SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume VI, May 24th -25th, 2019. 641-653

FOOD SECURITY – WAYS OF INTEGRATION OF ECONOMIC PRIORITIES AND THE ECOLOGICAL IMPERATIVE

Volodymyr Onopriienko
Sumy National Agrarian University, Sumy, Ukraine

Iryna Onopriienko
Sumy National Agrarian University, Sumy, Ukraine

Ihor Kovalenko
Sumy National Agrarian University, Sumy, Ukraine

Natalya Kovalenko
Sumy National Agrarian University, Sumy, Ukraine

Jeļena Volkova
Rezekne Academy of Technologies, Latvia

Abstract. *The socio-economic problems of the agro-industrial complex of Ukraine and importance of the demographic factor in ensuring food security are determined. The factors of degradation of the environment in the agrosphere are indicated. The economic mechanism of nature use must be embedded in the economic system, and not be a distinct set of measures and tools aimed at addressing certain environmental problems. The main task of planning measures to ensure environmental safety is development of integrated target ecological programmes (national, regional, and internal management levels), which include measures for sustainable and safe nature management, oriented towards ecologically safe food products.*
The aim of the paper is to reveal the role of food security in integrating economic priorities and the ecological imperative. The following methods were used in the research: monographic, problem analysis, scientific induction and deduction methods, and adoption of a decision under conditions of uncertainty.
Keywords: *demography, ecology, economy, food, priorities, security.*

Introduction

Existence of human society, as well as an individual's life, depends on many factors. Among the most important are: providing food and a favorable living environment. That is why many state resolutions and international agreements are devoted to the issues of food security and environmental protection.

http://dx.doi.org/10.17770/sie2019vol6.3724

The right to full nutrition and protection against hunger is an integral part of the International Covenant on Human Rights (1948) and the International Covenant on Economic, Social and Cultural Rights (1966). Later, the "Rome Declaration on World Food Security" (1996) established the right of every person for safe and good nutrition, as well as the right of everyone to be free from hunger. In 1947, the UN FAO issues special reports analyzing food security of the population of all countries of the world. The reports show that a positive decision on the food security issue has not yet been found in many countries around the world (The Food and Agriculture…, 2017).

Based on these international documents, Ukraine has developed the Law "On Food Security of Ukraine" (1997), which defines economic and social foundations of full provision of high-quality food products to the population of Ukraine. Though there are fierce discussions around this law, it plays an important role in targeting state structures to work to provide the population with food in the required amount and quality.

At the same time, a number of Laws of Ukraine are aimed at protecting the natural environment and biodiversity on the territory of the state. They include the Law of Ukraine "On Protection of Atmospheric Air" (1992), the Law of Ukraine "On Environmental Expertise" (1995), the Law of Ukraine "On Pesticides and Agrochemicals" (1995), the Law of Ukraine "On Environmental Network of Ukraine" (2004), the Law of Ukraine "On Basic Principles of Environmental Policy of Ukraine for the Period till 2020" (2010), and so on.

Despite the legislative, legal and economic justification, between the activity of agricultural enterprises, which is the basis of food production, and implementation of environmental laws, there are many sharp contradictions, and often direct antagonism. This fact is recognized by many experts. Therefore, finding ways to alleviate such contradictions and developing methods for integrating food and environmental security is an urgent task.

The aim of the paper is to reveal the role of food security in integrating economic priorities and the ecological imperative. The following methods were used in the research: monographic, problem analyses, scientific induction and deduction methods, adoption of a decision under conditions of uncertainty.

Food security

Food security means supplying food to the population of an individual country and the world as a whole. It also takes into account the need for food products of subsequent generations of the population. Therefore, food security technologies should be oriented not only to the current production of food, but also to the preservation of agrarian resources – areas of land suitable for agricultural use, soil fertility, productivity of natural forage land, etc.

International organizations have developed normative standards for food security. They, in particular, provide for the production of 300 kg of grain per person per year. The daily caloric intake of individuals should not be below 2500 kcal. The diet should include proteins in the amount of 0.83 g protein per 1 kg of body weight. Their source is mainly meat and fish products, as well as legumes. The indicators of food security also include mandatory state grain stock in the amount of 17% of annual consumption (UN norm), and the limit of the cost of the family budget for foodstuffs should not be more than 50% (Proshchalykina, 2016).

