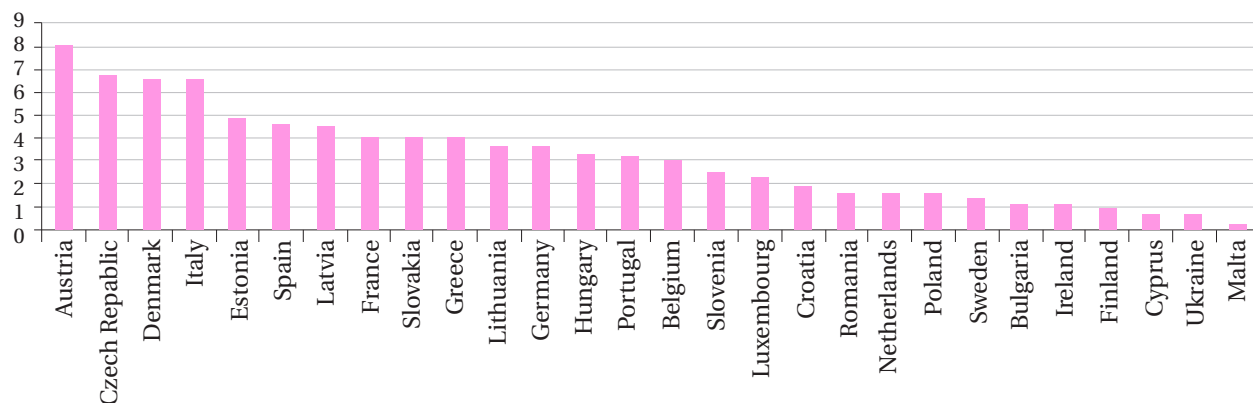
2 points – a high degree of anthropogenic load (industrial land, transport, settlements); 4

points – significant (arable land, perennial plantations); 3 points – average (natural fodder lands, grassed beams); 2 points – minor (forest belts, shrubs, forests, swamps, under water); 1 score – low (micro-reserves). Ukraine occupies one of the last places compared to the European Union in terms of the share of areas of high natural quality.

Table 4. Indicators of provision of ecological areas and suitable for transformation into such areas in 2019

Region	Amount of land with ecologically safe soil quality indicators, % of the total country territory
Odesa	2.00
Mikolaivska	0.53
Kherson	3.28

Source: (Organic production in Ukraine..., 2021; Ministry of Ecology..., 2020)

**Figure 4.** Share of organic areas to the total country's territory in 2019 in the EU, %.

Source: Developed by the authors based on (Kubakh, 2021)



Figure 5. Dynamics of areas under organic agricultural lands in Ukraine, 2002-2019

Source: (List of regional target..., 2021)

It demonstrates the imperfection of the management system in the field of land use, its specific features as a complex system and the inefficiency of using the existing advantages of the properties of land resources of Ukraine. In addition, this is confirmed by the investigation of the state of the environment in the zone of ecologically safe land use based on the calculations of the coefficients of ecological stability of landscapes.

$$K_{est} = F_{stab}/F_{unstab.}$$

where K_{est} is the coefficient of ecological stability of landscapes, $F_{stab.}$ is the area of stable landscapes (forests, protective forest plantations, floodplain

meadows, reserves, nature reserves, natural reservoirs, swamps, shrubs, pastures, hayfields, arable land under perennial crops); $F_{unstab.}$ – the area of unstable landscapes (land under construction, silted water bodies, mining sites, ravines, arable land under annual crops).

In the National Report “Sustainable Development Goals: Ukraine” (Ministry of Economic..., p. 109), within the framework of Goal 15

“Protection and restoration of terrestrial ecosystems”, indicator 15.3.4. – the area of agricultural land under environmentally friendly, namely organic production, is represented by the following target values (Table 5).

Table 5. Target values of agricultural land use areas under organic production, 2015-2030

Year	2015	2020	2025	2030
Target value, area, ha	410.6	500	1500	3000
Growth rate, %	-	121.8	300.0	200.0

Source: (Ministry of Economic, 2017, p. 109)

Therefore, it becomes obvious that the rate of expansion of organic land areas from 2020 is significantly accelerating. Thus, in 2015, the area of land under organic production of 410.550 thousand hectares was described as satisfactory for the target value of 410.6 thousand hectares. In 2019, 467.980 thousand hectares compared to the target value of 500.0 thousand hectares in 2020, was considered as not optimally performed.

Significant changes are envisaged in 2025 – a threefold increase from the current state of organic land use, 2030 – twice the area of land in 2025.

However, achieving the targets may become problematic due to various risk situations, in particular, the implementation of climate change impacts, which is described as uncertain and non-linear.

The availability of suitable land for conversion to organic is regulated by several factors, the values of which cannot be known within a specific time interval. However, this does not prevent establishing the target function of maximising economic benefits and the system of constraints (Fig. 6).

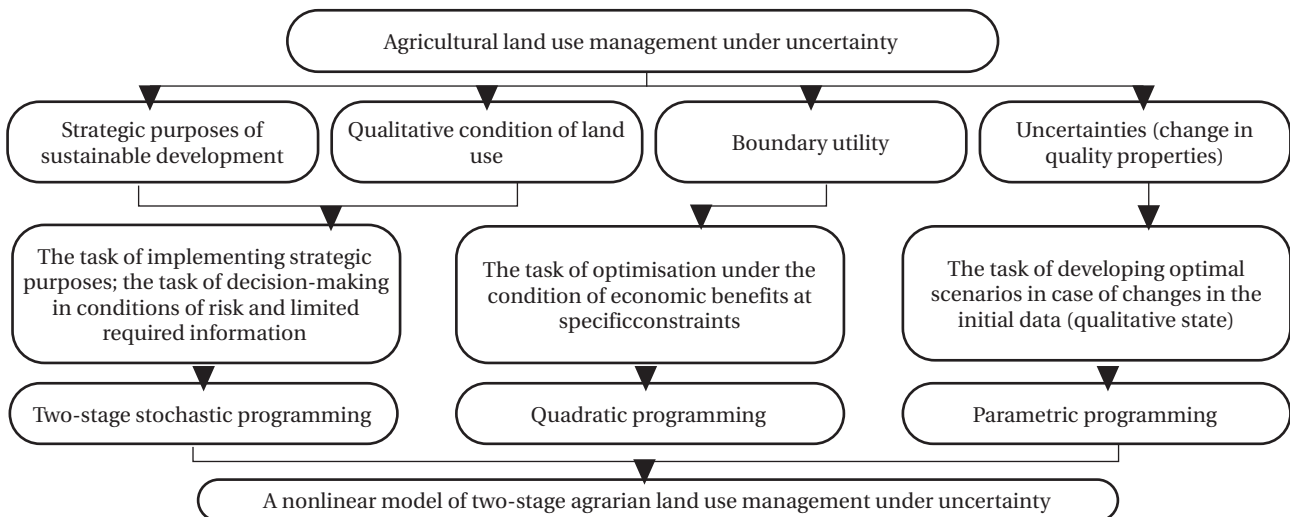


Figure 6. Model of nonlinear two-stage agrarian land use management under uncertainty

Source: Author's development using (Millennium Ecosystem Assessment, 2005; Organic crop area by..., 2012; Institute of Soil Protection..., n.d.)

Thus, information on the qualitative state of soils according to the latest research is presented in the time frame of 2011-2015 (Institute of Soil Protection..., n.d.). Full information is given in the National Report on the State of Soil Fertility of Ukraine in 2010 and periodic reports with insufficient information (Law of Ukraine № 1264-XII, 2021; 23).

The achievement of the targets specified in the Sustainable Development Goals is based on the justification of indicators for each area. According to the specific features of the territory, the results will vary.

Since the standard deviation of the information data is unknown and some data are completely missing, interval values are used. According to the developed scheme, several plans are required to establish environmentally safe land use (Fig. 7). Thus, the initial plan is used to determine the targets by years, the adjusted plan reflects the current state of land use. Only in the case of compliance with the adjusted and initial plans, it can be stated that the quantitative and qualitative indicators of land use have reached the target value. The task of achieving strategic purposes; the task of making decisions under conditions of risk and limited information.

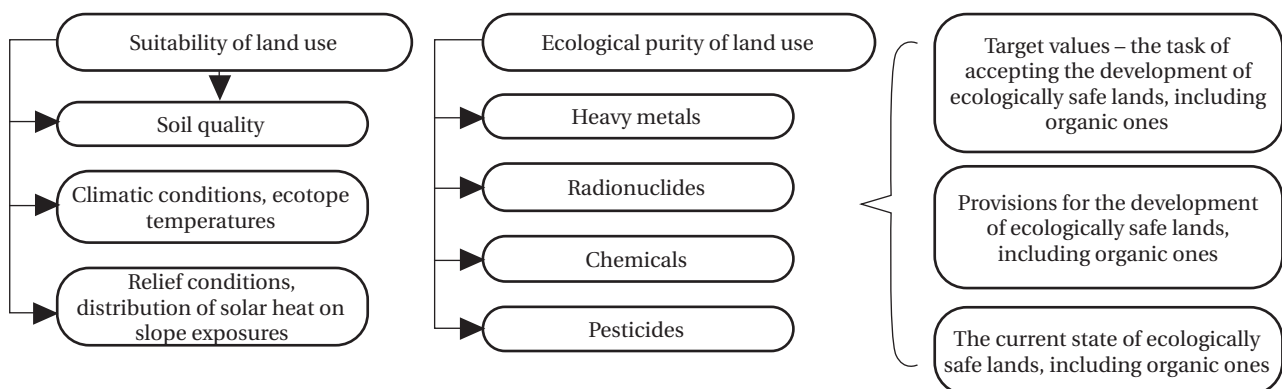


Figure 7. Scheme of development of ecologically safe (organic) lands about target values, provisions and current state of land use

Source: Based on (Tiutiunnyk, & Kupinets, 2020, p. 140)

Evidently, most of the actual data cannot satisfy the requirements of the target plan. Therefore, the optimisation of economic benefits for the farmer (community, state), with cur-

rent opportunities, is to adjust investment flows about the innovative component, through which it allows bringing land use to the required level (Fig. 8).

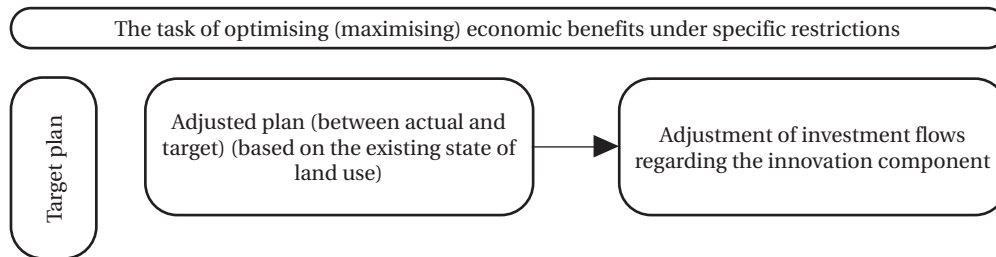


Figure 8. Diagram of the relationship between the target and existing land use plans

Source: author's development

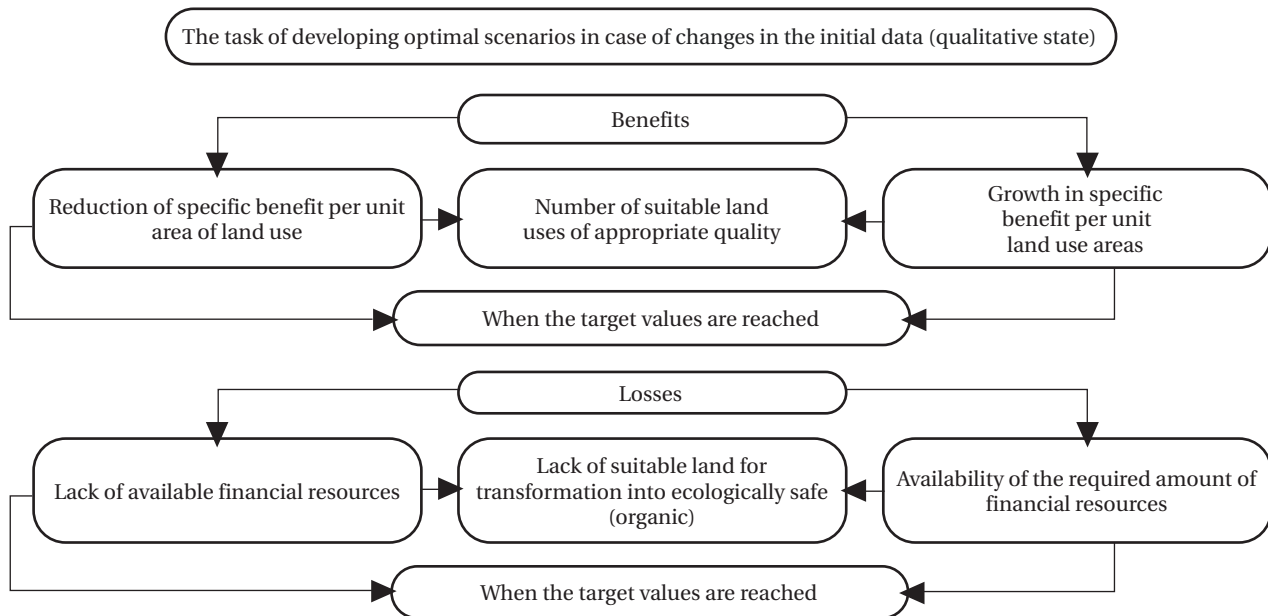


Figure 9. Benefits and losses with an appropriate amount of quality ecologically suitable land use

Deviation of plans is determined by a decrease in the specific benefit from the development of environmentally sound land use. Due to insufficient data, it is difficult to determine the exact value of benefits and costs when solving the problem of achieving the target values of environmentally sound land use.

The benefits for each community (oblast) include consideration of the deviation and conformity of the benefits in achieving the target values according to the respective availability of suitable land for transformation into environmentally safe ones. The losses are conditioned upon the lack of financial resources as a result of the transformation of suitable lands into environmentally safe ones. The result of solving

the problem of developing optimal scenarios in case of changes in primary data (qualitative condition) is socio-ecological and economic improvements.

Economic improvement is the ratio of the sum of benefits from using the land and the costs of maintaining the land (the effect of improved product quality). Environmental improvement is the ratio of the sum of monetary estimates of environmental benefits to the sum of monetary estimates of environmental costs, compensations, and fines. Social improvement is the ratio of the sum of monetary estimates of employment gains to the sum of monetary estimates of employment development costs (Fig. 10).

