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The role of ecological, economic and educational imperatives in development of organic agricultural production

The modern society is based on the anthropocentric type of world outlook, according to which nature as a basis of a human live activity has been considered as a mean of existence, but has not been considered as an object of care and preservation during many years. Tendencies of development and success of the science and technical progress stipulated formation of a consumer character of the civilization, which caused atrophy of moral basics that resulted in a spiritual crisis. Such attitude to nature formed a respective type of social behavior. Taking into consideration this type of behavior, the humanity causes a threat of ecological catastrophe (green-house effect, acid rains, raw and energetic crisis etc.).

Scientific problem. Scientists note that gradual humanity's consciousness of potential insecurity of the anthropocentric model of nature consumption being especially topical under modern ecologic conditions facilitates formation of a new type of world outlook, according to which a human begins to understand that he or she is one of live organisms of the biosphere. A human begins to realize priority of mutual existence with nature. Consequently, there is a need of ethics oriented on formation of a sense of personal and collective responsibility for a state of the biosphere before the modern and the future generations. In the majority of current scientific researches there is a proposition of the sustainable development concept as one of ways of outcoming a possible global ecological crisis. Applied realization of the sustainable development concept in a sector of agricultural production is implementation of organic agricultural production in an activity of agricultural producers of Ukraine, in particular in the organic arable farming.

Analysis of recent researches and publications. Working papers of N. A. Berlach [1], T. P. Halushko, L. M. Korsak [2], P. V. Pysarenko [3] etc. are dedicated to examination of theoretical basics of the sustainable development concept and organic agriculture.

Notwithstanding a considerable discussion regarding implementation of organic arable farming in an activity of domestic agricultural producers on the basis of sustainable development, scientists and economists pay inconsiderable attention to possible consequences for both the agriculture and the society in general.

The objective of the article is to determine necessity and expediency of implementation of principles and methods of the organic agricultural production in Ukraine and possible social and economic consequences and also establishment of interrelation between development of the organic agricultural production and a level of education, a state of the environment and the economy.

Statement of the main results of the study. The concept "sustainable development" at first appeared in the 70th of the XX century in the process of work of the Rome club created in order to analysis and to search ways of solution of global problems. This concept gradually expends and becomes popular due to the Forum of Millennium 2000, the Monterrey Conference 2002, and the Johannesburg Summit 2002, the

participators of which recognized the concept of sustainable development as an uncontested life strategy of the humanity in the XXI century [2].

Within the context of sustainable and ecologically balanced development the strategy of human activity shall oriented on maximization of preservation of natural resources and minimization of interference in the biosphere. This requirement to some extent restricts a contemporary economic activity, in particular, taking into account non-sustainability of mineral and ecological resources. One of the main tasks of changeover to a society of sustainable development is attaining of dynamic equilibrium within the system "society – environment".

The main criteria of the sustainable development are an ability of economic system to meet food and social needs of population during a long-term period on the basis of balanced usage of scarce resources and, simultaneously, an ability to use scarce resources in the future, and an ability to preserve and to augment natural potential [2,7].

The concept of sustainable development significantly depends on rational, careful, and respectful attitude to nature. According to this, the development of organic production in the agricultural sector basing on implementation of the organic arable farming as an alternative of chemical and technological intensification of agriculture becomes topical. Exactly the organic arable farming connects well positive consequences of educational, ecological, and economic imperatives within its principles by attenuation of technogenic pressure on the environment, at the same time enhancing quality of products and a level of used technologies.

The organic agriculture can be defined as a type of attitude to agriculture aimed at formation of stable, from the humanity's point of view, quality of the environment and an economically substantiated productive system. The main idea contemplates usage of self-regulative mechanisms of agricultural ecosystems, local resources and resources obtained in an area of activity, management of ecological and biological processes and reactions. Usage of external chemical as well as organic sources of the energy is restricted to a possible extent. The main aim of the organic agriculture is optimization of indices of society health and productivity of interdependent natural systems, e.g. soil lives, plants, animals, and humans [3].

Scientific literature does not consist of the sole definition of the concept of organic agriculture. The Law of Ukraine "On production and circulation of organic agricultural goods and raw materials" of 03.09.2013 notes that production of organic goods (raw materials) is a production activity of natural and legal entities (including growing and processing), in the process of which fertilizers, pesticides, genetically modified organisms, conservants etc. are not used and methods, principles, and rules determined by this Law are used at all levels of production (growing and processing) in order to obtain natural (ecologically clear) goods and to preserve and to renew natural resources [4].