Solving the problem of food security during the last century is a priority task in all the countries of the world. This work is under UN control. The World Food Programme (WFP) is the largest humanitarian organization in the world, whose members are actively working on food security issues around the world. The implementation of food security programmes developed by the UN FAO has led to a steady increase in global production of many types of agricultural products over the last two decades, as is evident from the example of the two leading crops – wheat and corn (Fig. 1). But the level of food security is not the same across the world. It is high in developed countries of Europe and the USA and unsatisfactory in a number of countries of Africa and Asia (Khinkis, 2015).

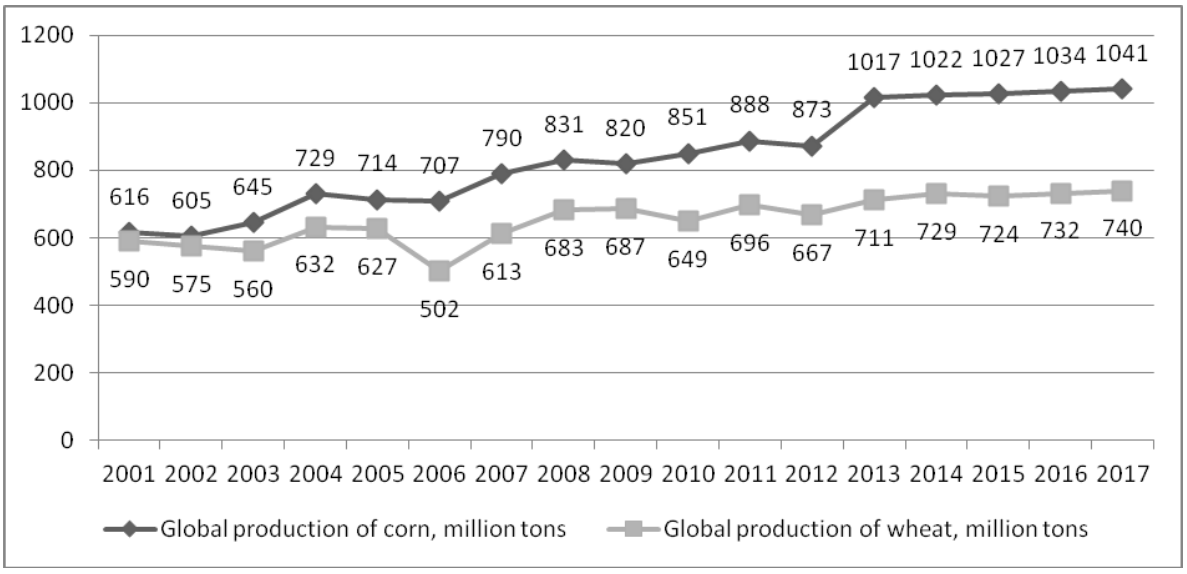

Figure 1 ***Volume of world grain and wheat production in 2001–2017, million tons*** *(Кернасюк, 2017)*

In the system of comparative international assessments of the level of food security, it was decided to introduce seven gradations:

I level – catastrophic. Daily calorie consumption per one person is 1500–1800 kcal, which corresponds to chronic malnutrition. **II level – critical.**

Average daily consumption is 1800–2200 kcal per person. It provides simple reproduction of the population. **III level – minimal**. 2300-2800 kcal per day per person. **IV level – sufficient**. Average daily consumption is in the range of 2800–3600 kcal per person, but it is not balanced by such elements of nutrition as proteins, carbohydrates and fats. **V level – normative**. Average daily consumption is within the range of 3300–3600 kcal per person. The diet is balanced with proteins, vitamins and other important ingredients. **VI level – optimal.** Consumption is balanced with all important nutritional components and includes the use of eco-friendly food. **VII level – promising**. The level of nutrition is optimal for all segments of the population (Khomyn, 2012).

Ukraine since 2000 has provided its population with the IV level of food security. For natural conditions in Ukraine, this indicator is unacceptably low. It is due to a set of reasons, basically, not natural, but of political and social nature.

Socio-economic problems of the agro-industrial complex of Ukraine

Ukraine has high potential for agricultural production, which is at the heart of food security. Ukraine was a breadbasket for all the republics of the USSR, and now it makes a significant contribution to the food programmes of the countries of Western Europe. Purposeful work is being done to provide agricultural products to the domestic market of Ukraine. On average per capita, Ukraine annually produces grains and legumes – 423.3 kg, sugar beet – 280.1 kg, potatoes – 385.9 kg, meat of all kinds – 36.1 kg, milk of all kinds – 285.7 kg (Дейнеко et al., 2006).