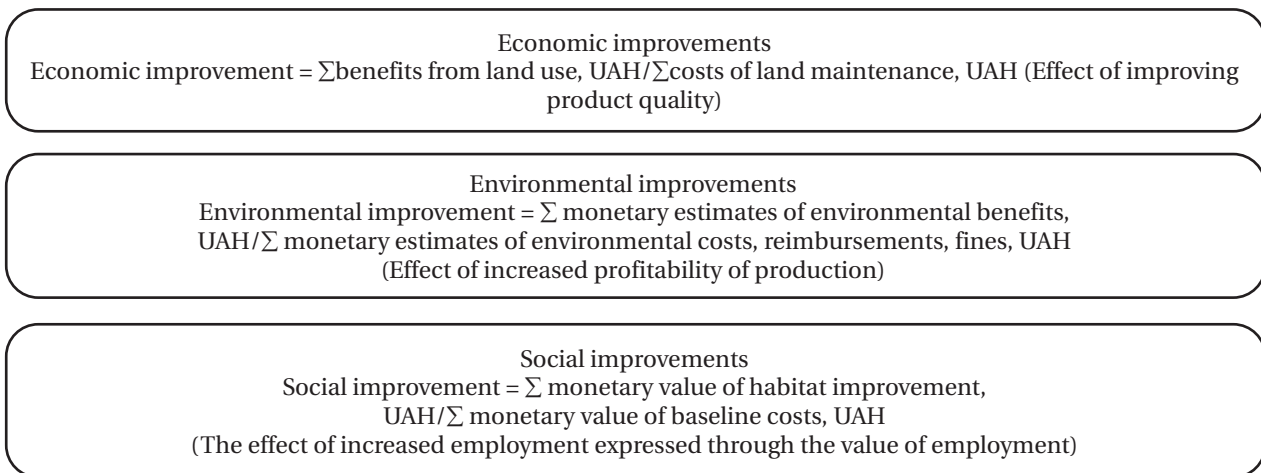


Figure 10. Socio-ecological and economic improvements to establish ecologically safe lands

Source: Author's development

where the sum of benefits from land use – expected income from production, UAH/ha; the sum of costs of land maintenance – production costs, UAH/ha; the sum of monetary estimates of environmental benefits – producer's profit from obtaining products from an ecologically clean area; the sum of monetary estimates of environmental costs, compensations, fines – producer's costs calculated for the total area of the plot; the sum of monetary estimates of habitat improvement – costs of establishing additional employment; the sum of monetary estimates of base costs – base costs for existing employment. It requires each local authority to decide on the organisation of activities to obtain benefits and prevent significant losses and risks. The target process is to identify and justify the difference between the benefits and costs of the restriction:

- availability of environmentally safe land uses;
- the most suitable land uses for transformation into environmentally safe ones;
- deficit of environmentally safe (clean) land uses.

According to the target indicators of sustainable development, the total area of ecologically safe land, in particular, organic land, should be expanded, and costs should be optimised. It will allow farmers (local authority, regions) to maintain the ecological state of land use without incurring losses and reducing motivation. The scenarios are considered as follows:

Scenario 1. Current conditions support the target values. The plan is being implemented.

Scenario 2. Existing conditions are lower than or equal to $\leq 10\%$ of the target values, which is $\geq 90\%$ of the current level. The plan is being implemented through several activities.

Scenario 3. Existing conditions are 20-30% lower, which is 70-80% of the current target level. This scenario means that the overall land use requires adjustments.

Scenario 4. Existing conditions are $\geq 30\%$ below, which is $\leq 70\%$ of the current target level. This scenario appears to be a case where significant improvements are required.

Optimal solutions may involve a trade-off between economic benefits and predetermined targets. In addition, it specifies the effects of marginal utility between the specific benefit and the amount of environmentally safe land. The obtained solutions are given in the form of determined or interval values. As a rule, solutions expressed as intervals demonstrate sensitivity to uncertainties in the model. Interval solutions can provide a range of options within a changing range of risks of loss of economic benefits.

Expected economic benefits as a result of spacing can fluctuate in a specific range and result in the establishment of alternative solutions. As the limits approach the lower limits, fewer benefits may be obtained for the ecologically oriented agricultural land use system. Therewith, when the lack of suitable land is low, it corresponds to a lower transition risk.

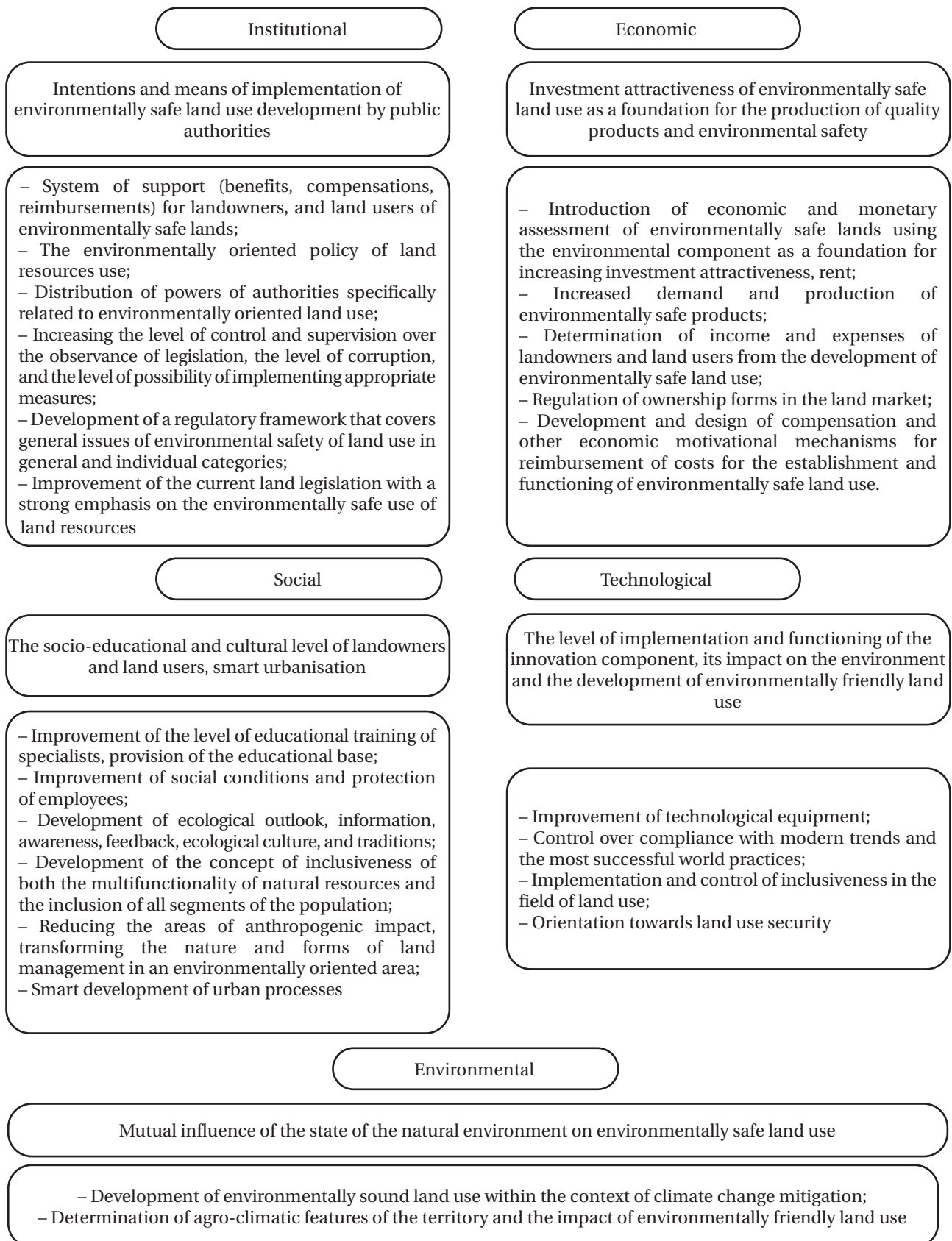


Figure 11. Strategic vectors of agrarian land use management in the context of a non-linear approach
Source: Author's development using (Tiutiunnyk, & Kupinets, 2020)

Otherwise, when the requirements for the availability of ecologically oriented land use are satisfied, higher benefits for agricultural land use can be obtained. However, the level of adverse factors may increase and increase the risk of system disruption. Thus, the results are capable of reflecting the relationship between the target values in the number of ecologically oriented land use areas, economic benefits and risk levels.

Strategic management should be implemented through the measures, plans and mechanisms of regional development strategies in which they are prescribed. Such measures should be included in the "Procedure for the development of regional development strategies and action plans for their implementation, and monitoring and evaluation of the implementation efficiency of these regional strategies and action plans". It includes vectors and required measures for the development and management of agrarian ecologically safe land use (Fig. 11).

Considering the above, the areas of strategic management of agrarian land use in the context of a non-linear approach are as follows: improvement of the current regulations (including regional programmes) on the environmentally safe use of land, their establishment, development and functioning; development of a land quality management system as part of monitoring, zoning and information and communication platform to ensure compliance of soil quality with the established standards of Ukraine and the EU, continuous monitoring and management of state authorities; development of a detailed cadastral database and cartographic representation, including innovation, investment and environmental components; training and raising the level of scientific and educational sphere, innovation provision of the scientific sphere of nature management, in particular environmentally sound land use, international cooperation; development of motivational mechanisms for environmentally sound use and valuation of land, transition to environmentally oriented management, considering the environmental component.

The expected results of strategic management of agrarian land use will be: research, control and improvement of soil quality characteristics

(bio-productivity, humus establishment), improvement of biodiversity, groundwater; control and management of non-linear transformations in the system of land use; development of educational, innovative and research sphere in the field of practical use, the introduction of innovative methods of organising land use and their development, improvement of the information component for scientific research; improvement of operational control and management of agrarian land use by authorities, landowners and land users; increasing the competitiveness of the country as an exporter of environmentally friendly products and services, generating income, increasing investment attractiveness.

► Conclusions

It is substantiated that agricultural land use should be considered from the standpoint of nonlinearity, and all aspects of this type of system should be considered in further decisions, which will result in different economic benefits and levels of risk or development of land use. From here:

1. A scientific approach to strategic land use management in the context of nonlinear changes based on the study of qualitative and quantitative features of soil processes, possible risks, modelling and definition of scenarios for the development of strategy is proposed.

2. The algorithm of the model of nonlinear two-stage agrarian land use management under uncertainty is based on:

- approach to the development of environmentally safe lands in terms of target values, provisions and the existing state of land use;
- approach to the relationship between the target plan and the existing land use plan;
- approach to the benefits and costs of achieving target values with an appropriate amount of quality environmentally suitable land uses.

3. The strategic vectors and areas, the expected results of agrarian land use management in the context of a non-linear approach, namely the improvement of soil quality characteristics, management of non-linear transformations in the land use system, the development of the scientific and educational sphere, the improvement of the information component for scientific research, the improvement of

operational control and management of agrarian land use, the increase of the country's competi-

tiveness as an exporter of environmentally friendly products and services are determined.

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Управління аграрним землекористуванням у контексті нелінійного підходу

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► **Анотація.** Використання земельних ресурсів не відповідає вимогам зрівноваженого природокористування. Значна частина земель через надмірну розораність, інтенсивні процеси деградації втратила економічну родючість. Екологічний стан залучених у сільськогосподарське використання земель настільки погіршився, що тепер, оскільки земельні ресурси в агробізнесі виступають як засіб виробництва, від них залежить економічний стан господарюючих суб'єктів, так і продовольча безпека країни. Мета статті – розвинути наукове бачення стратегічного управління землекористуванням у контексті нелінійних змін на засадах дослідження якісних і кількісних ознак ґрунтових процесів, можливих ризиків та моделювання сценаріїв розвитку. Використано сукупність методів, принципів і прийомів наукового пізнання: статистичний аналіз – при характеристиці довгострокових регіональних цільових програм щодо охорони та раціонального землекористування (екологічно безпечного) на прикладі Причорноморського регіону; порівняльний аналіз – при визначенні рівня забезпеченості регіонів України екологічно безпечними землями, стану довкілля в зоні екологічно безпечного землекористування, забезпеченості екологічними територіями і придатними до трансформації, порівнянні цільових значень площ аграрних землекористувань під органічним виробництвом; графічний – для наочного відображення моделі нелінійного двоетапного управління аграрним землекористуванням в умовах невизначеності її складових. Запропоновано: шляхи формування екологічно безпечних земель (органічних) щодо цільових значень, норми і стану землекористування; взаємозв'язок планів цільового та наявного стану землекористування; облік вигід і втрат досягнення цільових значень за відповідної кількості екологічно придатних землекористувань. Визначено стратегічні вектори, напрями та очікувані результати управління аграрним землекористуванням у контексті нелінійного підходу. Наукова новизна дослідження полягає в обґрунтованому алгоритмі моделі нелінійного двоетапного управління аграрним землекористуванням в умовах невизначеності. Обґрунтовано прорахунки державного управління земельними ресурсами як передумови стратегічного управління аграрним землекористуванням. Представлено модель нелінійного двоетапного управління аграрним землекористуванням в умовах невизначеності. Розроблено стратегічні вектори управління аграрним землекористуванням у контексті нелінійного підходу

► **Ключові слова:** стратегічне управління, нелінійність, стратегування, цілі сталого розвитку, моделювання



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Choosing a Model of the Agrarian Structure of Ukraine as a Foundation for Comprehensive Sustainable Rural Development

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► **Abstract.** In the current difficult financial, economic, military, social, and environmental conditions, through the unstable political situation, the only leader that "pulls" the economy of Ukraine is the agricultural sector. The purpose of the research – to analyse the models of agrarian structure that have been developed in Ukraine since independence. To determine the model of the agrarian structure that will provide the most efficient way to ensure comprehensive sustainable development of rural areas and preservation of the rural settlement network. The following scientific methods were used for the study: dialectical for cognition of processes and phenomena; empirical (observation, comparison, description); comparative analysis; abstract-logical (theoretical generalizations and development of conclusions). In the process of analysis of the models of agrarian structure that have been developed in Ukraine since independence, it was identified that the most efficient way to ensure comprehensive sustainable development of rural areas, preservation of the rural settlement network will be provided by the model of the agrarian structure, which is based on individual, farm, family farms, small and medium-sized agricultural enterprises. The influence of the choice of the agrarian structure model on the possibility of ensuring comprehensive sustainable development of rural areas and preservation of the rural settlement network is determined. Determined the model of the agrarian structure that will provide the most efficient way to ensure comprehensive sustainable development of rural areas and preservation of the rural settlement network. It is proposed to introduce changes to the legislation of Ukraine, which will contribute to the development of the model of the agrarian structure of Ukraine, which is based on individual, farm, family farms, and small and medium-sized agricultural enterprises

► **Keywords:** rural settlement network, land relations, land reform, agriholdings, agriculture, farming, family farm, land management, competitiveness, rural saving model

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► Problem statement

With the adoption on 18 December 1990 by the Verkhovna Rada of the Ukrainian SSR of Resolution No. 563-XII “On Land Reform”, land reform in Ukraine began and is still ongoing [1]. The preamble of the mentioned resolution states: “The objective of this reform is the redistribution of land with its simultaneous transfer to private and collective ownership, and to enterprises, institutions and organisations to establish conditions for the equal development of various forms of land management, the development of a multi-structured economy, and the rational use and protection of land” [2].