The Directive of the European Union №834/2007 determines the organic agriculture as a method of agriculture management, which in the process of its functioning connects the best nature protection means, a high level of biological diversity, preservation of natural resources, and application of high standards of animal treatment aimed at the most entire provision of consumers with products produced on the basis of natural substances and mechanisms [5].

The definition of organic agriculture of the USA Department of Agriculture states that it is a system of production of agricultural goods, which forbids or considerably restrains usage of synthetic combined fertilizers, pesticides, regulators of growth, and food additives to feeding during battening of animals. Such system is maximally based on season planting changes, usage of plant remains, humus, compost, legumes, manures, organic wastes of production, mineral raw materials, mechanical working the soil, and biological means of pest fighting to enhance productivity and to improve a structure of the soil, to provide rigorous feeding of plants and fighting with weeds and different pests [1].

The National standard of Australia for organic and bio-dynamic agriculture determines organic production as a system of production of food, which uses methods basing on principles of usage of recoverable resources, preservation of the energy, protection and preservation of the soil and water, taking into account requirements of livestock welfare, refusal of usage of fertilizers or synthetic chemicals [6].

The organic agriculture is grounded in the next principles:

1. The principle of health. The organic agriculture shall support and improve health of the soil, plants, animals, humans and the planet as the sole and indivisible unit.

2. The principle of ecology. The organic agriculture shall ground in live ecological systems and cycles, working, mutually existing, and supporting them.

3. The principle of fairness. The organic agriculture shall ground in relationships, which guarantee fairness, taking into consideration the general environment and life opportunities.

4. The principle of care. Management of organic agriculture shall have a cautionary and responsible character to protect health and welfare of the current and the future generations and the environment.

T. O. Chaika suggests that an attitude of a human to nature nowadays obtains the moral importance such as an attitude of a human to a human. Exactly this principle shall be a ground of the new world outlook. The main reference of this outlook should be consciousness of human inclusion in the sole global ecological system, because a human lives within both the social and natural contexts. It is important to understand that the humanity does not an owner of nature, but only is one of members of the nature union and, consequently, does not have privileges. Proclamation of the human unity with the environment and the respect to it, granting to nature the status of a competent subject in interrelationships with a society, is essential within mutual existence "nature – human" [7].

Because of this, there is a need to accentuate the harmonic connection of a human with the environment. The organic arable farming, pasturage of livestock, and natural systems of wild nature used to obtain a harvest shall be compliant with natural cycles and balances. These cycles are universal, but, at the same time, their processes depend on a place of location. Management of the organic agriculture shall be adaptive to local conditions, ecology, culture, and scales. The influence shall be reduced by reiterated usage, utilization, and effective management of materials and the energy in order to support and to enhance ecological quality and resources protected. The cautionary and the responsibility are key components in choice of methods of management, development, and technologies of the organic agriculture. The science is needed as a guarantor of health, safety, and ecological compatibility of the organic agriculture. In spite of this, scientific knowledge is not enough to successfully manage the organic production. Applied experience, accumulated wisdom, traditional and local knowledge propose effective solutions checked by time. The organic agriculture shall prevent risks by usage appropriate technologies and by refusal of technologies, which consequences to be difficultly forecasted, for instance, such as genetic engineering. The solutions should reflect values and requirements of everybody, whose interests can be violated by a clear and mutual process of decision making.

Consequently, in the process of modern development of the world agricultural sector the attention is shifted from intensification of production, production of a considerable amount of goods, using fertilizers and means of plant protection to a direction of "taking into consideration requirements of welfare of both livestock and plants and humans".

The first result of the organic production is a conscious internal and external restructurization of a style of agricultural thinking. Respectively, if rural inhabitant previously was a carrier of instinctive traditions, nowadays she or he is a carrier of conscious knowledge. For instance, methods of the organic arable farming management facilitate development of a farmer's sense of responsibility regarding a "live organism of the soil". In turn, this process changes the world outlook of a human, his or her moral and ethical principles on the basis of the unity of all live organisms on the Earth.

The main components of the organic agriculture encompass: organic arable farming, processing of agricultural goods, utilization of production wastes, and a system of provision of production with manures, energy-saving technologies, vehicles, and mechanisms. Thus, tendency of connection of the science and the organic production is strictly observed.

Pysarenko P.V. suggests that organic arable farming is a system of arable farming aimed at a balance between productivity of the agroce-

noze and the degradation of environment in order to provide preservation of soil quality for the future generations. Practically, it is a system that entirely or mainly excludes the usage of fertilizers, pesticides, regulators of growth, food additives to ration of animals, and other potentially unsafe substances. Incomings of essential elements are provided on account of: expansion of legume growing, plant remains, humus, green manures, other organic wastes, and raw fertilizers (ores). An aim of the system is to recover natural ecosystems [3].