The natural and climatic conditions of Ukraine contribute to successful agricultural management. Agricultural lands in Ukraine are mostly black earths and have high fertility potential. The climate of Ukraine is moderate with enough rainfall. The area of arable land is about 33 million hectares, while in Europe it constitutes (in descending order): France – 18 million hectares, Poland – 12.1, Germany – 11.9, Great Britain – only 6.

However, the level of food supply in Ukraine is insufficient. It can be confirmed by the so-called Global Food Security Index. This index is based on 28 indicators, which include real availability of food products, size of food losses, cost of scientific research in the field of agriculture, level of GDP per capita, etc. As of 2017, Ukraine, according to the global food security index, occupies 52nd place among 109 countries. Taking into account the natural and social conditions in Ukraine, this is a very low indicator. In addition, it is the lowest among other European states.

The unsatisfactory solution to the food security problem in Ukraine is determined by the complex economic and social conditions. Among the reasons for the crisis situation in the agricultural sector, the main one is low yields of agricultural crops due to lack of measures to protect and enhance the fertility of soils. Other reasons are also connected with it: low productivity of farm animals,

reduction of arable land through water and wind erosion, soil fertility decline, violation of crop rotation, high prices of fuel, fertilizers and pesticides.

According to estimates of international experts, Ukraine uses its agrarian potential only at 40%. In particular, wheat yield potential in Ukraine was used only at 40%, corn – at 60%. The yields of main crops are 1.5-2 times lower in Ukraine than in other countries (Fig. 2).

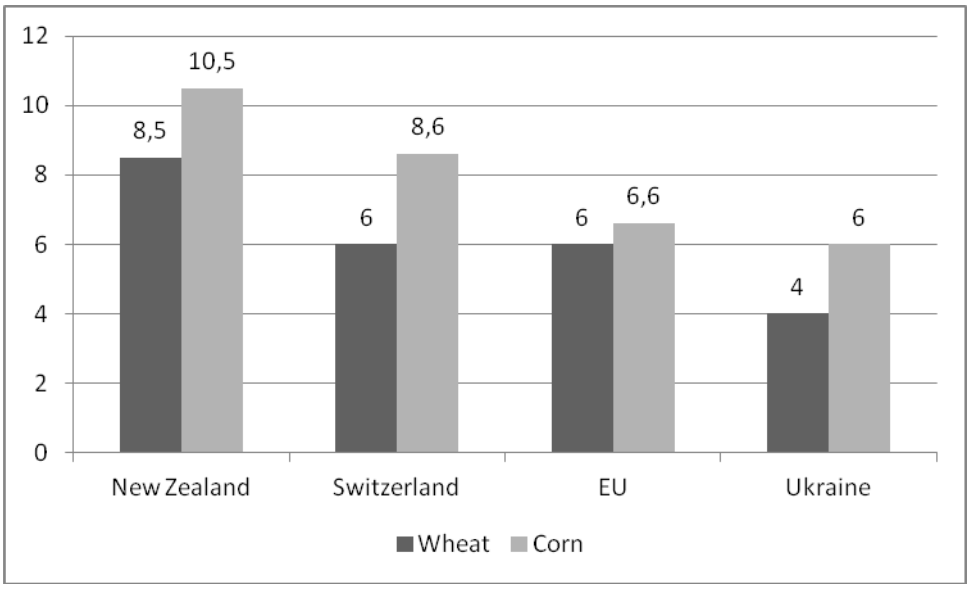

Figure 2 ***Yields of wheat and corn in Ukraine compared with other countries in 2017, t/ha***
(Agribusiness of Ukraine in graphs and maps, 2017)

The structure of agricultural production also contributes to the unsatisfactory solution of Ukraine's food security problem. Over the past three decades, the ratio of cultivated crops has changed significantly. According to the State Statistics Service of Ukraine, during this period, sunflower and rape production increased sharply, the production of grain and leguminous crops increased to a lesser extent, and the production of sugar beet root crops declined substantially.

One of the major causes of Ukraine's food security concerns is an increase in grain exports. Thus, in 2015, the volume of exports as a percentage of the total volume of crop was less than 40%, in 2016 – more than 60%. And in 2017, it increased by 3.9% compared with 2016. The change in the structure of crop production has led to a serious reorientation of markets. To date, the share of grain processed in Ukraine has fallen to 45% of its gross amount. Thus, the market has become export-oriented. At the same time, grain exports are mainly supplied as raw materials, and not processed products.