Adopted in 1990-1994 laws “On the priority of social development of the village” (1990); “On peasant (farm) economy” (1991); “On collective agricultural enterprise” (1992),

“On forms of land ownership” (1992) did not answer the questions: “What model of the agrarian system in Ukraine building?”, “What form of management will become the foundation for the development of a rich and confident future Ukrainian peasant, the preservation and development of the rural settlement network and the village as such?”, “What form of management in the countryside will guarantee the food security of the state?”. In Ukraine, for 30 years, there was an opinion that the free market without state intervention will solve everything and settle the problems on its own.

As a result, currently, according to the Latifundist.com website, as of January 1, 2021, the 100 largest Ukrainian latifundia cultivate a total of 6,020.25 thousand hectares of land, which is 18.5% of all arable land in Ukraine [3].

According to the State Statistics Service, in 2020 in Ukraine, 62968 agricultural enterprises used agricultural land. Among them 36277 agricultural enterprises, and 26691 farms [4]. Therewith, there are currently about 1 300 000 farms in Poland.

In Ukraine, on the one hand, the volumes of production, sales, and export of agricultural products, investments in the agricultural sector of the economy, and payment of taxes and rents are growing every year, but on the other hand, the gaps in several indicators continue to grow, and

the differences in the quality of life of rural and urban population deepen. As a result, the quantitative and qualitative features of demographic processes in the countryside are constantly deteriorating, employment is decreasing, migration to cities and abroad does not stop, and the reproduction rate and life expectancy of rural residents are decreasing. It results in the depopulation of rural areas and their decline. The rural settlement network is constantly shrinking, villages are disappearing from the map of Ukraine.

The total dominance of high-margin crops in agricultural holdings and the lack of production of products for the domestic market pose threats to the food security of the state. Evidently, without the active intervention of the state, the depopulation of rural areas and the destruction of the rural settlement network can no longer be stopped. The first step taken by Ukraine to improve the situation is to join the global process of sustainable development approved in September 2015 at the UN Summit with the support of the 17 Sustainable Development Goals (SDGs).

The following SDGs fully coincide with the problems that should be immediately addressed in Ukraine:

- overcoming poverty;
- overcoming hunger, achieving food security, improving nutrition, and promoting sustainable agriculture;
- ensuring a healthy lifestyle and promoting welfare for all at all ages;
- ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all;
- ensuring accessibility and sustainable management of water resources and sanitation;
- ensuring access to affordable, reliable, sustainable, and modern energy sources for all;
- promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all;
- establishing sustainable infrastructure, promoting inclusive and sustainable industrialisation and innovation;

- reducing inequality;
- ensuring openness, safety, resilience, and environmental sustainability of cities and other settlements;
- ensuring the transition to rational consumption and production models;
- protection and restoration of terrestrial ecosystems and promotion of their rational use, rational forest management, combating desertification, halting and turning back (reversing) the process of land degradation, and halting the loss of biodiversity [5].

Achievement of the Sustainable Development Goals will ensure comprehensive sustainable development of rural areas.

Currently, it is time to determine which model of agrarian structure will most efficiently ensure comprehensive sustainable development of rural areas and preservation of the rural settlement network.

The problems of development of land relations, sustainable development of rural areas, the problems of development of various forms of rural management, and the search for the optimal model of agrarian structure for Ukraine are the subject of study by both Ukrainian and foreign scientists, among which the most significant are: V.H. Andriichuk [6], O.H. Bulavka [7], Ya.M. Hadzalo [8, 9], P.I. Haidutskyi [10-12], A.O. Hutorov [13], A.S. Danylenko [14], V.M. Zhuk [8], R.Ya. Koriniets [15], M.F. Kropyvko [16], R. Levek [17], Yu.Ya. Luzan [9], Yu.O. Lupenko [18-20], Lupenko Yu.O., Khodakivska, O.V. [21, 22], M.Yo. Malik [15, 21,7], V.A. Mamchur [15], A. Mykhnenko [23], O.M. Mohylnyi [24, 25, 1], A.P. Sava [26], M.M. Fedorov [27], O.H. Shpykuliak [15] etc.

The purpose of the research – to analyse the models of agrarian structure that have been developed in Ukraine since independence. To determine the model of the agrarian structure that will provide the most efficient way to ensure comprehensive sustainable development of rural areas and preservation of the rural settlement network.

The subject of the study – assessment of the dependence of the possibility of achieving the

Goals of comprehensive sustainable development of rural areas and preservation of the rural settlement network on the model of the agrarian structure of Ukraine.

► Outline of the main material

Agroholdings

In the early 90s of the last century, collective and state farms left without financial and institutional support quickly went bankrupt. Their reforming was completed only by another change of name from collective farms to CAEs, from CAEs to peasants' unions, and from peasants' unions to economic companies. The galloping inflation "ate" working capital, fuel and lubricants could not be bought, domestic producers of agricultural machinery ceased their activities, the equipment of the enterprise was massively sold for scrap, intermediaries bought the grown products for nothing or they rotted, as there were no specific premises for storage, the number of cattle and pigs was massively slaughtered, racketeering and raiding, on the one hand, and the pressure of fiscal and regulatory authorities – on the other, hindered the development.

The situation was even worse for newly established farmers and private farms. The enthusiasm with which people in the late 80s – early 90s took the land for cultivation quickly faded, thousands of hectares of land remained uncultivated, and once livestock complexes with numerous livestock turned into ruins. Therewith, nothing new was established. The average annual decline in agricultural production, according to the State Statistics Service, in 1991-1994 reached 9.1%, and in 1995-1999 – 6.3%.

It was only in 1999 that the decrees of the President of Ukraine, "On Fixed Agricultural Tax" and "On Support of Agricultural Producers", introduced a simplified system of taxation and use of VAT funds. It has significantly reduced the tax burden on agricultural production.

In 1998, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On Land Lease", which defined the procedure for the transfer of land

shares by peasants to lease to economic entities. In December 1999, the Decree of the President of Ukraine, "On urgent measures to accelerate the reform of the agrarian sector of the economy", was signed, under which land shares were received by 6.8 million citizens, with an average size of 4.2 hectares [11, p. 243-248]. Therewith, there are people in Ukraine who, using the absence of state control, clarity, and order in all sectors of the economy, have accumulated significant capital on speculation in oil, gas, coal, on the sale of scrap metal from cut plants and factories, on barter schemes and offsetting schemes, etc. In the early 2000s, they began to invest the accumulated funds in agriculture – the first agricultural holdings were established there is no doubt that poor limited liability companies with the remains of old, still Soviet agricultural machinery and without working capital could not compete with the new rich players in the market.

Due to the lack of elementary monitoring and control of the state, a massive purchase of corporate rights of agricultural enterprises by agricultural holdings began. The leaders of the former collective farms reformed into limited liability companies fraudulently, using the permissiveness and uncontrolled state, on the one hand, and the low awareness of the peasants – on the other, concentrated in their ownership of the corporate rights of enterprises. The executive illegally sold the corporate rights of the enterprise together with the shares leased from the peasants at the rate of 100 to 500 USD per hectare. Shareholders did not receive anything from this deal – they were simply informed about the change of the "owner" and the necessity to renegotiate the lease agreement. Therewith, fraudsters were "working", who concluded lease agreements with peasants not to cultivate them but to collect a more or less decent bank of land and sell it profitably to the agricultural holding.

In 2000, 88% of land shares were leased by enterprises that previously employed peasants who had received shares and 12% by farms. After five years, 23% of the shares were cultivated by agricultural holdings that bought corporate property rights and lease rights to land shares from limited liability companies and farms.

In 2013, agricultural holdings already owned 44% of lease rights to land shares [11, p. 144-145]. The area of land in agricultural entities with a size of land use over 20,000 hectares increases over the years: from 1% in 2001 to 3% in 2005 and 18% in 2016. In 2017, agricultural holdings controlled 29% of agricultural land [17, p. 9].

Since 2010, state support is concentrated on agro holdings and large enterprises by three quarters [11, p. 148]. In particular, in 2017, the enterprises of the MHP holding received a record amount of subsidies – UAH 1.4 billion, or approximately 35% of the total amount of state support for the agricultural sector. The second largest recipient of subsidies was O. Bakhmatyuk's Ukrland-farming – UAH 517 million [28]. In 2018, MHP enterprises received UAH 970 million in subsidies from the state budget [29].

In 2017-2019, out of UAH 7.25 billion planned in the state budget to support farmers, only ten agricultural companies received almost UAH 3.6 billion in subsidies [30]. According to the Latifundist.com website, as of January 1, 2021, the 100 largest Ukrainian agricultural holdings cultivate a total of 6,020.25 thousand hectares of land, which is 18.5% of all arable land in Ukraine [3].

What are the consequences of the rapid development of agricultural holdings in Ukraine? On the one hand, the volumes of production, sales, and exports of products have significantly increased, and the profits of holding owners, investments, payment of taxes, and rents have increased, on the other hand, serious distortions and disproportions between the agriculture and food industry have occurred. In 2010-2013, there was a decline in the food industry with an increase in agricultural production. It indicates that Ukraine has become an exporter of food raw materials. Meanwhile, retail trade in food products increased due to the import of finished products [11, p. 148].

Serious deformations in agriculture and crop production were established. The area of forage crops has sharply decreased, and their share is 5 times less than optimal. Sunflower crops in Ukraine reach 20% of the arable land at the permissible rate of 9-12%. In some regions, up to a

third of the crops are under a sunflower. Almost half of the large farms have no livestock. Therefore, organic fertilisers have not been applied to the fields of such farms for years. The consequence of such management is a decrease in soil fertility. Agro holdings use the highest level of genetic modification of production and chemicalisation [11, p. 149-151].

Uncontrolled by the state growth of agricultural holdings has resulted in a decrease in competition and monopolisation of agricultural production, changes in the structure of agricultural production, commodity structure of export-import, destabilisation of the domestic food market, and a decrease in the supply of local products with an increase in the area under export commodity crops. It resulted in the growth of price supply in the domestic food market. The total dominance of high-margin crops in agricultural holdings and the lack of production of products for the domestic market pose threats to the food security of the state. The monopolisation of entire sectors of the agricultural economy, such as oilseed, sugar, chicken, and egg production, has resulted in the complete dependence of domestic prices on world prices. Monopolists do not want to sell products on the domestic market cheaper than on the foreign market. In this situation, Ukrainians are constantly suffering from rising food prices.

There is the oppression of other economic forms of management by agricultural holdings, destruction of competition and markets, excessive concentration of land, and violation of the established proportions of management. Agro holdings destroy old collective farms, farms, and other objects that belonged to collective farms to prevent any other business from operating there. The intensive displacement of small farms continues (their number decreased from 42 to 26.5 thousand).

Management practice proves that large agricultural enterprises establish less added value and jobs per 1 hectare of land, although they have much better access to land and other resources. Thus, the newly established added value per 1 hectare of land in farms is 221 euros, while in agricultural holdings – 131 euros [17, p. 11]. The number

of people employed per 100 hectares of land on farms is 2.5 people, and in agricultural holdings – 2 people [17, p. 11]. When growing grain agricultural holdings use even less human labour. There are 10-12 jobs per 1000 hectares of land under cultivation, 3-4 of them are unskilled, which are replenished by residents. Agroholdings refuse to grow labour-intensive crops and animal husbandry.

The greater the concentration of land in one commodity producer, the less employment of the local rural population. Of the almost 3 million people employed in agriculture, large enterprises provide jobs for less than 20%, and the rest, 80% – farms, peasants, and households.

The elimination of labour-intensive industries by large enterprises results in the growth of unemployment in rural areas, which in turn causes the outflow of labour to cities and abroad, narrowing of the economic base of rural development and reduction of revenues to budgets of all levels. The budget deficit results in further closure of educational, medical, healthcare, and social protection institutions, deepening of inequality, and tension in ecological and sanitary-epidemiological situations. Lack of funds for the repair of roads destroyed by large agricultural machinery results in total impassability.

Large agricultural holdings are unwilling to invest in rural infrastructure. Farmers and households invest 1.5-2 times more income than large enterprises to improve the living conditions of rural communities.

All these factors not only deepen the demographic crisis but result in total depopulation of the territories. Over the past 20 years, 500 villages have disappeared in Ukraine. The same amount exists only on paper – people do not live there [31]. In such a situation, it can be stated that agricultural holdings do not require either villages or people who inhabit them.

Due to the lack of clearly defined legislation purposes, objectives, and tasks of the land reform, which would correspond to the European practice of agriculture, the Latin American corporate-latifundia model of agriculture was established in Ukraine. This model provides for the concentra-

tion of land in the possession of large landowners and results in the landlessness of peasants.

Farming

In Ukraine, there are 26.5 thousand farms and approximately 600 thousand peasant farms that correspond to the features of farms in the European Union. Small producers produce 50% of agricultural products, including about 70% of potatoes, vegetables, fruits, and berries, more than 60% of milk, almost 50% of eggs, and one-third of meat of all kinds. The domestic and local markets are largely based on this.

Farming provides jobs in rural areas, as defined by rural residents; only local farmers employ local people and provide ongoing support to rural settlements. Farmers live in the community, thus they are closely integrated with the community within which they work. They build and maintain socially important facilities at their own expense. The range of their assistance to the community is very wide – from clearing snow from roads, and ploughing gardens to helping in burying the dead.

Farming preserves local foods and contributes to maintaining a balanced diet and protecting the world's agro biodiversity, and sustainable use of natural resources. Through the processing of products, provision of services, and infrastructures, farming establishes real economic opportunities both for farmers in a particular region and for the entire society.

Increasing farmers' access to infrastructure, technology, communications, and innovations that are tailored to their specific features is essential for the future of food systems and will enable them to attract young people to the sector. Farming supports diversified food systems that help the environmentally sustainable integration of urban and rural areas.

Farming provides an opportunity to ensure food security, improve welfare, manage natural resources, protect the environment and achieve sustainable development in rural areas [32].

Farms should be considered a fundamental factor in preserving the social significance of the village and the object of socio-economic policy at the national level.

Experience of the civilized world

In the countries of the European Union, the USA, and Japan, farms and family farms are considered to be the foundation of the agrarian system.

Thorough scientific research conducted by scientists of the NSC "Institute of Agrarian Economics", in particular O.V. Khodakivska, Y.O. Lupenko, and I.V. Yurchenko, proves that: "The purpose of land policy in the EU is to preserve the European model of multifunctional agriculture, characterised primarily by small and medium-sized family-type farms and cooperative associations, guaranteeing property rights to property and land, equitable access to productive and natural resources in the relevant territory, considering the demands of society, including the interests of future generations" [19].

The countries of the European Union apply different regulatory mechanisms based on national interests, the necessity to guarantee food security, and the specific features of the economy and the organisation of sustainable agriculture. Therewith, priority is given to the preservation and development of family-type farms [19, p. 7].

For example, in Poland, Article 23 of the Constitution stipulates that the basis of the agrarian system of the Polish state is the family farm (family farms) [19, p. 25]. Considering this, the entire policy of this country in the field of agriculture is designed to develop family farming.

