THE UTILIZATION OF NATURAL RESOURCES UNDER THE CONDITIONS OF INTERSECTORAL INTERGRATION

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Abstract

The paper studies and analyses the present-day state of the utilization of natural resources by agricultural commodity producers. Some changes of the natural components under the conditions of the increased anthropological load on landscape have been revealed. The author investigates the basic production factors which essentially influence the agrolandscape. It has been established that the increase in the technical level stipulates the human interference with natural complexes, land resources in particular. The article considers the state of farm land use in Zhytomyr region. Some special features of introducing resource-saving and ecological technologies of farming have been shown on the pattern of integrated enterprises. The paper investigates the prospects and economic efficiency of introducing the intersectoral production by integrated formations. Some measures aimed at the balancing of farm production and rational utilization of natural resources under the conditions of intersectoral integration have been suggested.

Introduction

Farming is one of the most sensitive factors of environmental influence which especially shows itself in connection with the extensification of the agrarian production, namely the continuous growth of the area under tillage as well as deep tillage, chemicalization, engineering reclamation and high concentration of production. The extensive economic growth is the easiest line of agricultural development, but it causes a number of negative ecological and economic results. A principle element of the integrated production management is the necessity of applying the systems approach to the preservation, rational utilization and reproduction of natural resources that must be considered as a single whole under the conditions of many-sided human influence upon them. Otherwise, there is a real threat for Ukraine to lose its competitive advantages in farming production (Oniehina, 2010, pp. 62–63).

Ukraine has 42.8 million ha (Mha) of agricultural land comprising 71% of the country's total area, of which 32.5 Mha is arable (excl. pastures, grasslands, permanent plantings etc.). Ukraine is richly endowed with chernozem (also known as "black earth"), one of the most fertile soils worldwide. Ukraine accounts for about 25% of the global chernozem area. Chernozem, a black-colored soil that contains a very high percentage of humus along with phosphoric acids, phosphorus and ammonia, occupies 41% of Ukraine's total area and even more of its agricultural land (54%) and plow land (62%) [5].

Under existing conditions, the agrarian production is characterized by a high degree of concentration and automatic control as well as the increasing amount of natural resources utilized. In addition, the amount of production waste which is emitted into natural complexes is also increasing, what, in its turn, predetermined global environmental changes. This is especially topical for farming where the increase in the output of production and anthropogenic load is in progress.

Among the domestic researchers who busy themselves with the problems of conservation of natural resources are V. Andriychuk, A. Dotsenko, S. Doroguntsov, D. Dobryak, A. Lysetsky, L. Moldavan, I. Lukinov, L. Novakivsky and others. The researchers have made a substantial contribution to the study of the problem of the rational utilization and conservation of natural resources. The current ecological situation, however, requires the development of the new resource-saving and appropriate technologies of nature management in farming.

Methods

The methodological and theoretical basis of the research is the systems approach to the study of fundamental principles of economic theory. I n the research process the following methods

were used: dialectical, abstract-and-logical (for the theoretical generalization and formulation of conclusions); monographical (when studying the advanced experience of the rational employment and conservation of natural resources); empirical (for the observation of the present-day state of agricultural production and comparison with the figures of the best enterprises); statistical-and economic methods (for studying the influence of commodity producer activities on the ecological situation in the region) and some others.

Results

The agrarian production is directly connected with the utilization of natural resources, namely land, water and forest ones. Nowadays, to raise crop yield commodity producers apply the techniques which negatively influence not only the human and animal health but also the environment as a whole. The consequences of this interference in ecosystems not only deteriorate the quality of farm produce but also affect the ground water state. Especially dangerous is the application of nitrates, pesticides and toxic chemicals, as a great deal of them remains in the produce. Year after year the anthropogenic load is increasing which causes the changes in the natural components of agrolandscape (Fig. 1).

Changes in natural components	
soils	✓ transformation of structure and chemical composition as a result of tillage and crop cultivation, excessive application of mineral fertilizers and plant protection means
vegetation	✓ change in species composition during the plowing up of steppes and meadows, transformation of natural plant groupings into cultivated plant ones
animal world	✓ impoverishment of its specific composition because of excessive industrial exploitation and change in ecological conditions
water regime	✓ by means of runoff regulation, creation of ponds and water –storage reservoirs, redistribution of river runoff
climate	✓ by means of active economic activities and anthropogenic load on the environment

Fig.1. **Changes in natural components under the conditions of the increasing anthropogenic load on the environment**

Under the present-day conditions of the economic management of farm businesses, the objective process of their production structure transformation is taking place. A characteristic feature is the adaptation of integrated formations to the agro-food market situation. In plant industry this reveals itself in growing energy-intensive crops, the substantial fraction of their produce being intended for export. In animal raising the fall in the total number of animals and the essential decline in their output is being observed. Most commodity producers only use single elements of intensive technologies of growing crops and keeping animals, this causing the decline in labor-intensive sectors, slowdown of rural area development and strengthening of the anthropogenic load on the environment.