The grain staple, in the commodity structure of supply from Ukraine to abroad, is followed by walnuts (USD 42 million per year), frozen berries (USD

10 million), as well as apples and pears (USD 5 million). Profitable is export of rapeseed oil – in monetary terms, the export of rapeseed oil gives from USD 1.15 million to 3.89 million a year. Due to the profit orientation of market mechanisms, food crops which are needed to satisfy the population of Ukraine are replaced by those that give more profit. So, Ukraine is the world's largest producer and exporter of sunflower oil, exported to more than 100 countries. Ukraine holds world leadership among exporters of sunflower *oil* (State Statistics Service, 2018a).

The combined negative impact on the process of sustainable food production is caused by the tendency to reducing the number of farm animals that has been formed in Ukraine. For the past 16 years, the number of cattle alone has decreased by almost three times, including the number of cows that decreased twice (Fig. 3). This process was accompanied by a drop in the number of breeding goats, sheep and pigs.

Consequently, there was a negative tendency to reduce milk production by 24% (Fig. 4). In addition to the shortages of dairy and meat products, lack of organic fertilizers – primarily manure, associated with decline in the number of cattle, causes a decrease in the amount of humus in arable soils. The soil fertility is negatively affected by the tendency to use post-drought vegetation residues as biofuels. As a result, from 2000 to 2017 alone humus content in soils in Ukraine decreased from 3.36 to 3.14%.

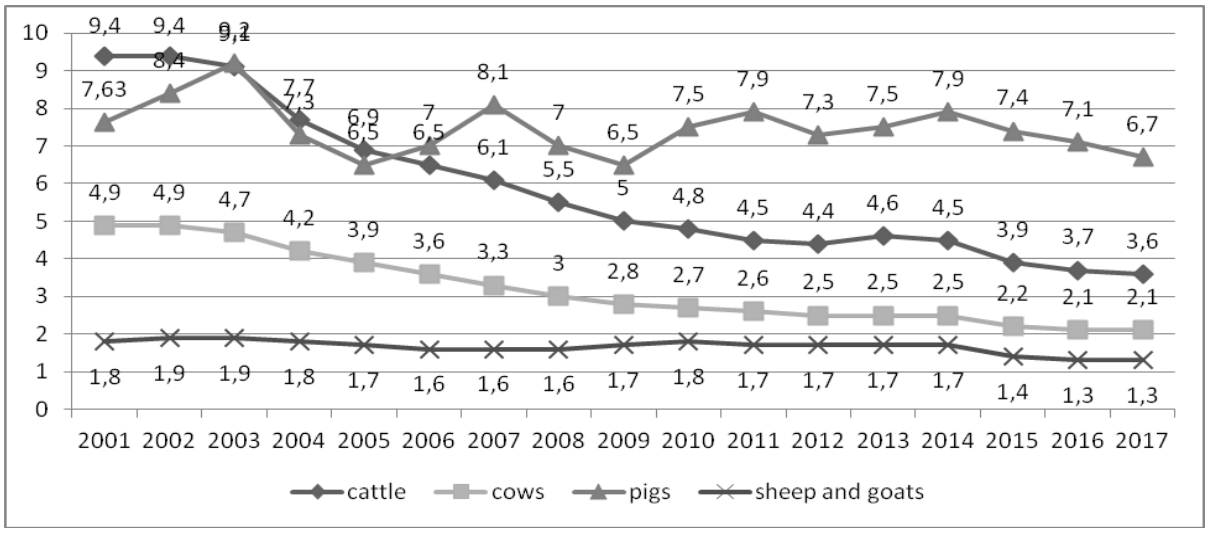

Figure 3 ***Dynamics of livestock population of farm animals in Ukraine in 2001–2017, million heads*** *(State Statistics Service, 2018a)*

At the same time, there was a positive tendency to increase meat production by 53%, eggs by 61%, grain and leguminous plants 1.5 times, sunflower seeds 5 times, potatoes by 28%, vegetable crops by 60% (Fig. 5).