It is required to emphasize that the organic arable farming is not the return to inveterate forms of economy, but, on the contrary, is development at a qualitatively new and scientifically substantiated level. It has been also proved that the organic agriculture influences natural resources and preserves harmonic correlation between a human activity and the environment, notwithstanding economic crisis, overproduction, and natural catastrophes.

Nowadays biodynamic companies successfully develop almost in the all world countries, because the biological arable farming dramatically reduces pollution of the environment, recovering and gaining the productivity of the soil.

To provide formation of the organic agriculture there is a need to obtain an effective system of provision containing subsystems, namely information, scientific, legal, regulatory systems, which are responsible for communication with an environment of company and conduce to efficiency of functioning of technical and technological, social and labor, organizational and economic, and financial and investment subsystems. The systems mentioned above shall be formed both at the micro and at the macro levels and successfulness of work of these subsystems depends on a level of population education, the environment, and an economy.

To confirm or to disprove a hypothesis about dependence of the organic agricultural production development on a level of population education, the environment state, and an economy state, there is a need to do correlation analysis, the results of which will be a basis of the correlation Pleiades. The so-called Pearson criterion, i.e. the linear correlation coefficient, is chosen as the basis of the relationship estimation. The formula of the Pearson correlation coefficient is (1):

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{X})(y_i - \bar{Y})}{(n-1)s_x s_y}, \quad (1)$$

x_i та y_i - values of two variables;

$\bar{X}$ та $\bar{Y}$ - average values of two variables (x_i and y_i);

s_x та s_y - standard values of two variables (x_i and y_i);

n - a number of pairs of values [8].

To determine dependence the author selected 13 indices influencing the organic agricultural production development of 122 countries of the world.

In order to achieve objectiveness of the research and comparability of the indices all indices are relative. A list of indices is given in Table.

Since the indices analyzed significantly differ from each other according to their quantity and quality, it is expediently to use not their absolute values, but normative values (from 0 to 1).

Valuation of the indices-stimulators is calculated on the basis of the formula (2) [12]. Such indices consist of indices X1; X3;X5; X7; X8; X10; X11; X12; X13:

$$S_{ij} = (X_{ij} - \min X_{ij})/(\max X_{ij} - \min X_{ij}), \quad (2)$$

S_{ij} – a valuated *i* index in a *j* aggregate;

X_{ij} – value of an *i* index in a *j* aggregate;

$X_{ij\,min}$ – minimal value of an *i* index in a *j* aggregate;

$X_{ij\,max}$ – maximal value of an *i* index in *j* aggregate.

Outcome indices

Group	Index	Period	Conventional designation
Education	Share of population being before the age of 25 that has secondary education	On average during 2005-2012	X_1
	Number of pupils per one teacher	On average during 2003-2012	X_2
	Share of GDP spent for education	On average during 2005-2012	X_3

Extension table.

Ecology	Exhaustion of natural resources (% of GNP)	On average during 2010-2012	X_4
	Share of potable water in a general amount of renewable resources	On average during 2007-2011	X_5
	Ejection of the carbon dioxide as a result of the energy consumption, mt per capita	2013	X_6
Economy	GDP per capita	2013	X_7
	Share of an agricultural sector in GDP	2013	X_8
	Share of an industrial sector in GDP	2013	X_9
	Share of a service sector in GDP	2013	X_{10}
Organic agricultural production	Share of organic lands in a general area of country	2012	X_{11}
	Amount of hectares of organic areas per 100,000 persons	2012	X_{12}
	Number of operators of an organic market	2012	X_{13}

The source: calculated on the basis of [9, 10, 11].

At the same time, the normative value of indices-regulators is calculated due to the formula (3) [12]. They include the indices X_2; X_4; X_6; X_9:

$$S_{ij} = (maxX_{ij} - X_{ij})/(maxX_{ij} - minX_{ij}). \quad (3)$$

The received values of indices should be processed using the statistical package SPSS 17.0 (Statistical Package for the Social Sciences). These data should be used to form a correlation matrix.

The results of calculations given in the correlation matrix show the presence or the absence of linear or inverse dependence and also identify the correlation significance.

The next step is to build the correlation pleiades of indices of development of education, ecology, economy, and organic agricultural production on the basis of the correlation matrix (Figure).