After the Second World War, France faced an aggravation of the food crisis. Considering this, food security has become a priority area of national policy. Therefore, France has developed a model of family farming as the foundation of the land system of the country, subordinated to the relevant agrarian and land policy, which is based on the activities of self-regulatory agricultural organisations and state regulation. The model that was used was based on the concept of the development of family-type farms, not large enterprises [19, p. 8].

In Romania, the main purpose of state regulation of the market turnover of agricultural land is the development of family farming [19, p. 24].

The German Land Privatization Agency (BVVG) takes measures to prevent the deterioration

of the farm structure by reducing the size of land use, which can reduce its efficiency, parcellation, or the development of inconvenient land masses for cultivation [19, p. 33-35].

The main producer of agricultural products in the United States - farms. Their number in 2017 exceeded 2 million. Of all farms, 90% are family-type farms. On average, in 2017, the farm area in the United States was 180 hectares [20, p. 83].

In Japan, 85% of all agricultural land is cultivated by farmers, which describes land relations as farmer-oriented. As of January 1, 2017, in Japan, 42.7% of farmers cultivated 1-5 hectares of land, and 17.1% – less than 1 hectare. The area of 5-10 hectares was cultivated by 13.2%, 10-20 hectares – 9.8% and 17.3% of land users performed economic activities on land plots with the area exceeding 20 hectares.

As a result of the study of agriculture in 10 countries, 7 of which are members of the European Union, it can be stated that none of the countries has free, unregulated, liberal agriculture. The regulation of the agricultural sector is designed to preserve and develop the family farming model, which has been and remains the benchmark for these countries [33, p. 104].

Farming in the civilized world is not so much a business as a guarantee:

- national food and environmental security;
- high social standards in rural areas;
- preservation of the settlement network in rural areas.

► Conclusions

From the analysis, it becomes obvious that the possibility of reaching the Goals of comprehensive

sustainable development of rural areas and preservation of the rural settlement network significantly relies on the model of the agrarian structure of Ukraine.

The foundation of the agrarian system model, which will provide an opportunity to ensure the most efficient comprehensive sustainable development of rural areas and the preservation of the rural settlement network, is considered to be individual, farm, family farms, and small and medium-sized agricultural enterprises (farming).

Only this model of the agrarian system can ensure the achievement of the Sustainable Development Goals approved by the UN. The development of farming will allow stopping the depopulation of rural areas and the destruction of the rural settlement network. However, it is impossible without the active intervention of the state. It is essential, following the example of Poland, to enshrine in the Constitution of Ukraine the provision according to which the foundation of the agrarian system of Ukraine is based on individual, farm, family farms, and small and medium-sized agricultural enterprises (farming). After that, the entire policy of Ukraine in the field of agriculture should be designed exclusively to help farms.

Therewith, it is necessary to unconditionally stop the practice of providing multi-million state subsidies and tax benefits to one enterprise or one group of related enterprises. In addition, the state is obliged to provide farmers with unimpeded access to the main means of production – agricultural land. Farmers are not capable of competing with agricultural holdings in a free, non-state-controlled agricultural land market.

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Вибір моделі аграрного устрою України як основи всебічного сталого сільського розвитку

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► **Анотація.** У сучасних складних фінансових, економічних, військових, соціальних, екологічних умовах, через нестійку політичну ситуацію, єдиним лідером, який «витагує» економіку України, є аграрний сектор. Мета статті – проаналізувати моделі аграрного устрою, що сформувалися в Україні за часів незалежності. Визначити модель аграрного устрою, яка надасть можливість найефективніше забезпечити всебічний сталий розвиток сільських територій та збереження сільської поселенської мережі. Для проведення дослідження використано наступні наукові методи: діалектичні для пізнання процесів і явищ; емпіричні (спостереження, порівняння, опис); порівняльного аналізу; абстрактно-логічний (теоретичні узагальнення та формулювання висновків). У процесі аналізу моделей аграрного устрою, які сформувалися в Україні за часів незалежності, з'ясовано, що можливість найефективніше забезпечити всебічний сталий розвиток сільських територій, збереження сільської поселенської мережі надасть модель аграрного устрою, основу якої становлять одноосібні, фермерські, сімейні фермерські господарства, малі та середні сільськогосподарські підприємства. Визначено вплив вибору моделі аграрного устрою на можливість забезпечення всебічного сталого розвитку сільських територій та збереження сільської поселенської мережі. Визначено модель аграрного устрою, яка надасть можливість найефективніше забезпечити всебічний сталий розвиток сільських територій та збереження сільської поселенської мережі. Запропоновано внесення змін у законодавство України, які сприятимуть розвитку моделі аграрного устрою України, основу якої становлять одноосібні, фермерські, сімейні фермерські господарства, малі та середні сільськогосподарські підприємства

► **Ключові слова:** сільська поселенська мережа, земельні відносини, земельна реформа, агрохолдинги, фермерське господарство, фермерство, сімейна ферма, управління земельними ресурсами, конкурентоспроможність, селозберігаюча модель



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Global Climate Crisis and its Impact on the Development of The Agricultural Sector of the Ukrainian Economy

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► **Abstract.** Currently, climate change is manifested throughout the territory of Ukraine. Rural areas are the most sensitive to these changes, as the manifestations of climate change, such as rising temperatures, changing precipitation patterns, and natural weather events significantly affect agriculture and the quality of life in rural areas. The purpose of the research – explore the impact of the global climate crisis on the development and efficiency of the agricultural sector of the Ukrainian economy at the zonal level and scientifically substantiate the conceptual vision of the strategic principles of adaptation of agricultural production to its consequences. In performing the study, a set of general scientific methods and techniques was used: monographic – in the study of domestic and foreign publications on the studied issues; mathematical statistics – to assess the absolute and relative deviation of agricultural production of strategic agricultural products from the average long-term volume at the regional level of the economy in terms of ensuring food security in the context of achieving sustainable development purposes; system approach based on the principles of system analysis and synthesis – to substantiate the relationship between sustainable development and food security, and the efficiency of agricultural production; abstract-logical – for theoretical generalisation of research results; economic analysis – to study the efficiency of agricultural production. The climate data of Ukraine are analysed. Based on a systematic analysis, the impact of the global climate crisis on the development of the agricultural sector of the economy in terms of assessing the level of food security in the context of achieving sustainable development purposes is explored. Established that during the period of data analysis from 2015 to 2020, due to a combination of adverse weather and climatic factors, fluctuations in annual precipitation and an increase in average air temperature, the level of sustainability of agricultural production in the Steppe regions decreased. A high level of variability in grain production was observed in some regions of all-natural and climatic zones. Based on the combination of theories of socio-economic and sustainable development, the theoretical and methodological approaches to assessing the impact of the global climate crisis on the development and efficiency of the agricultural sector of the Ukrainian economy at the zonal level were further explored. The results of the study are acceptable for practical use in the development and substantiation of regional and national strategies for the development of agro-industrial production and its adaptation to the challenges associated with the global climate crisis, and in further scientific research

► **Keywords:** efficiency, development, agricultural production, variation, climate, food security, economy

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► Problem statement

Rapid changes in the climate system caused by anthropogenic activities are resulting in rising air temperatures and sea level rise, which has significant implications for socio-economic activities around the world. There is an urgent requirement for appropriate adaptation and mitigation strategies to address climate threats in various sectors, including agriculture (Wang, Vanga, Saxena, Orsat, & Raghavan, 2018; Attri, 2020).

The world community is beginning to acknowledge the significance of food systems for peace and security. The Norwegian Nobel Committee has awarded the 2020 Nobel Peace Prize to the UN World Food Programme. In the context of the increasingly complex climate crisis, scientific, political and geostrategic security imperatives must come together to properly assess the overall situation while there is still time and resources to address it, rather than face the consequences in the distant future. These collaborative efforts require closer cooperation within the framework of interaction between humanitarian action, sustainable development and the global community to develop and implement systemic approaches aimed at transforming food systems and thus improving living conditions in rural areas (Läderach, Pacillo, Thornton, Osorio, & Smith, 2021).

For Ukraine, as for the rest of the world, the issue of climate change research and the prediction of its consequences is considered an urgent task for science. In domestic conditions, the achievement of sustainable development purposes at the regional level requires a comprehensive study of the basic theoretical and methodological foundations for the development of new forecasting and modelling systems that will address the most efficient use of available resource potential in the context of adaptation to global climate change and assess the adaptive capacity of food ecosystems.

Food systems research plays an important role in deepening the understanding of how climate change exacerbates existing risks, conflicts and crises in the world (Läderach, Pacillo, Thornton, Osorio, & Smith, 2021). Climate crisis is the term that currently best describes anthropogenic global warming and its consequences and conveys a sense of irreversibility associated with the inability of hu-

manity to perform sufficient actions to decelerate, stop and reverse global warming (Shanabhoga, Krishnamurthy, Suresha, & Shivani, 2020). In Ukraine and abroad, the study of this problem has become one of the current fields of research. Modern theoretical and methodological aspects of the study of the impact of the climate crisis on the development of the agricultural sector are considered in many scientific works of domestic scientists, among which should be separately highlighted publications by T.I. Adamenko (Adamenko, 2019), V.R. Vozhehova, (Vozhehova, 2019), Yu.O. Lupenko (Lupenko, 2012), V.Ya. Mesel-Veseliak (Mesel-Veseliak, Pekhota, & Hryshchenko, 2011), O.M. Nechyporenko (Nechyporenko, 2020), B.Ya. Panasiuk (Panasiuk, 2015), K.O. Prokopenko (Prokopenko, & Udova, 2017), M.I. Puhachov (Puhachov, 2017), O.G. Tarariko (Tarariko, Iliencko, & Kuchma, 2016), O.V. Khodakivska (Khodakivska, 2015), O.V. Shubravska (Shubravska, 2017). Among foreign scientists, notably, the latest research of S.D. Attri (Attri, 2020), M.P. Baldwin, M.B. Shanabhoga (Shanabhoga, Krishnamurthy, Suresha, & Shivani, 2020) etc. The above scientific studies, to some extent, cover most of the issues that address the global climate crisis. However, the results of processing their scientific achievements demonstrate that today theoretical, methodological and practical issues related to some aspects of the study of the impact of climate change on the development of the agricultural sector of the economy of Ukraine at the zonal level are still insufficiently explored. These aspects determine the relevance of their implementation.

The purpose of the research – explore the impact of the global climate crisis on the development and efficiency of the agricultural sector of the Ukrainian economy at the zonal level and scientifically substantiate the conceptual vision of the strategic principles of adaptation of agricultural production to its consequences.

► Outline of the main material

Agricultural production is extremely vulnerable to climate change, and this problem could complicate food support for the growing world population by 2050. Thus, understanding how and to

what extent climate change will affect agricultural productivity is crucial for food security in many countries (Kim, & Kwak, 2020).

Ukraine historically has a temperate continental climate, characterised by hot summers and cold winters. However, according to new meteorological observations in recent decades, annual precipitation has been gradually decreasing, and air temperature is rapidly rising from midnight to mid-day.

Table 1. Annual precipitation in different climatic zones according to the Ukrainian Hydrometeorological Center, mm

Year	Steppe	Forest-steppe	Polissya
2005	529.0	644.0	713.0
2010	630.0	690.0	842.0
2015	485.0	478.0	543.0
2020	387.0	539.0	720.0
2020 to 2005, +-	-142	-105	7
2020 to 2005, +-	-98	61	177

Source: compiled based on generalisation of data (Verner, 2021)

For example, in 2020, compared to 2005, the average annual precipitation in the zone

In the Steppe zone, it was 142 mm, and in the Forest-Steppe zone – by 105 mm lower. It is respectively 73.2% and 83.7% of the 2005 level.

Recently, according to domestic scientists, every year, compared to the climatic standard, the average annual air temperature is 1-2 degrees above the norm. (Adamenko, 2019; Dankevych, 2020; Ivaniuta, 2020). According to the National Academy of Agrarian Sciences of Ukraine, in recent decades, the boundaries of natural and climatic zones have shifted 100-150 km to the

Exploring the dynamics of annual precipitation in different natural and climatic zones according to the analysis of the Ukrainian Hydrometeorological Center, it can be observed how extreme these changes have become. There is a steady downward trend in precipitation in the Steppe regions. In the Forest-Steppe and Polissya zones, this trend is less pronounced. Although in some years in these agroclimatic zones a significant decrease is recorded (Table 1).

north. If the current trends of climate change continue in the next 20 years, the danger of actual loss for intensive agro-industrial production of both the Steppe zone and more than half of the arable land of Ukraine will become quite probable and real (Tarariko, Iliencko, & Kuchma, 2016; Khodakivska, 2015; How climate change affects..., 2021).

According to the analysis of information from the Ukrainian Hydrometeorological Center over the past 20 years, in all-natural and climatic zones, there is an increase in the average annual air temperature (Table 2).

Table 2. Average annual air temperature in different climatic zones based on the Ukrainian Hydrometeorological Center, 0°C

Year	Steppe	Forest-steppe	Polissya
2005	10.3	8.4	7.9
2010	11.0	8.9	8.4
2015	10.9	9.9	9.9
2020	11.6	10.4	10.4
2020 to 2005, +-	1.3	2.0	2.5
2020 to 2005, +-	0.7	0.5	0.5

Source: compiled based on generalisation of data (Verner, 2021)

Quite a significant increase in average annual air temperature was recorded in the zone of Polissya and Forest Steppe, respectively by 2.5 and 2°C. In the Steppe regions, the average annual

air temperature increased by 1.3°C. In the Steppe zone, due to the lack of moisture and significant fluctuations in maximum temperatures during the growing season, there is a specific demand for us-

ing irrigation technologies even for those crops that did not require it before (in particular, wheat and barley). With a high probability, given the above, it can be argued that in the short term, this will result in a significant increase in financial costs in agricultural production. Therewith, the issue of assessing the economic consequences of shifting climate zones for the agricultural sector requires additional research.

Changes in the temperature regime in the warm period of the year affected the thermal re-

sources of Ukraine, for the assessment of which the indicator of the sum of active (positive) air temperatures above +10°C accumulated during the warm period is used. Comparison of these amounts for different periods demonstrates their increase by an average of 200-400°C (Adamenko, 2019, p. 16).

Therewith, the sum of active air temperatures above +10°C is constantly increasing for a long period in all-natural and climatic zones (Table 3).

Table 3. Sums of active air temperatures above +10°C in agroclimatic zones of Ukraine for different periods

Agroclimatic zone	1961-1990	1991-2019	2010-2019
Steppe	3145	3400	3550
Forest-steppe	2705	2950	3150
Polissya	2500	2770	2950

Source: (Adamenko, 2019, p. 16)

According to K.O. Prokopenko and L.O. Udova, climate warming will cause both positive results and adverse consequences for agriculture. The positive effects include improvement of growing conditions and reduction of harvesting time; possibility of efficient introduction of late-ripening varieties (hybrids), which require more thermal resources; improvement of wintering conditions for crops and perennial grasses; increase in the efficiency of fertilizer application. Among the adverse effects: increased concentration of CO₂ in the air with a positive impact on crop yields, this will result in deterioration of grain quality; more frequent and severe droughts during the growing season; deterioration of soil moisture in the southern regions; failure to ensure full vernalisation of grain; increase in the number of pests, the spread of plant pathogens and weeds due to favourable conditions for their overwintering; increase in wind and water erosion of soil caused by an increase in the number of droughts and extreme precipitation; increase in the risk of freezing of winter crops due to the lack of stable snow cover with a significant decrease in temperature. Weather conditions of recent years have demonstrated the urgency of adapting crops to the conditions of global warming since the profitability of their cultivation largely depends on it (Khodakivska, 2015).