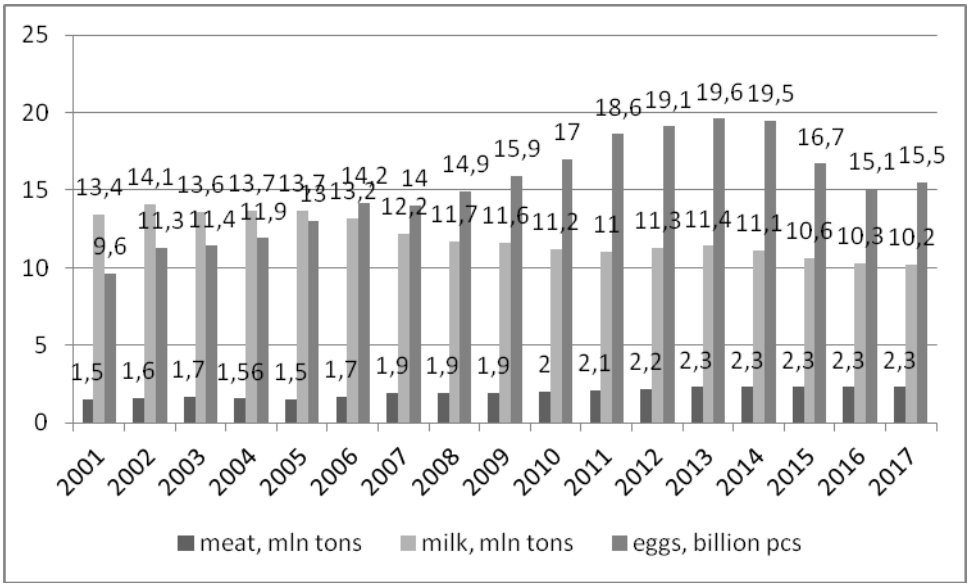

Figure 4 ***Dynamics of livestock production in Ukraine in 2001–2017, million tons***
(State Statistics Service, 2018a)

According to the State Statistics Service of Ukraine, in 2017, agriculture was the most profitable industry: 90% of all agricultural enterprises in Ukraine received profits. This is a paradox in the context of an extremely low food security index. In Ukraine, food prices have reached levels typical of the UK, Germany, the United States and other developed economies of the world, while the incomes of the bulk of the population are much lower (State Statistics Service of Ukrain, 2018).

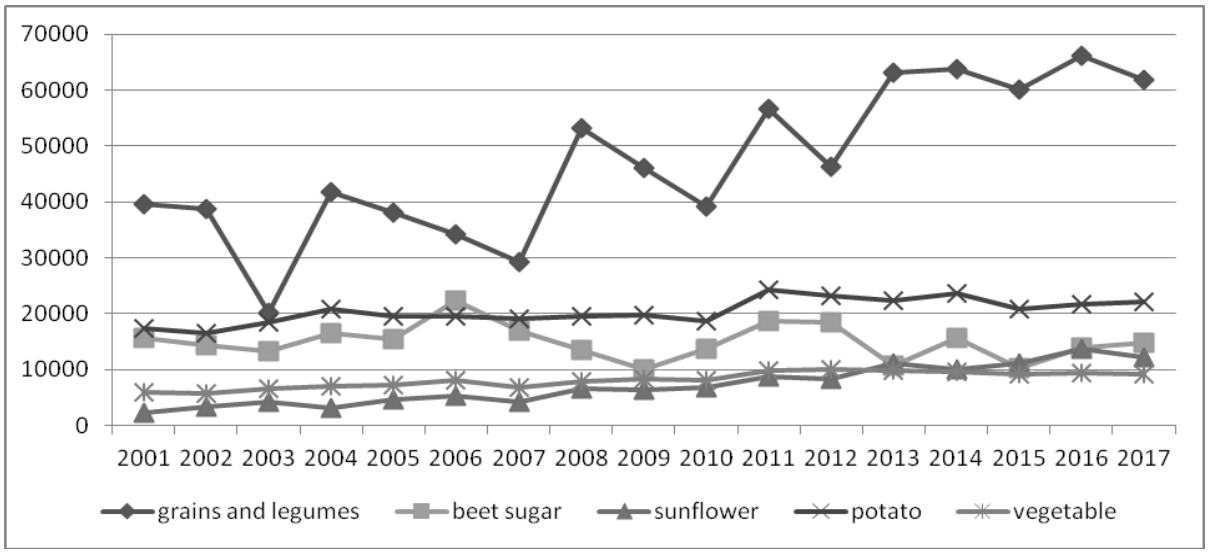

Figure 5 ***Dynamics of crop production in Ukraine in 2001–2017, thousand tons***
(State Statistics Service, 2018a)

Restoration of state control over the food market will not only reduce the cost of food for the end consumer, but also increase the quality by several times, which will ultimately affect the health of the population.