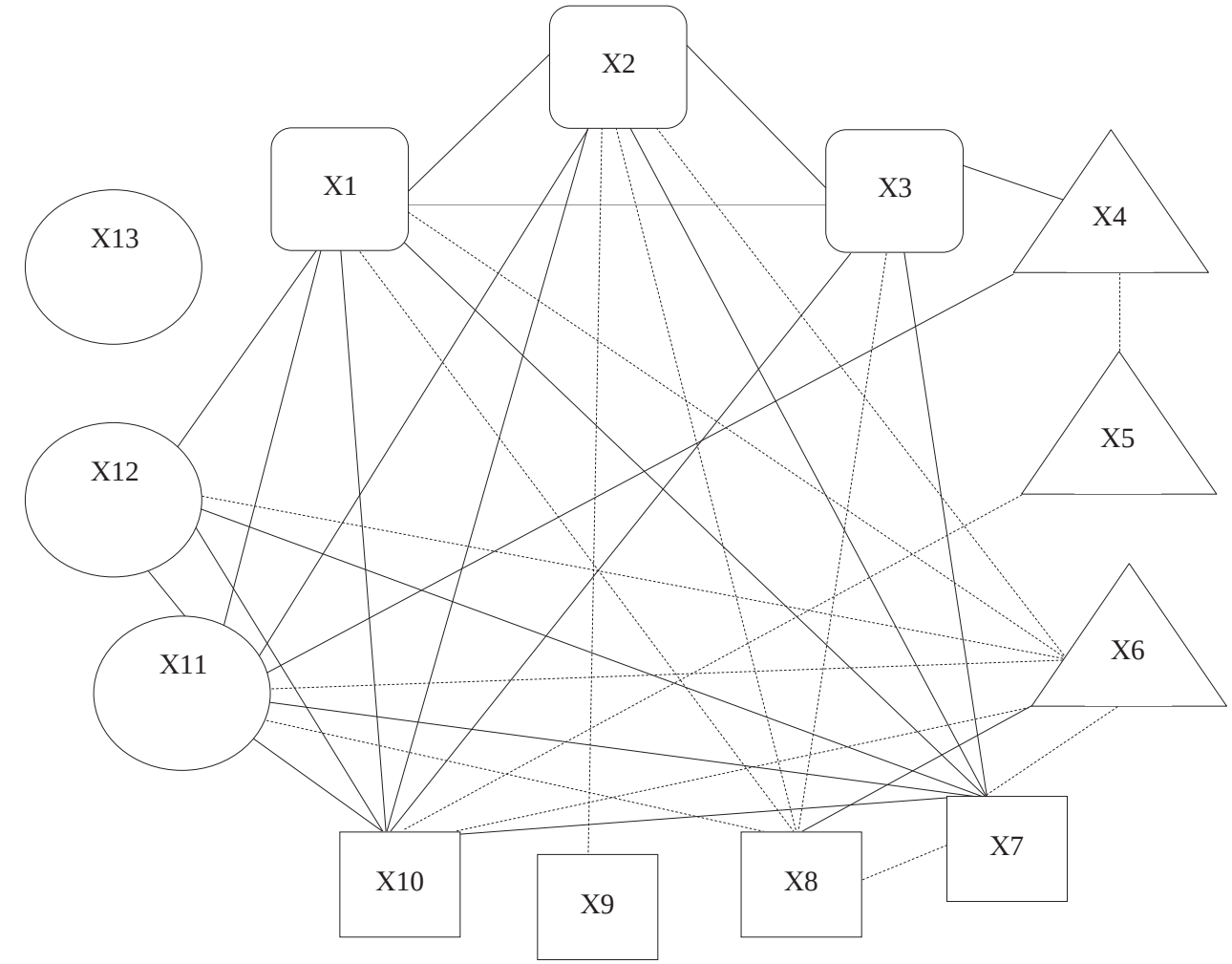
Taking into consideration the correlation matrix and Figure 1, the author may conclude that there are three types of correlation linear relationship between the indices of the group of education and the group of organic agricultural production. The index "Number of operators of an organic market" has neither linear nor inverse correlation for none of indices.

Correlation relationships between indices of the share of population being before the age of 25 that has secondary education (X1) and the share of GDP spent for education (X3); the share of population being before the age of 25 that has secondary education (X1) and the share of organic lands in a general area of country (X11); a number of pupils per one teacher (X2) and the share of GDP spent for education (X3); the share of GDP spent for education (X3) and exhaustion of natural resources (X4); exhaustion of natural resources (X4) and the share of potable water in a general amount of renewable resources (X5); the share of potable water in a general amount of renewable resources (X5) and the share of a service sector in GDP (X10) have the correlative significance at a level of 0.05. Simultaneously, other relationships have the correlative significance at a level of 0.01.

