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Anatoliy Moskalenko
PhD (Economics), Associate Professor,
Institute of Agricultural Microbiology and Agroindustrial Manufacture,
The National Academy of Agrarian Sciences of Ukraine, Chernihiv, Ukraine
97, Shevchenko Str., Chernihiv, 14027, Ukraine
ekomam@mail.ru

Principles and problems of agricultural land rational use

Abstract. *Introduction.* A successful development of any economic system is the principle of available resources rational use. However, the practice of agricultural land use in Ukraine demonstrates significant problems that arise during implementation of its rational use. *The purpose* of the research is to examine current problems and prospects of agricultural land rational use in Ukraine. *Key research findings.* The author considers a variety of problems that form the concept of rational land use. In the present circumstances it is largely connected with the structure of agricultural land and humus and nutrients balance. Examples of solving such problems in the United Kingdom, Poland, USA, Hungary, and Sweden are given. The author gives his interpretation of rational land use essence as complex result of economic, social and environmental effect of the land use in human economic activities with its natural features preservation. In the article the author's vision is proposed concerning the ways of rational land use formation in Ukraine based on maintaining soil fertility and optimal land resources and agricultural land structure. *Conclusions and proposals.* Firstly, the tendency to soil quality deterioration in Ukraine has continued for the past several decades. It has become particularly acute in the years of Ukraine's independence. In fact, today the nation uses natural fertility of the soil, which should be safeguarded for future generations. Secondly, there is no real working mechanism through which the state would have an opportunity to influence those entities that violate the regulations on rational land use. Moreover, economic entities have no common data registry on soil quality. Thus, it is suggested to urgently create a state body (or empower the existing body) within the Ministry of Agrarian Policy and Food of Ukraine that would monitor soil quality in dynamics and have the authority to file claims to those producers who violate existing land use rules and regulations. Thirdly, a land owner should be interested in maintaining soil fertility himself. To do that, in addition to administrative, measures should be introduced in economic and legal spheres. The first of them may include land tax differentiation depending on crop pattern and crop impact on nutrients balance. In particular, areas under such crops as sunflower, coleseed, and grain corn may have a higher tax rate than sugar beet or fodder crops. The second group of measures should provide the formation of a transparent legal environment of land rights. This will ensure land owners' confidence in the future, in their property rights, in the ability to transfer such rights to their descendants. Of course, it is not easy to create such a system of relations between the state and the commodity producer. But it should be a strategic goal for Ukrainian society.
Keywords: Rational Land Use; Natural Fertility; Nutrient Balance; Structure of Land
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Москаленко А. М.
кандидат економічних наук, доцент, Інститут сільськогосподарської мікробіології та агропромислового виробництва, Національна академія аграрних наук України, м. Чернігів, Україна
Принципи та проблеми раціонального використання сільськогосподарських земель
Анотація. У статті автором розглянуто сукупність проблем, які формують поняття «раціональне використання земель». Зазначено, що дана проблема має тривалу історію. В нинішніх умовах вона значною мірою пов'язана зі структурою сільськогосподарських угідь і балансом гумусу та поживних речовин. Наводяться приклади вирішення подібних проблем в інших країнах. Дається авторське бачення шляхів формування раціонального використання земель в Україні.
Ключові слова: раціональне використання земель; природна родючість; баланс поживних речовин; структура земель.

Москаленко А. М.
кандидат экономических наук, доцент, Институт сельскохозяйственной микробиологии и агропромышленного производства, Национальная академия аграрних наук Украины, г. Чернигов, Украина
Принципы и проблемы рационального использования сельскохозяйственных земель
Аннотация. В статье автором рассмотрена совокупность проблем, формирующих понятие «рациональное использование земель». Указано, что данная проблема имеет длительную историю. В современных условиях она в значительной мере связана со структурой сельскохозяйственных угодий и балансом гумуса и питательных веществ. Приводятся примеры решения подобных проблем в других странах. Дается авторское видение путей формирования рационального использования земель в Украине.
Ключевые слова: рациональное использование земель; естественное плодородие; баланс питательных веществ; структура земель.

Introduction. The principle of available resources rational use is in the basis of any economic system successful development. In agriculture, the resources are primarily capital, land and labour. Only those nations that follow this principle can have a high level of prosperity.

In Ukraine, one of the main resources is agricultural land. This resource given to our state by nature should be used with the highest efficiency and remain effective for future generations.

The requirement of rational land use is reflected in the Land Code of Ukraine, Article 5 of which defines the provision of land rational use and protection subject to the principle of land law [2]. This basic legislative act in the field of ecology states that the use of natural resources is carried out according to the rational and economical use of natural resources based on widespread utilization of new technologies [1, 546]. Moreover, nowadays it is believed that land use effectiveness is a key indicator of both the society and the state development [2]. However, the reality and practice of agricultural land use in Ukraine demonstrates significant problems that arise on the way to their rational use implementation.

