ПОД- СЕКЦИЯ 14. Экономика охраны окружающей среды.

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ENVIRONMENTAL AUDIT OF LAND RESOURCES IN AGRICULTURE

The intensive agricultural production is one of the main forms of negative impact on the environment. Ignoring the environmental principles of agricultural production will inevitably accelerate an environmental degradation of unique land resources of Ukraine, reduce environmental and economic efficiency of agricultural production, and finally account deepen social and environmental problems of food security [2, p. 63].

One of the tools to address these problems is environmental management, which in particular includes environmental auditing procedure to ensure the environmental safety of agricultural land management. When overseas environmental audit has been a real management tool, then work in Ukraine to build legislative and regulatory framework, the creation of appropriate techniques in this field is only launched. Ecological and economic processes in the country are caused by the introduction of market relations, the transition to sustainable development principles, the practical implementation of the principles of ecological safety of agricultural production, which requires the use of appropriate, common in the world of environmental audit procedures [1, p. 251].

However, the problems of environmental audit of land resources in agriculture in order to stabilize their ecological condition and safe operation in the transformation of land relations and the formation of environmental and economic mechanisms land management is not sufficiently researched. Ukraine has not yet developed a method of environmental audit of land resources in agriculture to be implemented in the context of provisions for environmental monitoring, agrochemical certification of compliance on environmental safety agroecosystems. Such a research direction is particularly important given the trend towards implementing the provisions of the agricultural land market as a part of the guarantee ecosafety land.

To implement the goals and objectives of environmental audit it is necessary to use a combination of legislative and regulatory acts, rules and regulations, standards for each facility. Methodological recommendations on preparation, implementation and execution of an environmental audit report of the Ukraine Ministry of Ecology and Natural Resources [4] require a consideration of land management type, built-up area, covered with vegetation area, acreage places for temporary and permanent storage of waste and hazardous substances, pesticides application area, the area of reclaimed land, sanitary protection, water protection zones, etc. It is also marked the actual performance of the facility audit measures to protect the land, compliance with the intended use of the territory; area of flooded land, state of up erosion and hydrotechnical facilities, protective plantations, availability and project implementation of improvement and landscaping the buffer zone facility audit and emphasis on compliance audited established procedures and restrictions while using lands

of water fund.

Information that is collected, in particular during the test soil and vegetation areas for this method includes: soil types which are dominant, texture, capacity of soil, water and physical properties (filtration coefficient); agrochemical properties (humus content, carbonates, the capacity of metabolic bases, pH), the degree of soil degradation due to erosion. The land management structure is characterized by areas of land occupied by natural and agricultural vegetation types and plants [6, p. 147]. The degree of soil contamination is measured by the maximum permissible concentration (MPC) of these substances in soil or tentative permissible concentration (TPC). In the absence of the chemical composition of the MPC is compared with background values or natural geochemical background (clarks). Contamination of soil by metals is assessed in terms of moving and soluble metals, biological indicators of soil and accumulation of metals in plants.

Existing methods of environmental land audits are intended primarily for the use of environmental land management audits in industry, construction and housing. Methods that can be used to conduct an environmental audit of functioning farms are based on purely environmental and agronomic procedures. However, none of them covers the whole complex of economic-specific parameters and characteristics of agricultural land management in the context of sustainable economic development. However, one of the priorities of environmental audit is to develop tools to stimulate ecological land management by farms in the way of determining the sensitivity of land resources in the case of changes in the performance of the company.

Therefore, during an environmental audit of land resources in agriculture it is necessary to take into account the depending level of economic efficiency enterprises from the ecological condition of agricultural land, which can be calculated on the basis of interdependence income elasticities of agricultural enterprises and ecological indicator of land farms. [6]:

$$E_P = \frac{\Delta P / P}{\Delta EC_l / EC_l}, \qquad (1)$$

where P – profits of the enterprise over a specified period, UAH;

EC_l – an indicator of ecological condition of the land resources at agricultural enterprises.

Elasticity – is the ratio of the sensitivity measures of one variable and another that shows how to change the first indicator when changing other comparable (tab. 1).