Demographic factor

Over the past three decades, a solution to the food problem and nature conservation in Ukraine has taken place against the backdrop of complex transition processes from a planned to a market economy. The social structure of the population changed significantly. Private farms and agricultural holdings replaced collective farms, while the network of protected natural objects – reserves, national parks – began to develop actively.

The most important factor that has been reflected in all sectors of the economy was depopulation. Since 1951, the population has steadily increased in Ukraine, but it has also steadily declined since 1990 (State Statistics Service, 2018b).

The reason for this is not only reduction of fertility and increase in mortality, but also emigration of the able-bodied population. At the same time, during the last decades, aging of the population of Ukraine took place.

Demographic processes are reflected in the employment of the population in agricultural production. In Ukraine, in 1990, 5 million people were employed in agriculture, forestry and fisheries, which was 19.8% of the total. By 2015, the number of employees in this sector of the economy decreased to 3.1 million people and constituted 17.2%. For comparison, according to the Statistical Service of the European Union (Eurostat), in 28 EU Member States in 2014, employment in the agrarian sector was 5%, in industry – 21.9% and services – 73.1%. According to the Statestat of Ukraine in 2015, the respective proportions for our country were as follows: 19.1, 15.1 and 65.8%. This suggests lower efficiency of using agricultural workers in Ukraine than in other European countries (Statistical Service of the European Union, 2018).

The low growth rates of wages in agriculture, which are lagging behind the level of inflation, and poor social infrastructure in the countryside, also cause reduction in the number of workers in agriculture.

There are world-wide indicators of the welfare of the population tested in terms of food security, environmental friendliness, social sustainability, etc. One of them is the so-called "index of national happiness". It is calculated on the basis of five criteria: GDP per capita, social support, life expectancy, social freedom of citizens, attitude to corruption (World Happiness Report, 2017).

In 2017, Ukraine among 155 countries, according to the index of happiness, took only 132th place. Taken together, the presented data indicate a serious contradiction in the system of "food security – environmental parameters

of the habitat" (World Happiness Report, 2017).

Factors of environment degradation in the agrosphere

Agricultural activities led to formation of a special part of the biosphere – agrosphere. The agrosphere is usually understood as part of the biosphere, used for various forms of agricultural production. The natural environment in the agrosphere is rapidly transforming and degrading under the influence of various factors, in particular: impact of agricultural machines on the soil cover and atmosphere, chemisation in its various forms with the use of fertilizers and pesticides, melioration, water and wind erosion, etc.

In Ukraine, negative changes in the agrosphere are deep enough. They are the result of joint impact of two processes – extensification, where the area under the arable land and pasture occupies the maximum possible size of the country's territory, and intensification, consisting in the pursuit of the selection of crops and varieties, fertilizers and pesticides to increase the yield of raw materials and food. According to the World Bank, up to 10 tons of soil is lost per ton of grain produced in Ukraine. The main types of negative impact of agricultural machinery on the natural environment are gaseous, solid and liquid emissions. First of all, they are carbon dioxide, nitrogen, lead dioxide, soot (Weizsaecker & Wijkman, 2018).

A number of modern agrotechnologies negatively affect the quality of food. Use of high doses of mineral fertilizers and pesticides causes pollution of the resulting products by heavy metals (Mn, Fe, Zn, Cd), nitrates, residual quantities of pesticides. Products grown in technogenically polluted land in areas of mining and large industrial enterprises are also dangerous for human health. To date, falsification of foodstuffs is quite widespread in Ukraine. The problem of quality and safety of food products is relevant in Ukraine in terms of access to international markets (Nagornaia & Savchuk, 2014).

It should be emphasized that basic elements of the agrosphere are unbalanced and do not work for triple socio-economic-ecological progress; therefore, our present must be considered as a new geological era – Anthropocene, the peculiarity of which is the global impact of man on the planet. There is a deep contradiction between economic benchmarks and the need to preserve the natural environment. Therefore, many experts consider the ecological situation in Ukraine and other CIS countries as a crisis (Bobylev & Zakharov, 2009).

The task of integrating the economic and environmental spheres of knowledge is currently solved by the so-called "ecological economics". Ecological economics as a science of human economic activity should be based on the environmental laws. In 1989, the International Society of Ecological

Economics was formed, the task of which was development of ecological economics as an interdisciplinary science that provided world sustainable development. There is no single definition of this new science now. Usually, ecological economics deals with cost methods of interpreting indicators of sustainable development, compatible with the current system of economic payments and taxes. It is opposed to the "economics of nature use", which considers nature as an inexhaustible source of resources for agriculture and industry (Blazhevych, 2015).