Brief Literature Review. The study of rational land use has lasted since the investigation of its qualitative characteristics was initiated. V. V. Dokuchaiev (1936) noted that the structure and the scope of agricultural land use in the state was far from meeting the requirements of nature resources rational use [3]. Today the issues of agricultural land rational use are raised in the works of V. M. Rusan (2008) [4], A. M. Tretiak (2012) [5],

D. S. Dobriak (2013) [6] O. V. Popova (2013) [7], S. A. Baliuk, V. V. Medviediev (2015) [8]. This problem has also been investigated by foreign scientists (Tweeten, Luther, and Carl Zulauf, and others 2008, 2009, 2009a, 2009b) [9-13]. Domestic scientists have studied a wide range of issues related to nature resources rational use in their works. In particular, these are economic problems of land use, features and qualitative characteristics of soils, land use structure in Ukraine. At the same time, a significant number of issues remain insufficiently investigated. This applies both to the notion of «rational land use» itself and the factors that determine these processes and the prospects for forming rational land use in Ukraine.

Purpose is to study current problems and prospects of rational use of agricultural land in Ukraine.

Results. Over the last century the ecosystems of Ukraine has experienced significant changes. This primarily concerns land use patterns, including the ratio between natural and man-made ecosystems. The research done by D. S. Dobriak (2013) [6] suggests the following. If previously 35% of the area were covered by steppe ecosystems, 34% – by forest ecosystems, today the natural steppes have almost completely been converted to agricultural land; they are preserved only in national parks, nature reserves and on the slopes of hills in a small number, while less than 11% of forests remain in their original state. The rest are artificial forests altered by human activities.

According to A. M. Tretiak (2012), if in the past the average forest cover of the planet's ecosystems was 50%, now it is kept at the rate of 18% (from land area). Since the beginning of the 18th, century about 700 million ha of forests have been lost, which is greater than the area of Europe. 900 million ha of the Earth's surface have been transformed into permanent cropland since the middle of the same century [5]. Then, the author notes that one of the major biosphere problems now is widespread deterioration of the productive land quality which is already exploited at the limits of the possible [Ibid.].

It should be specifically emphasized that the content of soil resources rational use is still interpreted ambiguously. We can agree that rational use of soil resources means the process of achieving scientifically proven economic benefits and ensuring the environment improvement, including soil as one of its main components [8]. At the same time it should be noted that the term «rational land use» was considered through the prism of a particular time measurement. Thus, the term «rational land use» was considered in the Soviet period. In particular, famous Ukrainian scientist P. F. Viedienichev (1972) noted that «rational land use» should be understood as appropriateness, completeness and degree of land use efficiency [14]. A more extensive interpretation of «rational land use» was made by another Ukrainian researcher – D. I. Hnatkovych (1986) who understands the word «rational» as correct, appropriate, scientifically grounded land use in terms of cross-sector allocation of the country's land between the categories of land and land users [15, 60]. Further, the author suggests a controversial idea from today's point of view: «The higher the proportion of cultivated land is, the more rational its use is» [Ibid. 62].

How do modern Ukrainian scientists interpret the term «rational land use»? O. I. Bochko (2010) argues that rational land use means maximum involvement of land into economic turnover and its effective use for the main purpose, creating favourable conditions for high productivity of agricultural land and receiving maximum amount of products per area unit at the lowest labour cost and expenses [16]. V. M. Rusan (2008) believes that land use rationality means obtaining the biggest benefits from growing crops, which a land plot is able to provide based on natural and economic location [4]. The content of the term «rational land use» given by O. I. Bochko and V. M. Rusan is rather wide and not always unambiguous. H. Z. Bryndzia (2009) believes that only such land use should be considered rational, at which ecological balance of all natural factors is kept along with the production of economically profitable product quantities [17]. This interpretation uses the environmental component in conjunction with the economic one.

A. M. Tretiak (2004) emphasizes that the most important land management task is to ensure relative labour costs and material resources decreasing with the help of rational land use forming and internal arrangement of the territories [18]. According to the author, the essence of rational land use is in aggregate investment and non-investment factors application aimed at soil fertility improvement, its protection, and increase in the number of necessary public products, their quality improvement, and increase in labour productivity through motivational factors. Thus, the term «rational land use» is interpreted ambiguously by now.

In our view the essence of rational land use should be interpreted as a complex result of economic, social and environmental effects of the land use in human economic activities with preservation of its natural features.

Unfortunately, soil fertility preservation is rather a theoretical concept. Agrochemical investigation of soils in Ukraine and their qualitative characteristics indicate their deterioration. In particular, humus content decrease in the soil is observed.

Parallel to this phosphorus and potassium compounds content decreases, the reaction of soil solution changes [8; 19].

Recently, microbiologists have been involved in the issues of soil fertility conservation and reproduction, pointing at the distortion of soil formation in agrocenoses relevant to existing ways of soil use. In the context of absence of organic matter income and unbalanced fertilizers use, crop rotation ignoring, minimization the area for legumes cultivation, straw burning, etc. profound changes occur in soils for the microorganisms composition and their quantity while dehumification processes are activated. Soil biogenesis composition is significantly depleted, minimization and even loss of certain types of beneficial organisms is observed. Many agrocenoses have turned into reservations of pathogens. The amplitude of such phenomena raises serious concern [20].