However, other researchers are much more pessimistic about the possible consequences of the

climate crisis. In their opinion, the expected climate change and, especially, the increase in ambient temperature will result in a decrease in the yield of major crops (Wang, Vanga, Saxena, Orsat, & Raghavan, 2018).

Agricultural production is a complex dynamic system of social and economic relations based on forward and backward linkages, which are associated with the factors of resource, biological, technological, innovative, demographic, environmental, climatic deterministic, and stochastic nature of influence in a market environment. One of the urgent problems of the development of the domestic agricultural sector is to ensure the sustainable economic growth of agricultural production. The complexity and unpredictable nature of the conditions of the interaction of exogenous and endogenous factors affecting agriculture cause some problems in analysing the dynamics of its economic growth indicators and determining the magnitude of their impact on the total gross output, and forecasting the prospects of the industry.

Conducted within the framework of the implementation of the IPA NAAS 36 and task 36.00.00.24. P "To develop a scientifically based system for forecasting and modelling the development of agro-industrial production of the Steppe zone regions in the context of global climate change", the study of the impact of climate change on the sustainability and dynamics of the agricultural sector of the economy demonstrated that in

recent years the most unstable agricultural production has been observed in some regions of the Steppe, Forest Steppe and Polissya (Table 4).

Three statistical indicators were used to analyse and assess the impact of the climate crisis on the sustainability of agricultural production of

grains, vegetables, potatoes, and sunflowers. Notation: Av – the average long-term value of the indicator of production of main crops, thousand tons; STDev – standard deviation of production of main crops, thousand tons, and Cv – coefficient of variation (variability, deviation from the mean value), %.

Table 4. Analysis of the dynamics of grain production in different climatic zones, thousand tons

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Dnipropetrovsk	3866.2	3480.8	3578.4	3487.5	4285.4	3539.5	3706.3	317.4	8.6
Donetsk	1536.1	1793.4	1908.0	1344.4	1968.7	1988.0	1756.4	261.3	14.9
Zaporizhzhia	2728.1	2624.4	2907.1	2233.3	3339.1	2964.4	2799.4	370.5	13.2
Kirovohrad	3313.9	3725.8	2858.0	3763.2	4346.6	2689.1	3449.4	620.6	18.0
Luhansk	992.8	1274.2	1276.2	1159.4	1446.5	1375.9	1254.2	161.2	12.9
Mikolaivska	2896.4	2725.5	2674.6	2673.4	3137.9	2362.1	2745.0	258.6	9.4
Odesa	3489.0	4403.3	4264.9	4319.9	3747.9	1955.0	3696.7	926.3	25.1
Kherson	2621.9	2262.4	2545.4	2267.7	2739.7	2719.9	2526.2	214.0	8.5
Together in the Steppe zone	21444.4	22289.8	22012.6	21248.8	25011.8	19593.9	21933.6	1777.1	8.1
Vinnitsia	3768.3	5563.5	4888.9	5911.1	5936.2	4015.3	5013.9	951.0	19.0
Kyiv	2820.0	3327.5	2646.9	4081.5	4215.7	2987.2	3346.5	662.1	19.8
Poltava	5363.2	5783.1	4241.4	6341.8	6118.8	5050.3	5483.1	771.4	14.1
Sumy	3734.5	3816.2	3686.2	4470.1	4432.6	4819.7	4159.9	475.3	11.4
Ternopil	2199.0	2448.6	2622.3	2631.9	2699.9	2837.4	2573.2	222.4	8.6
Kharkiv	4209.7	4316.7	3859.2	3829.2	4416.1	4852.6	4247.3	381.2	9.0
Khmelnitsky	2792.9	3085.5	3421.4	3861.0	3798.2	3985.3	3490.7	475.9	13.6
Cherkasy	3745.5	4091.7	2926.5	4644.0	4559.8	2692.3	3776.6	820.3	21.7
Chernivtsi	523.5	507.4	603.9	586.4	642.0	578.2	573.6	50.3	8.8
Together in the Forest-Steppe zone	29156.6	32940.2	28896.7	36357.0	36819.3	31818.3	32664.7	3411.5	10.4
Volyn	1062.3	1109.7	1165.2	1237.2	1292.6	1401.2	1211.4	124.9	10.3
Zhytomyr	1459.6	2093.9	1993.7	2424.1	2738.3	2526.1	2206.0	457.8	20.8
Zakarpattia	332.4	412.4	390.1	375.9	391.7	327.0	371.6	34.5	9.3
Ivano-Frankivsk	688.5	772.8	753.7	804.5	743.6	826.5	764.9	48.7	6.4
Lviv	1366.3	1428.8	1417.0	1440.0	1643.7	1607.4	1483.9	113.2	7.6
Rivne	1101.5	1300.5	1208.7	1259.5	1493.0	1443.7	1301.2	146.5	11.3
Chernihiv	3514.2	3739.9	4079.0	4909.5	5009.2	5389.3	4440.2	764.6	17.2
Together in the Polissya region	9524.8	10858.0	11007.4	12450.7	13312.1	13521.2	11779.0	1572.4	13.3
Ukraine	60125.8	66088.0	61916.7	70056.5	75143.2	64933.4	66377.3	5505.0	8.3

Source: compiled based on generalisation of data (Verner, 2021)

It is established that a high level of variability of grain production is present in some regions of all-natural and climatic zones. In the Steppe – Odesa (coefficient of variation 25.1%) and Kirovohrad (18%) regions, in the Forest-Steppe – Cherkasy (coefficient of variation 21.7%), Kyiv (19.8%) and Vinnitsia (19%) regions, in Polissya – Zhytomyr (coefficient

of variation 20.8%) and Chernihiv (17.2%) regions. The production of potatoes, the second most strategically significant crop for the food security of the state, was the least stable primarily in the Steppe regions – Odesa, Mykolaiv, Luhansk, Zaporizhzhya and, partially, in the Forest-Steppe and Polissya regions – Kharkiv and Zhytomyr (Table 5).

Table 5. Analysis of potato production dynamics in different climatic zones, thousand tons

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Dnipropetrovsk	560.3	602.1	567.9	523.9	434.1	466.1	525.7	64.4	12.3
Donetsk	397.7	409.1	446.8	343.8	358.0	417.5	395.5	38.4	9.7
Zaporizhzhia	258.5	263.7	226.2	189.7	218.8	177.7	222.4	34.9	15.7
Kirovohrad	525.5	603.4	559.9	575.8	503.1	515.5	547.2	38.9	7.1
Luhansk	208.0	252.8	298.7	232.0	208.6	213.8	235.7	35.4	15.0
Mikolaivska	196.1	268.4	183.0	171.4	176.8	207.0	200.5	35.7	17.8
Odesa	494.6	541.1	393.0	304.8	381.0	361.5	412.7	88.1	21.4
Kherson	287.2	279.6	271.0	296.4	258.8	279.7	278.8	13.0	4.7
Together in the Steppe zone	2927.9	3220.2	2946.5	2637.8	2539.2	2638.8	2818.4	257.9	9.2
Vynnytsia	1836.6	1848.5	1884.9	1907.6	1826.7	1907.8	1868.7	36.1	1.9
Kyiv	1433.6	1703.1	1700.5	1830.7	1506.4	1549.3	1620.6	148.6	9.2
Poltava	1137.9	1065.4	996.6	1096.0	996.3	1003.9	1049.4	59.9	5.7
Sumy	1068.4	1065.6	1107.4	1000.7	950.9	901.6	1015.8	78.9	7.8
Ternopil	927.8	987.0	991.3	1035.8	960.6	914.1	969.4	44.9	4.6
Kharkiv	1029.0	1077.7	1077.8	1078.8	843.0	712.8	969.9	155.4	16.0
Khmelnysky	1064.9	1320.5	1385.3	1386.8	1096.6	1279.8	1255.7	141.8	11.3
Cherkasy	778.2	839.2	731.6	915.8	632.1	729.2	771.0	98.2	12.7
Chernivtsi	586.3	594.7	615.3	613.8	579.5	597.0	597.8	14.4	2.4
Together in the Forest-Steppe zone	9862.7	10501.7	10490.7	10866.0	9392.1	9595.5	10118.1	584.9	5.8
Volyn	1098.8	1132.4	1139.4	1164.5	1174.2	1201.5	1151.8	36.0	3.1
Zhytomyr	1176.8	1316.6	1648.4	1879.1	1598.9	1773.8	1565.6	269.4	17.2
Zakarpattia	545.8	534.3	531.0	529.8	494.7	477.6	518.9	26.5	5.1
Ivano-Frankivsk	942.5	975.0	1000.2	1009.8	1007.8	999.2	989.1	26.0	2.6
Lviv	1622.5	1618.9	1693.8	1698.2	1572.9	1601.1	1634.6	50.7	3.1
Rivne	1227.6	1249.4	1310.9	1310.8	1284.7	1286.0	1278.2	33.5	2.6
Chernihiv	1434.7	1201.8	1447.3	1408.0	1204.7	1264.5	1326.8	115.9	8.7
Together in the Polissya region	8048.7	8028.4	8771.0	9000.2	8337.9	8603.7	8465.0	394.8	4.7
Ukraine	20839.3	21750.3	22208.2	22504.0	20269.2	20838.0	21401.5	883.6	4.1

Source: compiled based on generalisation of data (Verner, 2021)

The vegetable sector proved to be somewhat more resilient to climate change than others, as evidenced by the analysis of the coefficient of variation

of the average annual production of vegetable crops. Thus, vegetable production is the least stable in Odesa and Zaporizhzhya regions (Table 6).

Table 6. Analysis of the dynamics of vegetable production in different climatic zones, thousand tons

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Dnipropetrovsk	728.3	732.7	702.6	749.0	727.5	684.6	720.8	23.2	3.2
Donetsk	208.0	213.8	233.1	235.8	270.2	241.4	233.7	22.1	9.5
Zaporizhzhia	435.7	391.4	352.3	273.9	273.9	254.0	330.2	74.2	22.5
Kirovohrad	234.8	233.9	243.2	257.6	260.8	254.0	247.4	11.7	4.7
Luhansk	163.3	168.0	186.8	164.2	177.8	148.5	168.1	13.2	7.8
Mikolaivska	483.0	500.9	554.5	515.6	478.5	575.3	518.0	39.2	7.6
Odesa	436.5	348.8	287.7	270.7	289.4	246.6	313.3	69.2	22.1
Kherson	1251.5	1278.2	1268.9	1317.0	1320.0	1315.7	1291.9	29.4	2.3

Table 6. Continued

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Together in the Steppe zone	3941.1	3867.7	3829.1	3783.8	3798.1	3720.1	3823.3	75.8	2.0
Vinnitsia	460.4	477.8	483.3	461.4	455.7	429.7	461.4	18.9	4.1
Kyiv	511.2	631.1	581.1	604.2	565.8	566.5	576.7	40.6	7.0
Poltava	517.3	522.2	402.4	524.5	545.6	563.1	512.5	56.6	11.1
Sumy	189.2	200.4	183.9	201.2	203.2	205.2	197.2	8.6	4.3
Ternopil	255.4	259.3	274.3	265.3	282.9	272.7	268.3	10.2	3.8
Kharkiv	689.8	692.5	687.7	694.4	675.9	578.6	669.8	45.2	6.7
Khmelnitsky	187.4	227.5	268.7	262.8	249.4	224.6	236.7	30.1	12.7
Cherkasy	365.3	354.2	313.3	354.7	358.8	387.9	355.7	24.2	6.8
Chernivtsi	222.3	227.7	234.3	238.3	247.5	253.7	237.3	11.8	5.0
Together in the Forest-Steppe zone	3398.3	3592.7	3429.0	3606.8	3584.8	3482.0	3515.6	91.0	2.6
Volyn	276.4	288.7	302.6	280.2	281.9	279.9	285.0	9.6	3.4
Zhytomyr	271.9	297.0	327.2	340.1	393.7	403.3	338.9	52.0	15.4
Zakarpattia	267.2	267.2	271.3	283.6	271.0	280.9	273.5	7.0	2.6
Ivano-Frankivsk	169.8	172.2	174.2	177.6	181.5	185.2	176.8	5.8	3.3
Lviv	483.5	505.7	511.1	512.8	709.1	806.7	588.2	135.5	23.0
Rivne	213.6	236.2	268.1	265.1	268.9	274.7	254.4	24.2	9.5
Chernihiv	192.2	187.1	173.7	190.2	198.6	220.0	193.6	15.3	7.9
Together in the Polissya region	1874.6	1954.1	2028.2	2049.6	2304.7	2450.7	2110.3	220.9	10.5
Ukraine	9214.0	9414.5	9286.3	9440.2	9687.6	9652.8	9449.2	190.5	2.0

Source: compiled based on generalisation of data (Verner, 2021)

The analysis of the range of variation in sunflower production is of some scientific and practical interest. According to the analysis of available data, the share of the coefficient of variation of sunflower production increases from the Steppe zone to the Polissya zone (Table 7). In the Steppe, this figure is the lowest, at 11.5%. In the Forest-Steppe it is 15.1% and in Polissya – 25.7%. The high variation of sunflower cultivation in Polissya is explained by the almost absence of this crop among the crops typical for this zone in previous years. Warming has established conditions favourable for growing

sunflowers in it. However, for the less fertile soils of Polissya, its cultivation can potentially become rather risky soon compared to other zones.

The research of the reasons for the high variation of intrazonal production of major crops in all categories of farms of the main natural and climatic zones over the years of observation allowed the establishment of some regularities and trends. First of all, for grains, sunflowers, and vegetables, the coefficient of variation increases from the Steppe to Polissya, while for potatoes, on the contrary, it decreases.