Table 1

Level of elasticity sensitivity

$E_p > 0$	Indicators of environmental state of the land resources increases with profits increase
$E_p > 1$	Indicator of ecological condition of land resources is changed to a higher percentage than income
$0 < E_p < 1$	Indicator of ecological condition of land resources is changed to a lower percentage than profit. That is, to increase profits in a certain number of times, the rate of ecological condition of land resources will increase by less than the number of times
$E_p < 0$	Indicator of ecological condition of land resources is decreases when increasing profits

$E_p = 0$	There is no direct relationship between the environmental condition of land resources and changes in income

The indicator of ecological condition of agricultural enterprises land resources can be calculated according to the methodology for assessing the agroecological state of agricultural land, proposed by O. Rakoyid and researchers from the Institute of Agroecology and Natural Management of NAAS [3]. This technique is based on the use of the both direct and indirect indicators. The first group includes parameters that determine the environmental and agrochemical condition of arable land, the second – degree of ecological balance in the ratio of land in agricultural landscapes and spatial distribution and intensity of expression of soil degradation processes. The ecological state of agricultural land for the main manifestation of the degradation processes, which include dehumification, soil depletion of nitrogen, phosphorus and potassium, erosion and deflation, salinization and alkalinization, acidification, waterlogging and flooding, contamination, have determined by methodology developed by us which is based on assessing manifestation of some degradation processes in the share of medium-and heavily degraded soils in soil contour. A comprehensive assessment of agroecological farmland condition was performed by integration benchmarks into a single composite index, which was calculated by evaluation an ecological balance state in the ratio of arable land and ecologically stabilizing land, environmental and agrochemical state of arable land and soil cover degradation [7, p. 107]. To each of benchmarks was appropriated a certain score on a five point scale, besides the growth of score indicated a deterioration that was assessed (Table 2).

Table 2

The scale for assessment of agroecological state of agricultural land for the complex parameters

Mark	Correlation P:ESL, %	Ecological and agrochemical state of land, creditworthiness mark	Soil cover degradation, integral index	Integral index, mark	Agroecological condition
1	< 20 : > 80	61–70	< 1,4	1,0–1,7	Good
2	21–36 : 64–80	51–60	1,4–1,7	1,8–2,5	Satisfactory
3	37–55 : 45–63	41–50	1,8–2,1	2,6–3,3	Unsatisfactory
4	56–70 : 30–44	31–40	2,2–2,5	3,4–4,2	Critical
5	> 70 : < 30	21–30	> 2,5	4,3–5,0	Crisis

Since these parameters have different effects on Agroecological condition of agricultural lands in the process of integrating to each of them was appropriated a weighting factor, the value of which was established by expert considering the direct or indirect effects of each factor on the growth, development and productivity of crops. Agroecological assessment of agricultural land was defined as the weighted average of benchmarks by the formula [3]:

$$I = \frac{Ek_1 + Dk_2 + Ck_3}{k_1 + k_2 + k_3}, \quad (2)$$

where I – the integral indicator of the agroecological condition of agricultural land, mark;

E – indicator of ecological and agrochemical condition of the of arable land, mark;

D – index of soil cover degradation, mark;

C – the ratio of arable land (P) and ecological stabilizing land (ESL), mark;

$k_1 - k_3$ – weighting coefficients of indicators.

The rate flexibility data obtained should be used during internal and external environmental audits of agricultural land, which in turn will facilitate comparative ecological and economic analysis of agricultural enterprises. Each partial and comprehensive performance has an independent value and is simultaneously an integral part of the index. But its calculations allow to construct a single scale, on which will be placed various farms in order of ranking, which is a prerequisite for the formation of environmental rating.

Thus, the use of income interdependence elasticity indicator of agricultural enterprises and ecological condition indicator of agricultural enterprises land resources during an environmental audit of agricultural land management allows to take into account the dependence of the enterprises economic efficiency on the environmental condition of land resources for agricultural producers.

Suggested recommendations on an environmental audit of land management in agriculture is a prerequisite for the comparative analysis of the performance with indicators of agricultural enterprises competing with companies that are leaders in their respective fields, compared with figures of previous years and more. Given the nature of the integral index of land use, we consider justified its use in economic forecasting ecological development of agricultural land.

Consequently, the proposed methodical recommendations for conducting environmental audits at an agricultural enterprise allow to take into account not only the actual state of land resources, but also the potential agriculture impact on land resources of the enterprise and the zone of influence of the enterprise.

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