Extensive methods of management negatively influence land resources as well. Their uniqueness is contained in the high content of soil humus, the layer of which amounts to 40-50 cm and even more, what is of great importance for farm use [7]. For several recent years soil destruction has grown as a result of economic mismanagement. At present the ecological conditions for successful farming in Ukraine turn out quite unfavorably because of the substantial erosion of soils (18%), their flooding (17%), secondary salinization (25%) and humus loss (Skoryk, 2008, pp. 15–16).

We will give consideration to the problem of land use on the pattern of Zhytomyr region. Having an agrarian orientation, the soil cover in Polissya is spatially very complicated in agroindustrial respect as compared with other areas (table 1). The land improvement systems which regulated the soil water regime do not practically function and require major repairs. The

given trends resulted in the fact that farm lands in this area are characterized by lower productivity and require additional capital investment for receiving competitive products [3].

Table 1

The ecological and productive state of farm lands in Zhytomyr region, (thous. ha)

Land characteristic	1990	2000	2005	2012	Deviation of 2012 from the Year of 1990, (%)
The area of lands with the increased acidity level	458.1	351.4	348.6	372.5	81.3
The area of water-logged lands	72.1	80.3	82.6	84.7	117.5
The area of swampy lands	352.4	362.2	363.5	364.8	103.5
The area of lands with the increased stoniness level	10.8	11.9	12.1	12.3	113.9
The area of farm lands exposed to water and wind erosion	75.3	83.9	84.6	87.8	116.6

For the last 20 years the ecological state of farm lands in Zhytomyr region did not improve, but substantially deteriorated in many parameters. The only positive indicator is the reduction in the area of lands with the increased acidity level. But this result was not achieved at the expense of raising the intensity of soil liming, but owing to the fact that the farms began to apply a considerably lesser amount of fertilizers.

Three major land cultivation technologies are applied in Ukraine: till, low-till or mini-till, and no-till. Tillage is the agricultural preparation of soil by mechanical agitation of various types, such as digging, stirring, and overturning. Intensive tillage systems leave less than 15% crop residue cover on arable land. The most important negative effect of such technology includes erosion of soil. The soil loses a lot of its nutrients like carbon, nitrogen and its ability to store water, thus requiring a higher rate of fertilizing and increasing grain production costs. Low till or mini-till leaves between 15 and 30% residue cover on the soil. In the no-till farming system, significant amounts of crop residue remain on the soil surface, protecting it from water erosion and improving soil cultivation. No-till farming (also called zero tillage or direct planting or pasture cropping) is a way of growing crops from year to year without disturbing the soil through tillage. It increases the amount of water and nutrients in the soil and decreases erosion. It also contributes to the variety of life in and on the soil but may require herbicide usage [7].

The inobservance of scientifically justified methods of economic activity management results in the deterioration of the ecological situation and advancement of erosion processes covering 104.8 thous. ha of farm lands which makes 3.5% of the Zhytomyr region`s territory and 6.5% of the farm land area. The recent years saw a substantial environmental degradation which caused the intensification of water erosion processes, considerable ecological and economic losses and damage. The level of farm land plowing up is above 49% which is the highest figure among the developed European countries.

The extensive economic management, irrational land use and unreasonable plowing up of the arable land resulted in the diminishing of the fertility of soils and their degradation. Over the period of 100 years the soils of Ukraine lost nearly 25 percent of humus. The growth of anthropogenic load in the periods of the implementation of the extensive farming policy not so ensured the achievement of planned world crop yield and livestock productivity levels as diminished the soil fertility. And in case this tendency to be continued, in the not so distant future the native farming can find itself on the threshold of the `humus hunger – a major ecological disaster, and then none of the agro-engineering, melioration, nature protection as well as

organizational-and-economic measures will not be able to restore the agrotechnical land potential (Kussul, 2010, pp. 67–68).