Table 7. Analysis of sunflower production dynamics in different climatic zones, thousand tons

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Dnipropetrovsk	1198.6	1264.1	1202.8	1283.2	1448.6	1013.5	1235.1	141.6	11.5
Donetsk	528.3	620.0	555.5	531.0	685.7	571.8	582.1	60.8	10.4
Zaporizhzhia	961.8	985.2	866.4	720.5	1020.5	827.3	897.0	113.3	12.6
Kirovohrad	1170.1	1293.8	1091.9	1458.7	1540.3	1033.1	1264.7	203.4	16.1
Luhansk	484.8	670.1	566.1	720.9	860.6	678.3	663.5	129.5	19.5
Mikolaivska	938.7	1162.3	875.8	1087.2	1063.4	691.9	969.9	171.2	17.7
Odesa	755.3	1004.2	903.9	886.3	693.4	452.9	782.7	195.9	25.0
Kherson	486.5	613.1	499.2	552.8	641.1	531.6	554.1	61.9	11.2

Table 7. Continued

Natural and climatic zone, region	2015	2016	2017	2018	2019	2020	Av	STDev	Cv, %
Together in the Steppe zone	6524.1	7612.8	6561.6	7240.6	7953.6	5800.4	6948.9	798.1	11.5
Vinnitsia	503.6	819.8	725.8	808.1	846.0	773.4	746.1	125.9	16.9
Kyiv	292.1	452.6	397.5	570.1	508.0	454.8	445.9	95.3	21.4
Poltava	848.4	824.4	730.9	943.9	979.3	974.1	883.5	99.0	11.2
Sumy	471.2	488.4	516.3	621.0	777.1	880.1	625.7	168.7	27.0
Ternopil	74.7	149.1	234.2	190.6	215.6	285.4	191.6	73.0	38.1
Kharkiv	1172.2	1352.2	1103.0	1468.2	1480.6	1355.8	1322.0	154.3	11.7
Khmelnysky	105.9	346.7	438.7	484.1	513.4	568.8	409.6	166.6	40.7
Cherkasy	541.6	576.0	504.7	640.9	673.7	568.8	584.3	62.7	10.7
Chernivtsi	20.8	55.5	43.6	52.4	34.3	52.6	43.2	13.5	31.1
Together in the Forest-Steppe zone	4030.5	5064.7	4694.7	5779.3	6028.0	5913.8	5251.8	794.5	15.1
Volyn	5.2	15.6	39.5	69.5	94.5	100.9	54.2	40.4	74.5
Zhytomyr	141.5	231.7	247.6	298.6	324.6	346.0	265.0	74.7	28.2
Zakarpattia	4.7	6.9	6.8	5.4	8.0	6.4	6.4	1.2	18.4
Ivano-Frankivsk	27.3	53.1	76.9	57.6	61.1	64.3	56.7	16.5	29.1
Lviv	27.8	67.6	73.7	79.8	72.7	84.8	67.7	20.5	30.2
Rivne	9.6	37.0	67.0	58.4	77.9	101.7	58.6	32.2	54.9
Chernihiv	410.4	537.5	467.7	576.0	633.7	692.1	552.9	104.2	18.8
Together in the Polissya region	626.5	949.4	979.2	1145.3	1272.5	1396.2	1061.5	272.8	25.7
Ukraine	11181.1	13626.9	12235.5	14165.2	15254.1	13110.4	13262.2	1437.0	10.8

Source: Compiled based on generalisation of data (Verner, 2021)

To a large extent, under specific conditions, the adverse impact of climate change can be reduced if specific standards of environmentally safe agricultural production are observed. However, in practice, in a significant number of farms, these requirements have not been observed for many years and are deliberately violated.

In particular, according to Y.M. Gadzalo and Yu. Luzan, only 15% of agricultural producers use scientifically based crop rotations, while in most farms other agrotechnical and environmental requirements are actually not observed, there is no balanced application of organic and mineral fertilizers, uncontrolled use of plant protection products, the decline of land reclamation continues, and the natural fertility of soils is generally lost (Läderach, Pacillo, Thornton, Osorio, & Smith, 2021). As noted by Sh.I. Ibatullin, O.V. Shanin and other researchers, in the field of crop production there is a transformation of the structure of

agricultural land use and a change in the regional specialisation.

The process has a spontaneous, opportunistic nature, which violates the technological and environmental foundations of farming and requires state regulation. Export-oriented crops dominate, which increases the environmental load on land resources (Ibatullin, Shanin, & Stepenko, 2014). In general, throughout the Steppe zone, according to the results of research and analysis of long-term statistical data and the calculation of the coefficient of variation, it was established that the shortfall in grain production on average due to the impact of climate change can range from 1 to 5 million tons per year. This aspect has a significant impact on the economy of agricultural production, which is confirmed by the results of the analysis of gross agricultural production per 100 hectares. In the steppe zone, which suffered from climate problems in 2020, agricultural production per 100 ha is much lower (Table 8).

Table 8. Analysis of agricultural production efficiency per 100 ha of agricultural land by region (in constant prices of 2016)

Natural and climatic zone, region	Average for 2015-2020			For 2020		
	Total of 100 hectares, thousand UAH	Including, %, to the indicator		Total of 100 hectares, thousand UAH	Including, %, to the indicator	
		thousand UAH	Ukraine		Steppe zone	Ukraine
Dnipropetrovsk	1525.0	127.1	94.9	1448.8	137.5	93.5
Donetsk	892.0	74.4	55.5	949.1	90.1	61.2
Zaporizhzhia	1098.1	91.5	68.3	1072.4	101.8	69.2
Kirovohrad	1510.5	125.9	94.0	1249.5	118.6	80.6
Luhansk	647.4	54.0	40.3	671.5	63.7	43.3
Mikolaivska	1176.2	98.1	73.2	991.5	94.1	64.0
Odesa	1090.5	90.9	67.9	666.2	63.2	43.0
Kherson	1386.3	115.6	86.3	1375.4	130.6	88.7
Together in the Steppe zone	1199.5	100.0	74.7	1053.4	100.0	68.0
Vinnitsia	2586.3	215.6	161.0	2419.9	229.7	156.1
Kyiv	2320.3	193.4	144.4	2129.4	202.1	137.4
Poltava	1931.6	161.0	120.2	1776.0	168.6	114.6
Sumy	1690.3	140.9	105.2	1846.5	175.3	119.1
Ternopil	2229.7	185.9	138.8	2341.8	222.3	151.1
Kharkiv	1566.1	130.6	97.5	1582.8	150.3	102.1
Khmelnitsky	2194.9	183.0	136.6	2241.1	212.7	144.6
Cherkasy	2547.5	212.4	158.5	2187.0	207.6	141.1
Chernivtsi	2165.5	180.5	134.8	2238.6	212.5	144.4
Together in the Forest-Steppe zone	2110.9	176.0	131.4	2029.4	192.7	130.9
Volyn	1518.0	126.5	94.5	1603.5	152.2	103.5
Zhytomyr	1629.8	135.9	101.4	1733.5	164.6	111.8
Zakarpattia	1879.8	156.7	117.0	1897.7	180.2	122.4
Ivano-Frankivsk	2132.8	177.8	132.7	2216.6	210.4	143.0
Lviv	1770.8	147.6	110.2	1933.7	183.6	124.8
Rivne	1767.4	147.3	110.0	1871.6	177.7	120.7
Chernihiv	1432.2	119.4	89.1	1558.3	147.9	100.5
Together in the Polissya region	1947.0	162.3	121.2	1942.5	184.4	125.3
Ukraine	1606.8	134.0	100.0	1550.0	147.1	100.0

Source: Compiled based on generalisation of data (Prokopenko, 2021)

In modern conditions, the determining factors of adaptation to climate change in all-natural and climatic zones are the choice of zoned varieties, using the optimal fertilizer system and integrated plant protection. The factor of timeliness and quality of implementation of all these measures is important. The problem of developing and implementing new strategies for the organisation of climate-optimised agro-industrial production, which will solve the socio-economic problems of the industry and consider weather and

climate changes and their impact on the development of the agricultural sector, is currently relevant (Hadzalo, & Luzan, 2017; Baldwin, & Lenton, 2020).

► Conclusions

In the Steppe regions, the impact of climate change on the sustainability and dynamics of agricultural production is quite significant, which requires the development of a scientifically based forecasting and modelling system to prevent potential economic losses and assess

risks. This situation is primarily conditioned upon the frequent combination of two adverse environmental and climatic factors in some years – the increase in the average annual temperature and a sharp decrease in precipitation.

Achievement of strategic areas of agrarian development by the Concept of implementation of the national policy in the field of climate change for the

period up to 2030 requires a systematic analysis of the problems of efficient management of economic and agro-climatic potential at the regional level to ensure balanced use of labour, financial and natural resources, and the development of a qualitatively new institutional environment while maintaining sustainable growth dynamics, environmentally safe and competitive functioning of industries.

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Глобальна кліматична криза та її вплив на розвиток аграрного сектору економіки України

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► **Анотація.** Сьогодні зміна клімату проявляється по всій території України. Найбільш чутливими до цих змін є сільські території, адже прояви зміни клімату, як то підвищення температури, зміна режиму опадів та стихійні погодні явища безпосередньо впливають на сільське господарство та якість життя у селі. Мета статті – дослідити фактор впливу глобальної кліматичної кризи на розвиток і ефективність аграрного сектору економіки України на зональному рівні та науково обґрунтувати концептуальне бачення стратегічних засад адаптації агропромислового виробництва до її наслідків. При виконанні дослідження застосовано сукупність загальнонаукових методів і прийомів: монографічний – при вивченні вітчизняних і зарубіжних публікацій досліджуваної проблематики; математичної статистики – для оцінки абсолютного й відносного відхилення аграрного виробництва стратегічних видів сільськогосподарської продукції від середнього багаторічного обсягу на регіональному рівні економіки з точки зору забезпечення продовольчої безпеки в контексті досягнення цілей сталого розвитку; системного підходу на основі принципів системного аналізу і синтезу – для обґрунтування взаємозв'язку сталого розвитку й продовольчої безпеки, а також ефективності аграрного виробництва; абстрактно-логічний – для теоретичного узагальнення результатів досліджень; економічного аналізу – для вивчення ефективності аграрного виробництва. Проаналізовано кліматичні дані України. На основі системного аналізу досліджено вплив глобальної кліматичної кризи на розвиток аграрного сектору економіки із точки зору оцінки забезпечення рівня продовольчої безпеки в контексті досягнення цілей сталого розвитку. Встановлено, що за період аналізу даних із 2015-го по 2020 р. через поєднання комплексу несприятливих погодно-кліматичних факторів коливання річних опадів і підвищення середньої температури повітря знизився рівень стійкості аграрного виробництва регіонів Степу. Високий рівень мінливості виробництва зернових культур спостерігався в окремих регіонах усіх природно-кліматичних зон. На основі поєднання теорій соціально-економічного та сталого розвитку набули подальшого вивчення теоретико-методичні підходи до оцінки впливу глобальної кліматичної кризи на розвиток і ефективність аграрного сектору економіки України на зональному рівні. Результати дослідження прийнятні для практичного використання при розробці й обґрунтуванні регіональних і загальнодержавних стратегій розвитку агропромислового виробництва та адаптації його до викликів, пов'язаних із глобальною кліматичною кризою, а також у подальших наукових дослідженнях

► **Ключові слова:** ефективність, розвиток, аграрне виробництво, варіація, клімат, продовольча безпека, економіка



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Methodical Approaches to the Assessment of Financial Risks of the Agricultural Sector

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► **Abstract.** For the purpose of risk management, the specific features of the agricultural complex and the main sources of information used in risk identification are identified. The purpose of the study – substantiate the methodological tools for identifying and assessing financial risks for managing such on the example of the agricultural sector. The monographic method was used to review the scientific publications of researchers and analyse the regulatory framework for identifying and assessing risks, systematic and comparative analyses to form methodological approaches to financial risk assessment, empirical method and synthesis to analyse food security indicators, indicators of state regulation of financial risks in the industry, a graphical method to display the dynamics of individual indicators under study, an abstract-logical method for theoretical generalisations and conclusions. Methodical approaches to financial risk assessment are considered. The components of the methodology of financial risk assessment as a system of principles, approaches and methods of scientific research of identification and measurement of risks, and the theoretical foundations of using these tools in the study of security aspects of the national economy are specified. It is determined that financial risk concerns almost all areas of activity and is a kind of assessment of decision-making under conditions of uncertainty in the field of financing, investment, asset management and resource potential at different levels of management. For the macro-level of financial risk assessment, the dynamics of the food security index as the main criterion for the consequences of the financial security of the industry; the state of the shadow economy as a determining factor of systemic financial risks; the level of budget support as a factor in the efficiency of the state financial policy of the industry and financial risk management were analysed. For the micro level, the classification of methods for assessing financial risks based on the methods of the financial condition of enterprises is clarified, and the relationship between them is argued. Express analysis of financial risks based on financial statements by analytical coefficients on the example of PJSC "Myronivsky Hliboproduct" was performed. The regulatory methods for determining financial risk by the coefficient analysis and cost-benefit analysis and the National Standard of Ukraine are summarised. "Risk management. Methods of general risk assessment" to justify the necessity of developing a unified system of methodological approaches to financial risk assessment. The necessity of forming a unified methodology for assessing the financial risks of the agricultural sector is proved, for which the financial resources of the industry for 2013-2020 are analysed and it is found that their share accounts for 9.4% of the resources of the economy. Methodological approaches to the assessment of financial risks are expanded by involving the macro-level of the agricultural sector in the analysis, as it serves as a guarantor of food security, there is a necessity to constantly monitor the state of financial resources and its regulation through budget support, tax preferences,

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and regulatory measures to maintain the competitiveness of the industry. It is generalised that the content of the assessment of financial risks of agricultural enterprises is determined by the purpose and main tasks, which are graded at the hierarchy levels. The scheme of the methodology for assessing financial risks of the agricultural sector is developed. The methodological support of financial risk assessment processes has been improved, which can serve as the foundation for the development of a unified Methodology for analysing the financial condition and financial risks of agricultural enterprises. The stages of financial risk assessment for the agrarian sector are proposed according to the algorithm: detection – analysis – minimisation, which can be useful for agricultural enterprises in the implementation of a comprehensive financial analysis. Some conclusions of the study can be used in the development of the financial policy of the agricultural sector

► **Keywords:** agricultural enterprises, methodological approaches, assessment, analytical indicators, financial risks, financial condition

► Problem statement

Financial risks are an indispensable attribute of economic activity, and the deepening of the crisis in the economic environment is the reason for their dynamic growth. Therefore, in the current conditions of global and national economic instability, it is advisable to expand knowledge about their nature and methods of managing them.

In the practice of financial risk assessment, the most widespread are methodological approaches based on: analysis of the balance sheet of enterprises (horizontal, vertical, trend analysis, method of financial coefficients); heuristic methods, informal intuitive approaches, generalisation of solutions to similar problems, expert assessments; economic and mathematical methods (Gómez-Limón, & Sanchez-Fernandez, 2010). Since financial risks are inherent in almost every component of economic security, the general state and development of the economy depend on the quality of their scientific generalisation. Efficient risk management involves appropriate methodological aspects of assessment and justification of actions to reduce or avoid adverse effects of risks at all levels of the hierarchy. In this aspect, it is essential to analyse the financial risks of the agricultural sector as one that ensures food security and is characterised by a changing environment and increased risk.