Within the built correlation pleiades, the relationships X1-X2; X1-X6; X1-X7; X1-X8; X2-X6; X2-X8; X6-X7; X6-X8; X7-X8 have high correlation coefficients in modulus. The values of correlation coefficients characterizing a linear relationship of indices, which are included in the group of indices of education and organic agricultural production, equal the average value.

The analysis of given indices shows that increase of the share of an agricultural sector in GDP negatively influences the share of organic lands in a general area of country. At the same time, increase of the share of a service sector in GDP positively influences the share of the organic soils in a general area of country.

Taking into account the vector of dynamics of dependences between the share of population being before the age of 25 that has secondary education, the share of an agricultural sector in GDP, and the share of organic lands in a general area of country obtained in consequence of the done research on the basis of data of 122 countries, it is possible to conclude that increase of the share of population being before the age of 25 that has secondary education positively influences the share of organic lands in a general area of country.



Correlation pleiades of indices of development of education, ecology, economy, and agricultural organic production

Source: [own research].

Conclusions. Consequently, the change of attitude to nature required by modern economic conditions shall prepare a social and physiological basis to outspread it at a level of mass conscious in order to provide terms for changeover to a new style of arable farming, since saving arable farming contemplate both new technologies and a new style of society life.

At the current level of development of the agricultural sector of Ukraine rural inhabitants unwillingly perceive innovations because of unexpectedness of consequences and a risk of loss of anticipated incomes. Thus, in our opinion, the state shall develop a detailed program of implementation of the organic agricultural production. Moreover, the plan should encompass an educational direction as well as a material and technical one.

Development of the organic agriculture in Ukraine is a key to entrance into the world markets of food with really qualitative goods, which enable to take an appropriate position as well as to become one of the most considerable world suppliers of ecologically clear products. In terms of such vector of development, there is a need to take into consideration the results obtained in the process of research of interrelations between the development of organic agricultural production in 122 countries and the groups such as education, ecology, and economy.

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Новини АПК

Оперативна інформація Мінагрополітики: хід осінньо-польових робіт

Станом на 07 жовтня 2014 року

І. Збирання сільськогосподарських культур

Зернові та зернобобові культури обмолочено на площі 11,8 млн га (80%) при врожайності 38,3 ц/га (у 2013 р. – 34,1 ц/га), намолочено 45,2 млн т зерна, в тому числі: кукурудзи – майже 8,9 млн т, гречки – 172 тис. т, проса – 177 тис. т.

Найвища урожайність зернових у Хмельницькій – 54,2 ц/га, Черкаській – 52,4, Чернівецькій – 51,3, Вінницькій областях – 50,9 ц/га.

Соняшнику з площі 4,5 млн га (87% до прогнозу) намолочено 8,3 млн т, сої – майже 2,3 млн т з площі 1,2 млн га га (65%).

Цукрові буряки зібрано на площі 146 тис. га (44% до прогнозу), накопано 6,3 млн т при врожайності 433 ц/га (у 2013 р. – 385 ц/га). Працює 44 цукровий завод (у 2013 р. – лише 25), які від початку виробництва переробили майже 4,2 млн т цукрових буряків та виробили 554,0 тис. т цукру.

ІІ. Посів озимих культур

Озимі зернові посіяно на площі близько 5,4 млн га, або 72% до прогнозу (у 2013 р. – 4,0 млн га), з них:
озимої пшениці та тритикале – 4,9 млн га, або 79% до прогнозу;
жита – 122 тис. га, або 59% до прогнозу;
озимого ячменю – 353 тис. га, або 33%.

Озимий ріпак при прогнозованій площі 859 тис. га посіяно на площі 799 тис. га, або 93% (у 2013 р. – 813 тис. га).

Довідково: Озимі зернові прогнозується розмістити на площі 7,5 млн га (на 94,4 тис. га більше ніж у минулому році), в тому числі: пшениці та тритикале – 6,2 млн га (+131,0 тис. га проти минулого року), ячменю – 1,07 млн га (-42,5 тис. га), жита – 206,5 тис. га (+5,9 тис. га).

ІІІ. Міндобрива

За оперативними даними областей з урахуванням перехідних залишків у наявності (без урахування АР Крим, Донецької, Луганської областей) є 578,4 тис. т (85% до заявки – 678,1 тис. т), або 79% до минулорічних показників.

Прес-служба Мінагрополітики України