The consequence of soil quality worsening is shortage and, therefore, economic damage to agricultural producers [6; 8].

It should be specifically emphasized that soil protection should be exactly the basic factor for its rational use. Without this, it is basically impossible to talk about the problem solution. The reproducibility of soils natural properties, their preservation for future generations is a mandatory component for a comprehensive solution of land use rationalization.

O. L. Popova also noted the importance of land use rationalization. To do this, in her view, it is necessary to regulate economic behaviour of agricultural entities to comply with appropriate land management, including crop rotation, general agronomic practice that is needed in the conditions of current mass disregard of these rules, large-scope commercialization and mono-culturing of agriculture. It is important that legislative provisions related to imposing fines on citizens and officials for land management violation, which have been several times postponed by the authorities, finally come into force [7].

As the research note of the National Institute for Strategic Studies subordinate to the President of Ukraine highlighted, cropland occupies 78.1% (32.5 million ha) in the agricultural land structure, which is significantly higher than in European countries and the USA [21]. By the share of natural grasslands in the total area of agricultural land (1%) Ukraine is considerably inferior to other countries of the world – in most European countries this figure ranges 30-40%, and in the UK and the USA is 63.1 and 56.0%, respectively [22]. All this evidences a high developmental level and a burden on agricultural soil cover, which increases the probability of country's land erosion and degradation threats appearance.

Our calculations done on the basis of the State Agency for Land Resources of Ukraine data (form 6-zem) as of 01.01.2014 confirm this conclusion. Particularly, the ploughness level in Kherson region exceeds 91%, while the average for Ukraine is 80.5%. In the area of woodlands this figure is somewhat lower – not reaching 70.0%. It should be noted that there is a significant difference in terms of ploughness depending on the region in Ukraine. Thus, in Zakarpatska (Transcarpathian) region the ploughness level is 50.2, while in Zhytomyr region – 74.9%. At the same time agricultural lands ploughness in the USA does not exceed 25% [8].

High land ploughness degree in Ukraine has ultimately led to the fact that land reserves in the state, as concluded by UN experts in 2011, do not exist [23]. In comparison, these reserves amount to 100% in the USA, Canada, Australia, and Brazil.

It should be specially emphasized that the problem has a long history. Back in 1914 N. Ohanovskyi (1914) noted that in the early twentieth century 80% of peasant lands in the Russian Empire were rendered for croplands, while in Germany the figure was from 40 to 56% [24, 37].

D. I. Pshoniak (2012) also reports a tendency to extensive expansion of land used in agriculture, primarily in the form of cropland, which actually continued in Soviet times [25]. The solution, from the author's point of view, may be found in collective decision on the transformation of farmland.

It is worth noting that there have been such cases in history. In particular, Western countries repeatedly performed the transformation of cropland to other type of agricultural land. For example, Sweden reduced the area of cropland by 11% in 1940; the degree of ploughness was decreased by 8% in the US in 1936, in 1985 – by 11% [26].

In this context the problem of the country's territory afforestation should be also mentioned. More than 200 years ago half of Ukraine's territory was forested; before the breakup of the Soviet Union this figure was 14.3%. The EU has established afforestation at the rate of 30%. In Ukraine, even in Chernihiv region, 300 thousand ha are missing to optimal afforestation. In comparison, the afforestation degree in France was 28%, in Poland – 30% in 2011 [23]. It is a strategic problem which should solved at the national level.

Conclusions. Summing up the issue of the study let us make the following conclusions. Firstly, the tendency to soil quality deterioration in our state has continued for the past several decades. It has become particularly acute in the years of independence of Ukraine. In fact, today the nation uses natural soil fertility, which should be safeguarded for future generations. Secondly, there is no real working mechanism through which the state would have an opportunity to influence the entities that violate the regulations on rational land use. Moreover, economic entities have no common data registry on soil quality. So, it is suggested to urgently create a state body (or empower the existing body) within the Ministry of Agrarian Policy and Food of Ukraine that would monitor soil quality in dynamics and have the authority to file claims to those producers who violate existing land use rules and regulations. Thirdly, (which is perhaps the most important), a land owner should be interested in maintaining soil fertility himself. To do that, in addition to administrative, measures should be introduced in economic and legal spheres. The first of them may include land tax differentiation depending on crop pattern and crop impact on nutrients balance. In particular, areas under such crops as sunflower, coleseed, and grain corn may have a higher tax rate than sugar beet or fodder crops. The second group of measures should provide the formation of land rights transparent legal environment. This will ensure land owners' confidence in the future, in their property rights and the ability to transfer such rights to their descendants. Of course, it is not easy to create such a system of relations between the state and the commodity producer. But it should be a strategic goal for our society.

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