The definition of the essence of financial risks and the main methods of their assessment have been the subject of research by well-known scientists in this field, including: O. Baranovsky; V. Varnaliy; V. Gayets; A. Yermoshenko; S. Maistro; I. Rekunenko; V. Rossokha; O. Radchenko

(Melnychuk, Radchenko, & Leontovych, 2021), P. Sabluk; S. Svirko; Y. Kharazishvili etc. On the theoretical foundations of financial risk management of the enterprise worked N. Kuznetsova, P. Bidiuk (Kuznetsova, & Bidiuk, 2020), O. Shyshkina (Shyshkina, 2019); D. Dermenzhi (Dermenzhi, 2018), Y. Shvets (Shvets, 2018), who provided a definition of the essence of financial risks and the main methods of their assessment in an unstable market economy. A significant part of research is devoted to the economic and mathematical modelling of indicators of the efficiency of the financial risk management system: G. Chaban (Chaban, 2020); S. Tkachenko (Tkachenko, 2017). I. Fedulova, G. Pyatnytska *et al.* (Fedulova, & Piatnytska, 2020), exposed the signalling of risk management, crisis management and compliance in the management of the financial security of the enterprise. Financial policy in the context of shadowing and imbalances was studied by I. Lukyanenko *et al.* (Lukianenko, 2020); national systems of risk and threat assessment – by O. Reznikova *et al.* (Reznikova, Voitovskiy, & Lepikhov, 2020); N. Poida-Nosyk, I. Cherleniak (Poida-Nosyk, & Cherleniak, 2021) – financial security management at macro and micro levels. Regarding agrarian risks, the authors' developments are known: A. Sakun, O. Prystemsky (Sakun, & Prystemsky, 2019), O. Prokopchuk (Prokopchuk, 2019), O. Emelyanov (Yemelianov, 2020), I. Posokhov, Y. Zhadan (Posokhov, & Zhadan, 2019), N. Sirenko, A. Minaeva (Sirenko, & Minaeva, 2015) and others.

Foreign researchers J. Gómez-Limón and G. Sanchez-Fernandez (2010) (Gómez-Limón, &

Sanchez-Fernandez, 2010) noted that risk plays a key role, and its acceptance by farmers contributes to their competitiveness, so reliable assessment methods are required; C. Cafiero, F. Capitanio, A. Cioffi, A. Coppola (2007) (Cafiero, Capitanio, Cioffi, & Coppola, 2007) developed approaches to risk and crisis management in the reformed European agricultural policy; T. Andersen, P. Schreder (2010) were concerned with the practice of strategic risk management (Andersen, & Schreder, 2010); J. Clapp, S. Isakson (2018) (Clapp, & Isakson, 2018) assessed the risk profit and the consequences of financialization in the food system; M. van Asseldonk, M. Jongeneel, R. van Kooten, J. Cordier (2019) (van Asseldonk, Jongeneel, van Kooten, & Cordier, 2019). M. Janowicz-Lomott, K. Łyskawa (2017) (Janowicz-Lomott, & Łyskawa, 2017) considered agricultural risk management in the European Union, etc.

Thus, the researchers classified financial risks; provided substantiation of methodological approaches and practical tools; developed risk management models by stages and components; developed management strategies for the hierarchy based on the results of mathematical modeling; identified areas for improving risk analysis, etc. However, with the deepening of the crisis, it has become relevant to conduct research in the field of systematisation of methodological approaches to financial risk assessment tools to generalise them specifically for the agricultural sector.

The purpose of the study – justify the methodological tools for identifying and assessing financial risks to manage them in the example of the agricultural sector.

► Summary of the main results of the study

Methodological approaches to financial risk assessment include its identification, the actual

assessment process, and the choice of neutralisation methods. According to researchers, in particular S. Tkachenko, “financial risk management is understood as a system of methods and tools used in the identification, analysis of financial risks, assessment of their possible consequences for the enterprise, development and implementation of measures to neutralise them” (Tkachenko, 2017, p. 172). The definition of financial risk is organically inherent in the practice of market management. According to D. Dermenji (Dermenzhi, 2018, p. 72), there are many opinions on the essence of the concept of financial risk in the variation that it is: associated with financial transactions (profit, currency, securities, etc.); covers all types of activities. Therefore, one of the essential stages of financial risk management is its assessment. Thus, I. Lukyanenko et al. established that “the financial system is stable if: it efficiently redistributes resources from savings owners to investors; financial risks are carefully assessed and adequately managed; the financial system can absorb shocks without significant adverse consequences” (Lukianenko, 2020, p. 28), and “conditionally, the risks of financial systems can be divided into three categories: business risks, financial and operational risks”.

According to the study of N. Kuznetsova, and P. Bidiuk (Kuznietsova, & Bidiuk, 2020), financial risks are the probability of financial consequences in a situation of the uncertainty of the conditions of activity. The consequences of risk implementation can be both losses and gains, they require rather sophisticated tools for their processing. Thus, financial risk relates to many areas, it serves as a kind of assessment of uncertainty in the process of activity, decision-making in the field of financing, investment, asset management, in general, and resource potential, thus, the methods of assessment are rather diverse (Table 1).

Table 1. Methods of financial risk assessment

Assessment method	Essence of the method
Oriental	The degree of risk impact on key performance indicators is assessed
Systematic	It is estimated by the coefficient β (sensitivity coefficient), which determines the level of fluctuations in the performance of the industry relative to the performance of the market or the entire economy
Statistical	Determining the probability of losses based on statistical data of the previous period and establishing the zone, risk coefficient: assessment of the probability of execution, analysis of the probability distribution of the payment flow, decision tree, simulation risk modeling, and technology “Risk Metrics”

Table 1. Continued

Assessment method	Essence of the method
Analytical	They allow determining the probability of losses based on mathematical models and are mainly used to analyse the risk of investment and innovation projects: sensitivity analysis, method of adjusting the discount rate to consider the risk, method of equivalents, method of scenarios
Expert	A set of logical and mathematical-statistical methods and procedures for processing the results of the expert group survey
Financial sustainability assessments	It is designed to assess the financial stability of the enterprise (project) and to identify potential risk areas based on this: fixing the financial condition of the enterprise (financial stability assessment); comparing the financial stability of the enterprise before and after the implementation of the analysed project (cost-effectiveness assessment)
Rating	It consists of the following elements: a system of evaluation coefficients; a scale of values of these coefficients (if necessary); a scale of evaluation of the values of the obtained indicators; formulas for calculating the final rating
Regulatory	Based on using a system of financial ratios: liquidity, debt, autonomy, manoeuvrability, immobilisation, coverage
Fundamental	Financial risk is calculated through fundamental indicators: <i>volatility of asset profitability, the small size of the company (P/BV), unbalanced growth (ROE is higher than the coefficient of balanced growth)</i>
Combined	Various methods are used

Source: (Zorina, 2015, p. 224; Dermenzhi, 2018, p. 73)

According to the above data, it follows that risk assessment methods are divided into qualitative and quantitative, where the first – the determination of the scope of possible risks, and factors affecting them, preliminary assessment of the danger, and the second – providing their specific measurement. The variety of evaluation methods is generated by different objectives. Therefore, the primary task of methodological approaches to

financial risk assessment is to define the purpose and its objectives precisely.

For agricultural enterprises, an express analysis of financial risks is performed based on financial statements in specific areas identical to the analysis of the financial condition. Analytical coefficients and methods of their calculation on the example of PJSC “Myronivsky Hliboproduct” are as follows (Table 2).

Table 2. Analytical ratios of PJSC “Mironivsky Hliboproduct” for 2016-2020

Indicator	2020	2019	2018	2017	2016
Liquidity, %	85.00	62.00	65.11	51.50	80.59
current assets/current liabilities					
Accelerated liquidity, %	82.00	60.00	57.20	48.99	74.44
current assets – inventories/current liabilities					
Monetary liquidity, %	9.00	7.00	4.64	2.77	4.17
cash and its equivalents/current liabilities					
Cycle of accounts receivable repayment, times	4.82	13.41	12.52	4.88	1.95
revenue from sales/accounts receivable					
Inventory renewal cycle, times	55.30	59.76	14.74	20.62	5.04
cost of sales (goods)/inventory					
Share of the involved of equity in assets, %	132.00	127.00	144.15	115.60	102.80
long-term and current liabilities/assets					
Ratio of borrowed and equity capital, %	-415.00	-417.00	-326.48	-741.20	-3673.32
long-term and current liabilities/equity					
Share of fixed assets in assets, %	40.00	35.00	48.46	89.56	65.51
fixed assets/assets					
The level of depreciation of fixed assets, %	20.00	9.00	12.18	22.50	20.60

Table 2. Continued

Indicator	2020	2019	2018	2017	2016
depreciation/original cost of fixed assets					
Profitability, %	-5.00	14.00	11.52	10.10	17.78
net profit/net sales revenue					
Profit on the involved assets, %	-6.00	16.00	13.00	4.46	4.84
(net profit/assets at the beginning of the period)					
Profit on the invested capital, %	18.00	-58.00	-29.44	-28.63	-172.97
(net profit/equity at the beginning of the period)					

Source: Based on (Sirenko, & Minaieva, 2015)

The risks of the analysed enterprise are significantly increasing, as evidenced by a decrease in return on assets, a decline in overall profitability, the duration of the receivables repayment cycle, etc.

In practice, the methodological approach of coefficient analysis and expediency of costs is used, the methodology of which is performed by the national legislation, in particular, the Order of the Ministry of Economy of 19.01.2006 No. 14 "Methodological Recommendations for Detecting Signs of Enterprise Insolvency and Signs of Actions to Conceal Bankruptcy, Fictitious Bankruptcy or Bringing to Bankruptcy" and in the "Regulation on the Procedure for Analyzing the Financial Condition of Enterprises Subject to Privatization" approved by the Order of the Ministry of Finance of 26.01.2001 No. 49/221. Of particular note is the list of methodological approaches provided in the National Standard of Ukraine "Risk Management. Methods of general risk assessment", according to the Order of the Ministry of Economy No. 1469 of

11.12.2013 DSTU IEC/ISO 31010:2013 (IEC/ISO 31010:2009, IDT).

In addition, there is a methodological approach to risk assessment (risk criteria by the degree of risk), provided in the "Procedure for the development of the schedule of a documentary scheduled audits of taxpayers", approved by the Order of the State Tax Service of Ukraine dated 27.06.2012 No. 553.

The methodological approach to the assessment of financial risk by the integral indicator of financial condition is disclosed in the Order of the Ministry of Finance dated 14.07.2016 No. 616 "On Approval of the Procedure for Assessing the Financial Condition of a Potential Beneficiary of an Investment Project", which provides models for calculating the integral indicator of the beneficiary's financial condition, including in the field of agriculture (Table 3) for large and medium-sized enterprises (formula 1) and small enterprises (formula 2):

$$Z = 1,3 \times K_3 + 0,03 \times K_4 + 0,001 \times K_5 + 0,61 \times K_6 + 0,75 \times K_7 + 2,5 \times K_8 + 0,04 \times K_9 - 0,2, \quad (1)$$

$$Z = 0,02 \times MK_1 + 0,02 \times MK_2 + 1,5 \times MK_3 + 0,6 \times MK_7 + 2,6 \times MK_8 + 0,008 \times MK_9 - 1,1; \quad (2)$$

where K_1 – coverage ratio (liquidity of the third degree); K_2 – intermediate coverage ratio; K_3 – financial independence ratio; K_4 – non-current assets to equity ratio; K_5 – return on equity ratio; K_6 – return on sales by financial results from operating ac-

tivities (EBIT); K_7 – return on operating activities by EBITDA; K_8 – return on assets by net profit; K_9 – turnover ratio of current assets; K_{10} – turnover ratio of borrowed capital by financial results before taxation, financial expenses and depreciation (Table. 3).

Table 3. Assessment of the financial condition and determination of the class of potential beneficiaries of the investment project

Type of activity	Classes by the level of financial condition of the borrower				
	1	2	3	4	5
Agriculture, forestry and fisheries: Section A (01-03)	More than + 0.81	From + 0.80 up to + 0.35	From + 0.34 up to - 0.25	From - 0.26 up to + 0.35	Less than - 3.2

Source: (Order of the Ministry..., 2016)

Finances of the agricultural sector are an essential component of the national economy, thus, the risks related to the sector are subject to measurement and regulation. According to the balance sheet of enterprises in 2013-2020 (Table 4), their share accounts for 9.4% of the financial resources of the sectors of the economy on average, with 5.48% in 2013 and 8.96% in 2020, that is, the niche of the agricultural sector's participation in general economic finance is steadily expanding. The highest figure was in 2016, when the share

of the agricultural sector in the balance of enterprises of economic sectors reached 15.39%. Therewith, the agricultural sector plays a significant role in the implementation of the state's financial policy, as it is a budget-forming industry, covers more than a third of exports, demonstrates consistently high profitability indicators over the years and the predominant share of profitable enterprises in financial results (Melnychuk, & Lupenko, Pasichnyk, 2019; Yevtushenko, Tymkiv, & Sheshenia, 2016, p. 39).

Table 4. Financial resources (balance sheet indicators) of agricultural enterprises by size of activity in 2013-2020, UAH million

Year	Total	Great	Medium	Small	Of these, micro-
2013	313096.7	43349.9	168073.3	101673.4	36713.1
2014	390606.9	60067.2	199608.9	130930.7	43371.3
2015	685844.8	126294.2	298600.5	260950.1	96737.6
2016	1537319.0	149731.6	444450.6	943136.7	571754.9
2017	911614.0	151691.4	414798.7	345123.8	118140.6
2018	983593.6	108002.3	468616.0	406975.2	168915.3
2019	1030366.6	164961.5	457819.9	407585.2	168122.0
2020	1130304.8	185032.9	474249.8	471022.0	192436.2

Source: (Official website of the..., n.d.)

The industry is a guarantor of food security, thus, the state constantly monitors the state financial resources of agricultural enterprises and their regulation through budget support, tax preferences, and regulatory measures to maintain the competitiveness of the industry in the economy

and various forms of management in the agricultural sector. It can be assumed that the confident role of agricultural finance in the economic market largely depends on the national policy of protectionism. The state of food security by indicators in 2013-2020 is demonstrated in Table 5.

Indicator	2013	2014	2015	2016	2017	2018	2019	2020
Daily caloric intake food, thousand kcal	2969	2939	2799	2742	2707	2706	2691	2674
The ratio of production and consumption per person, %								
meat and meat products	93.6	101.4	106.5	106.0	105.5	106	111.0	108.5
milk and dairy products	114.3	116.2	118.0	116.1	120.1	120.0	115.0	111.3
eggs	139.5	146.9	139.9	132.5	1337	139.0	140.7	137.3
oil	613.5	874.5	869.3	1083.4	1262.8	1241.0	1367.0	1358.4
sugar	74.8	131.5	95.4	142.2	158.2	139.0	121.7	178.1
potatoes	361.4	390.8	353.7	364.6	364.5	382.0	355.0	386.6
vegetables and melons	143.6	147.1	142.1	143.1	143.3	143.0	148.0	138.5
Production of grain at one person per year, i.e	1.39	1.49	1.40	1.55	1.46	1.66	1.80	1.60
The level of cereal stocks, % before consumption	81.8	92.0	89.2	108.2	118.0	136.2	116.0	105.7
Share of sales of imported food products, %	14.1	14.4	14.8	15.2	17.8	19	20.0	20.6
Food safety	86	94	92	92	91	90	89	85

Source: Formed based on data calculated by the Ministry of Economy of Ukraine (n.d.)