N.N. Rodzevich emphasized that in most countries of the world a free (unregulated) market economy prevailed. Such an unregulated market economy and the ecological imperative are incompatible. A market economy is characterized by a constant desire for profit, which is accompanied by an increase in production and, consequently, an increase in consumption. A productive market economy is built on increasing consumption of natural resources and inevitably accompanied by massive pollution of the environment by waste from production and consumption (Rodzevich, 2017).

A modern ecological economy seeks a compromise between the requirements of powerful economic development and the need to protect the environment. A.M. Tretiak et al. define the purpose of land tenure in agronomy in the following way: "the purpose of land use is to obtain the highest benefit, the highest effect of land while observing the requirements of its conservation and improvement". Some authors include complying with requirements of the ecological imperative in the task of environmentalizing the economy, and give it their own definition. The ecological imperative is defined as "a set of compulsory socially necessary requirements, rules, standards in relation to the regulation of functioning of the land relations institution, which provides a sufficient level of environmental balance and economic efficiency of land use in society" (Третяк et al., 2017).

This compromise definition will not solve the problems of environmentalization of the agro-industrial complex. But compromise solutions are never effective. In fact, the ecological imperative should be defined as a system of total prohibitions on anti-ecological technologies.

Yu. Chukhlib rightly stressed that "for the ecologization of agricultural production, it is necessary to carry out a comprehensive study of all aspects and spheres of the agricultural enterprise". In order to overcome the crisis phenomena in the area of providing the population with food and preserving the quality of the natural environment, integration of economic and environmental interests and goals in all branches of agriculture is necessary. This is a complicated process (Chukhlib, 2012).

Ecologization in the agro-industrial sector should include three most important elements: a) introduction of resource-saving and nature-disrupting

technologies into production, b) integrated approach to the use of natural resources with a focus on their protection, c) preservation of natural cleanliness of the environment (Chukhlib, 2012).

In order to address the food security problem, taking into account the requirements of ecologization of production in Ukraine, it is necessary: a) to introduce scientifically grounded flexible crop rotation, which may be short-rotational, but with a bean area of not less than 30–40% of the total area; b) to revive the livestock sector with increase in the number of cattle to the level of full supplying of arable land with manure, which will simultaneously solve the problem of providing the population with dairy products at affordable prices; c) to use for the production of biofuels only raw materials of fast growing tree species cultivated in non-fertile land plots which are not suitable for agricultural use, biomass of algae or certain types of bacteria.

At present, even in developed countries, these approaches are only proclaimed, but are not a guide for practical work. Capitalism is an economic system of production and distribution based on private property and freedom of business. The main criterion for making economic decisions is the desire to increase capital before making a profit. New agricultural technologies are considered not from the point of view of their environmental safety, but from the point of view of possible reduction of wage costs, fertilizers or other elements of technology. In modern agricultural technologies, there is a clear tendency to save"on ecology". Thus, even in developed countries, the share of environmental spending in the total GDP does not exceed 1–1.5% (Tsybuliak, 2015).

The concept of sustainable development requires change in the outlook in all strata of society and target settings of being. Therefore, in modern conditions it is not realized. At this stage of civilization development, as the first step, it is necessary to rely on the concept of ecological and economic security, which would cover socio-ecological and economic systems. This approach is realistic and can be productive, but under the condition of "equality" of all three subsystems: social, environmental and economic.

An important element of environmentalization and resource conservation is embedding of environmental ideas in not only agricultural processes, but also in the system of education Agricultural universities in Ukraine actively work in this direction (Onopriienko & Onopriienko, 2018).

In the developed countries, restructuring of the educational process in schools in this direction has started. For example, a new educational-methodological complex "Green Package" for secondary schools was created by the Organization for Security and Co-operation in Europe, which aims at forming ecocentric worldviews in students, understanding that each of us is personally responsible for preserving the natural environment of our planet.

Conclusions and Suggestions

For creating highly productive, prosperous agriculture, it is necessary to implement a new concept of agrarian sector development and a new economic policy of the state, based on the principle of a non-antagonistic combination of food security and environmental safety of the population.