Agricultural enterprises, on their part, do not have enough incentives to carry out capital investments in land protection and restoration. One can name at the least three reasons of that: 1) most farm lands are not the property of agrarian enterprises; 2) many commodity producers are unprofitable and do not receive enough profits to carry out long-term investments; 3) the absence of the system of the preferential crediting of those economic entities that are ready to make investments in nature protection projects.

It is, however, necessary to mention a number of farms which were able to rationally use the available resource potential owing to intersectoral integration. At present, intersectoral integration is a form of the territorial-and- industrial combination and the aggregation of technologically and economically connected agricultural commodity producers and industrial enterprises. The main aim of the aggregation is the processing of the vegetable raw materials grown and development of trade and servicing structures for achieving a synergic effect when using the raw materials potential.

At present, the urgent problem is the introduction of organic soil management under the conditions of intersectoral integration, that is the system of farm production which restrains or largely restricts the use of combined synthetic fertilizers, pesticides, growth regulators and food additives when feeding animals. This system is based on the application of rational crop rotations, use of plant by-products, manure and composts, beans, organic waste products, biological means that control pests and pathogenic agents. The given trend of farming production is widely applied at the Galeks-Agro private enterprise in Novograd-Volynsky district of Zhytomyr region. The selling price of the produce grown under the organic soil management is 20-25% higher than when it is grown under the traditional farming system.

It should be noted that the integrated farm businesses were able to achieve positive results in their economic activities due to the use of current technologies, presence of conditions for agricultural produce storage and pretreatment, its partial processing and marketing through their own sales network. For example, at the Tsyurupa private farm business a raw materials base for its own sugar-mill was set up and a closed cycle of sugar production was introduced. Its waste products are utilized in animal husbandry. The organization of the rational sectoral relationship makes it possible to maintain scientifically based standards of economic activity and to rationally utilize the available resources.

The Mriya Company applies No-Till technologies which stipulate seeding without soil tillage. This makes it possible to reduce the machinery fleet, do field work in the optimal time as well as optimize labor hours and monetary resources. Traditionally, Ukrainian agrarians used the full tillage technique for soil cultivation, leaving almost no crop residue on fields. However, no-till and mini-till are starting to gain favor in the country due to significant soil erosion from full tillage. Still, only about 10% of Ukraine’s arable land was cultivated with the help of the no-till technique while full tillage accounted for over 45% of overall acreage in 2011, being used by both large agribusinesses (operating over 5,000 ha) and small and medium-sized farms [1].

At the integrated enterprises the classical system of the basic soil cultivation is being replaced by the subsoil tillage (the Raiz private joint-stock company), which makes it possible to economize fuel within 5-7 l/ha, enhance the productive efficiency of plowing units by 7-8%, restore the activity of soil-forming microorganisms and contribute to the maintenance of ecological balance. One of the important aspects of the rational land use is the setting-up of agrochemical inspection laboratories (the Privat group), which makes it possible to take an individual approach when applying technologies in a definite farm field (McFetridge, 1999, pp. 529–530). Due to intersectoral integration, farm businesses have the opportunity to rationally utilize natural resources and contribute to the revival of rural areas.

Conclusions

Under the present-day conditions of economic management, the utilization of natural farm resources in the native zone of Polissya is irrational and ecologically imbalanced. The correlation

between arable and other types of farm lands is now unsatisfactory from both an ecological and economic standpoint. The plowing up of the agrolandscape varies within 50-70% which is nearly twice higher than its ecologically-based index. The situation results in the increased level of anthropogenic load on the environment, thus causing the expansion of soil cover degradation as well as water and air pollution.

To normalize the given situation, it is necessary to improve the legislation in force and work out normative-and-legal acts on the issues of planning and developing populated localities and their neighboring territories, reforming the social, housing and investment policy, land use, especially under the conditions of the activities of integrated formations. It is now necessary to strengthen the controlling-and-stimulating function of the government as to the rational utilization and protection of natural resources, namely to organize the public control over the effective land use by means of the close collaboration between landowners, local authorities and leaseholders.

It is significant to take decisions on the reduction of the anthropogenic load on the environment by farm businesses at government level and directly at every enterprise. If not to stop the negative trends of today, there exists a possibility of losing the most valuable resource the Ukrainian people have, that is the fertile land, making it unsuitable for growing food products through the use of monocultures and chemicals. The research conducted has proved that under the conditions of intersectoral integration and with the combined economic management, there is an opportunity to carry out a balanced, ecologically safe production.

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