In 2020, the daily caloric content decreased food by 10% compared to 2013, increased consumption eating oil, sugar, and potatoes, with cheaper of the entire price segment. Food level whose security in 2020 is the same as it was in 2013, but lower than in other years analyzed period. That

is, the state of food safety is indirectly evidenced by the increase management of risks in the industry. They have a significant impact on finances risks of the shadow economy. The shadow level economy of Ukraine by economic types activity in the last year is defined as follows (Fig. 1).

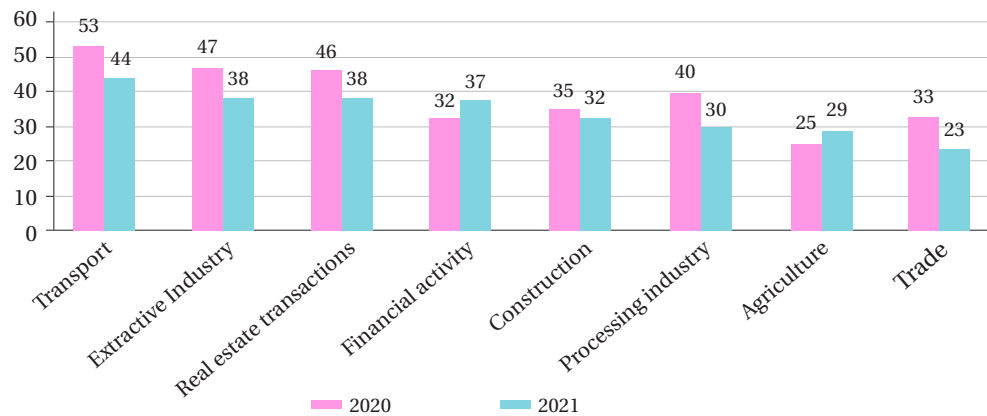


Figure 1. The level of the shadow economy of Ukraine by types of economic activity, % of the volume of official GVA corresponding to foreign trade

Source: Shadow Economy: General Trends. (Department of Strategic... 2021)

According to the Department, the share of the shadow sector in the “Agriculture, Forestry and Fisheries” increased by 3 p.p. to 29% of GVA of the industry. According to the methodological provisions of the calculation, the increase in the shadow economy in the GEA is a reflection of the growth in the number of unprofitable enterprises, the number of which has increased due to several interrelated factors: due to the seasonal nature of production in agriculture, gross output in the in-

dustry from January to May is exclusively developed by the production of livestock products; the harvest lower than last year’s resulted in higher prices for feed in livestock production and, accordingly, increased production costs.

The regulation of financial risks of agricultural enterprises at the macro level is performed by state support measures. The dynamics of functional expenditures of the state budget for the agricultural sector in 2013-2020 were as follows (Table 6).

Table 6. Dynamics of state budget expenditures on the agricultural sector of Ukraine in 2013-2020

Indicator	2013	2014	2015	2016	2017	2018	2019	2020
State budget expenditures on agriculture, million UAH	6915	5135	4143	4075	10532	13054	13020	13496
Share of agriculture in expenditure of the budget, %	1.37	1.19	0.71	0.59	1.25	1.32	1.21	1.04
Share of agriculture in expenditure of on the economy, %	13.62	14.92	11.15	12.97	22.39	20.52	18.00	7.98
Share of expenditures on the agricultural sector in GVA of the industry, %	5.37	3.18	1.73	1.45	3.46	3.61	3.65	3.47

Source: (Official website of the..., n.d.)

According to the data on expenditures on the agricultural sector for the period 2013-2020, the average annual expenditures amounted to UAH 3.3 billion. The structure of the programmes

in terms of funding in the last three years was as follows: financial support for activities by reducing the cost of loans – 25%, support for livestock and agricultural processing – 25, financial support for

agricultural producers – 25, support for horticulture – 10, other programmes – 15%. These areas of support are conditioned upon the assessment of sectors, types of products, and forms of management, considering the risks of income shortfalls and the implementation of food security tasks. Thus, the role of the budget in the development of financial resources of the agricultural sector is rather significant and is designed to strengthen the impact of budgetary levers on the volume and structure of financing and reduce financial risks. The analysis of budget support for the agricultural sector confirms some positive changes in improving the conditions for providing credit support; targeted actions to support small producers, and strengthening logistics through compensation for the cost of machinery and equipment. Thus, in those areas that require state regulation in mar-

ket conditions. However, in general, the system of state support for the financing of the agricultural sector is still in the phase of identifying and systematising the factors of development of enterprises and industries, forms of management and types of products, searching for unused reserves to increase efficiency for various economic forms, in particular for small businesses, as the most vulnerable form of increasing financial resources, especially borrowed ones. These factors determine the necessity to develop a unified approach to the methodology of financial risk assessment of the agricultural sector.

According to the results of the study, it can be concluded that the content of the assessment of financial risks of agricultural enterprises is determined by the purpose and main tasks, which are graded at hierarchical levels (Fig. 2).

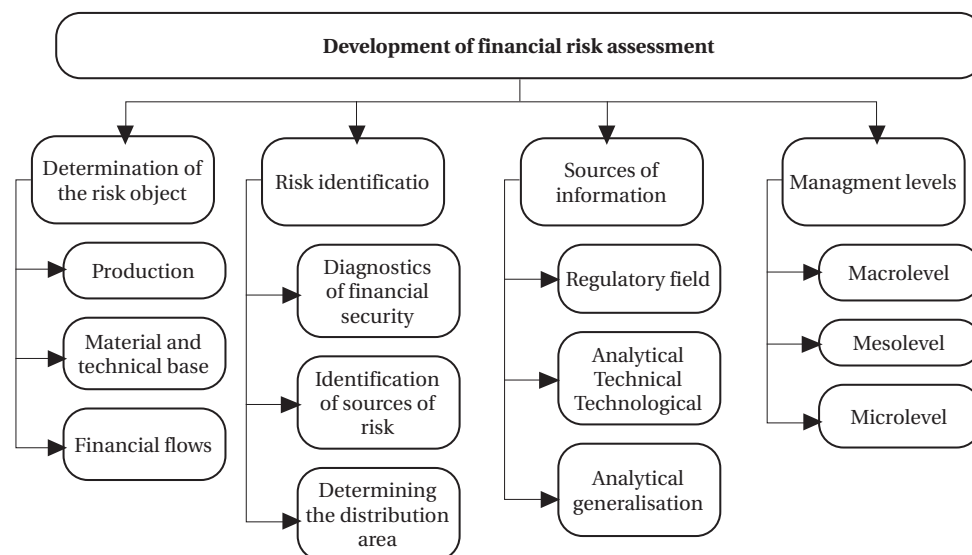


Figure 2. Development of financial risk assessment of agricultural enterprises

Source: Based on (Kuznietsova, & Bidiuk, 2020)

The stages of financial risk assessment for the agricultural sector can be performed according to the algorithm: detection – analysis – minimisation (Kuznietsova, & Bidiuk, 2020; Zorina, 2015, p. 27). At the identification stage, it is a clarification of the risk context, identification and type of the risk source, the scope of the distribution and possible risk situations, and identification of the causes and factors that determined it. Risk analysis involves identification, quantitative assessment of the probability of its occurrence and possible losses,

determination of parameters, and risk monitoring. Risk minimisation measures include planning actions to respond to the manifestations of risk, reducing the level of risk through using specific management methods for each type of risk and controlling efficiency.

► Conclusions

The methodological approaches to the assessment of financial risk are analysed, and it is determined that it applies to almost all areas of activity, is a

kind of assessment of uncertainty in the process of activity, decision-making in the economic sphere of financing, investment, asset management, in general, resource potential and requires a unified approach at the management levels.

To assess the macro-level financial risks, the dynamics of the food security index were analysed, the state of which indicates an increase in risks in the industry; the state of the shadow economy, the share of which for the agricultural sector increased by 3 per cent points over the year – up to 29% of the GVA of the industry; the level of budget support, the dynamics of which for the period 2013-2020 demonstrates average annual expenditures of UAH 3.3 billion, which is insufficient to ensure financial security.

To assess the financial risks of the microlevel, the financial resources of agricultural enterprises for 2013-2020 were analysed, where it was identified that their share accounts for 9.4% of the financial resources of the sectors of the economy on average. In addition, methodological approaches to the assessment of financial risks based on the analysis of the financial condition of enterprises

are systematised; regulatory approaches to the definition and assessment of financial risk according to the coefficient analysis and expediency of costs are generalised. To justify the necessity of developing a unified system of methodological approaches to the assessment of financial risk for the agricultural sector, the stages of the algorithm of detection – analysis – minimisation are proposed as a supplement to the financial analysis of enterprises.

The research will improve approaches to the methodology and tools for assessing financial risks of the agricultural sector and will contribute to the development of an efficient financial policy for reducing risks, restoring economic growth, and increasing the competitiveness and financial stability of agricultural enterprises through balancing fiscal and economic policy instruments, introducing a monitoring and diagnostic system, expanding the boundaries of financial analysis. Prospects for further research recognised the necessity of scientific support for the development of a unified methodology for the identification, assessment and prevention of financial risk in the agricultural sector.

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Методичні підходи до оцінки фінансових ризиків аграрного сектору

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► **Анотація.** З метою управління ризиками визначено специфічні для аграрного комплексу ризи та основні джерела інформації, що використовується при ідентифікації ризиків. Мета статті – обґрунтувати методичний інструментарій ідентифікації та оцінки фінансових ризиків для управління такими на прикладі аграрного сектору. Використано монографічний метод для огляду наукових публікацій дослідників та аналізу нормативної бази щодо ідентифікації та оцінки ризиків, системний і порівняльний аналізи для формування методичних підходів до оцінки фінансового ризику, емпіричний метод та синтез для аналізу індикаторів продовольчої безпеки, показників державного регулювання фінансових ризиків галузі, графічний метод для відображення динаміки окремих досліджуваних показників, абстрактно-логічний для теоретичних узагальнень та висновків. Проаналізовано методичні підходи до оцінки фінансового ризику. Уточнено складові методики оцінки фінансових ризиків, як системи принципів, підходів і методів наукового дослідження ідентифікації та виміру ризиків, теоретичні засади використання цих інструментів при вивченні аспектів безпеки національної економіки. Визначено, що фінансовий ризик стосується практично усіх сфер діяльності, виступає своєрідною оцінкою прийняття рішення в умовах невизначеності у сфері фінансування, інвестицій, управління активами та ресурсним потенціалом на різних рівнях управління. Для макрорівня оцінки фінансових ризиків проаналізовано динаміку індексу продовольчої безпеки як основного критерію наслідків фінансової безпеки галузі; стан тіньової економіки, як визначальний фактор системних фінансових ризиків; рівень бюджетної підтримки як фактор ефективності державної фінансової політики галузі та управління фінансовими ризиками. Для мікрорівня уточнено класифікацію методів оцінки фінансових ризиків на основі методів фінансового стану підприємств та аргументовано зв'язок між ними. Проведено експрес-аналіз фінансових ризиків на основі даних фінансової звітності за аналітичними коефіцієнтами на прикладі ПАТ «Миронівський хлібопродукт». Узагальнено нормативні методики визначення фінансового ризику відповідно до коефіцієнтного аналізу та аналізу доцільності витрат, а також Національного стандарту України. «Керування ризиком. Методи загального оцінювання ризику» з метою обґрунтування необхідності формування єдиної системи методичних підходів до оцінки фінансового ризику. Доведено необхідність формування єдиної методики оцінки фінансових ризиків агросектору, для чого проаналізовано фінансові ресурси галузі за 2013-2020 рр. та встановлено, що на їхню частку припадає 9,4 % ресурсів галузей економіки. Розширено методичні підходи до оцінки фінансових ризиків шляхом залучення у сферу аналізу макрорівень аграрної галузі, оскільки вона слугує гарантом продовольчої безпеки, наявна потреба постійно здійснювати моніторинг стану фінансових ресурсів та його регулювання шляхом прямої бюджетної підтримки, податкових преференцій, а також регулятивних заходів для підтримання конкурентоспроможності галузі. Узагальнено, що зміст оцінки фінансових ризиків аграрних підприємств визначається відповідно до мети та основних завдань, які мають градацію на рівнях ієрархії. Побудовано схему методики оцінки фінансових ризиків аграрної галузі. Удосконалено методичне забезпечення процесів оцінки фінансових ризиків, що може слугувати основою формування єдиної Методики аналізу фінансового стану та фінансових ризиків аграрних підприємств. Запропоновано етапи проведення оцінки фінансового ризику для аграрної галузі за алгоритмом: виявлення – аналіз – мінімізація, що може бути корисно аграрним підприємствам при здійсненні комплексного фінансового аналізу. Окремі висновки дослідження можуть бути використані при формуванні фінансової політики аграрної галузі

► **Ключові слова:** аграрні підприємства, методичні підходи, оцінка, аналітичні показники, фінансові ризики, фінансовий стан



Economics of seed production

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In the context of the implementation of the Sustainable Development Goals, approved at the UN Summit on Sustainable Development in 2015, domestic science focuses its efforts on their scientific support. Among these Goals, the key place is occupied by the issues of equitable social development, the achievement of which for rural areas is hampered by the lower level of social infrastructure, education, health care, services, state and public institutions, etc. in comparison with cities and urban-type settlements. These issues have become even more aggravated in the context of the government decentralization, under which there has been an enlargement of communities, a change in the administrative-territorial division, and the availability of production and social infrastructure. The successful solution of the problems associated with the achievement of equitable rural social development requires original scientific solutions, substantiated proposals for changes in this process.

Taking into account the urgency of the problem of equitable rural social development in the context of government decentralization, we publish an article dedicated to it by academician of the NAAS V.P. Riabokon and hope that our readers will be interested in the issues raised. Realizing the importance of financial and investment support for agricultural development, we pay attention to the research results of candidate of economic sciences M.I. Kisil on the macroeconomic investment process in agriculture and doctor of economic

sciences, prof. O.V. Zakharchuk, candidate of economic sciences O.V. Vyshnevetska and candidate of economic sciences V.V. Nechytailo, Ye.Yu. Ionitsoi on increasing the capitalization of agribusiness.

Overcoming current global challenges is the subject of the article of candidate of agricultural sciences A.V. Vdovychenko and candidate of agricultural sciences Yu.V. Ternovyi, PhD in economics V.I. Lazarenko, O.O. Kachkovskiy and post-graduate student M.M. Fedorchenko on the prospects for the development of organic farming in the European green deal; doctor of economic sciences, prof. N.I. Patyka on foreign trade in agrifood products in the context of the COVID-19 pandemic; candidate of economic sciences Yu. V. Kernasiuk about the impact of the global climate crisis on the development of the agricultural sector of the economy. This topic is becoming increasingly crucial for the successful development of agriculture and rural areas.

Among other relevant studies, we offer articles by doctor of economic sciences, prof. L.Ye. Kupinets and candidate of economic sciences H.O. Tiutyunnyk relatively nonlinear approach to agricultural land use management; I.M. Sabii on the choice of model of the agrarian system to ensure sustainable rural development; young scientist O.O. Melnychuk on the assessment of financial risks of the agricultural sector.

We hope that our readers will be interested in the published articles and expect a reaction to the presented research results.

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