Taking into account the current situation in Ukraine, the following three mechanisms should be put forward as the priority tasks of ecologization of agriculture: a) banning, in which, in accordance with the requirement of the ecological imperative, certain technologies that have an environmental degradation effect are completely excluded; b) financial-regulatory, which includes obligatory expenditures on environmental protection measures, a system of fines for damage to the natural environment and environmentally hazardous products, incentive payments for the ecologization of technologies for cultivation of agricultural products and foodstuffs; c) innovative, focused on the development of new environmentally friendly technologies. These three distinct positions are the nodal centers of environmentalization of agriculture.

Summary

The aim of this research - to reveal the role of food security in integrating economic priorities and the ecological imperative - was sucssesifuly achieved by using the following methods: monographic, problem analysis, scientific induction and deduction methods.

The economic mechanism of nature use must be embedded in the economic system, and not be a distinct set of measures and tools aimed at addressing certain environmental problems. The market character of this mechanism involves the regulatory role of the state, whose function is to establish the main directions, parameters and order of its application.

The main task of planning measures to ensure environmental safety is development of integrated target ecological programmes (national, regional, and internal management levels), which include measures for sustainable and safe nature management, oriented towards ecologically safe food products. In general, independence of food provision and demographic security should be based on a stable and strong national economy and a self-sufficient and sustainable agro-industrial sector.

References

Agribusiness of Ukraine in graphs and maps (2017). *Yield of wheat and corn for grain in Ukraine in 2017*. Retrieved from http://businessviews.com.ua/ru/economy/id/20-grafikov-i-kart-kotorye-dostupno-328/

Blazhevych, T.P. (2015). Ecological economics – new economic teaching. *Materials of the*

International scientific-methodological conference, 120-125.
Bobylev, S.N., & Zakharov, V.M. (2009). *Crisis: Economics and Ecology*. Moskow.: Institute for Sustainable Development.
Chukhlib, Yu.O. (2012). Development of the strategy of ecologization of agricultural production. *Bulletin of Poltava State Agrarian Academy*, *4*, 160-164.
Khinkis, L.L. (2015). World Food Program and actions of countries within the framework of the Universal Declaration on the Elimination of Hunger and Malnutrition. *Taurian Scientific Observer*, *4*, 161-164.
Khomyn, O. (2012). Food provision of demographic security of Ukraine. *Bulletin of NSEEI*, *11*, 107-124.
Nagornaia, V.P., & Savchuk, I.G. (2014). Possible threats to Ukraine's agriculture from the standpoint of eco-security. *Journal Economy of Ukraine, 2*(619*)*, 71-83.
Onopriienko, V., & Onopriienko, I. (2018). Resource-saving in agriculture – intersections center of economics, environmental production and ecological education of specialists. *PNAP. Scientific journal of Polonia university, 1*, 68-76.
Proshchalykina, A.N. (2016). *Features of the current state of food safety of Ukraine*. Retrieved from http://elib.bsu.by/bitstream/123456789/186634/1/
Rodzevich, N.N. (2017). *Problems of implementation of ecological imperative.* Retrieved from http://geo.1september.ru/view_article.php?ID= 200802413
State Statistics Service (2018a). *Food* .Retrieved from http://www.ukrstat.gov.ua/
State Statistics Service (2018b). *Population*. Retrieved from http://www.ukrstat.gov.ua/
Statistical Service of the European Union (2018). *Population and social conditions.labor market*. Retrieved from https://ec.europa.eu/eurostat/web/labour-market/overview
The Food and Agriculture Organization of the United Nations (2017). *The state of food and agriculture*. *FAO UN*. Rome. Retrieved from http://www.fao.org/3/a-i7658e.pdf
Tsybuliak, A.G. (2015). Modern trends in the development of ecologization of world trade. *Actual problems of international relations, 124*(1), 134-140.
Weizsaecker, E., & Wijkman, A. (2018). *Come On! Capitalism, Short-termism, Population and the Destruction of the Planet.* Retrieved from https://www.springer.com/gp/book/9781493974184
World Happiness Report (2017). *New York: Sustainable Development Solutions Network.* Retrieved from http://worldhappiness.report/ed/ 2017/
Дейнеко, Л.В., Коваленко, А.О., Коренюк, П. І. та ін.(2006). Продовольчий комплекс: стан і перспективи розвитку. Київ.: *НАН України*
Кернасюк, Ю. (2017). *Зернові культури: тенденції і прогнози ринку*. Retrieved from http://agro-business.com.ua/agro/ekonomichnyi-hektar/item/2644-zernovi-kultury-tendentsii-i-prohnozy-rynku.html
Третяк, А.М., Будзяк, О.С., Третяк, В.М. та ін.(2017). *Екологія землекористування.* Київ.