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THE STUDY OF THE ECOLOGİCAL TECHNOLOGY İNTENSİTY OF THE TERRİTORY AND THE İNFLUENCE OF ANTHROPOGENİC FACTORS

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Abstract

The conducted research allows us to build a conceptual model of the secondary use of resources in a closed cycle of agricultural production. The effective functioning of agricultural enterprises is at a level that can play an important role in its implementation towards the goals of sustainable development of the country's economy based on the principles of applied ecology. The impact of environmentally and economically efficient use of waste on the ecological and economic potential of agricultural enterprises was determined by the use of innovative environmental management technologies.A comprehensive analysis of the negative impact of the system of using existing means of mechanization on the environment of the technological potential of agriculture, the technical load, as well as the interaction of the level of technical equipment of agricultural enterprises and the scope of application of agricultural machinery is carried out. definite. In scientific research, the environmental technology intensity of territories in agricultural areas of the republic, the definition of limits of man-made loads can be assessed as a scientific innovation, and the definition and implementation of measures to reduce harmful effects are of great practical importance.

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Introduction

Research on the greening of agricultural production, green economy and applied ecology appeared in the form of the first scientific and practical research almost relatively recently. They can be grouped into several complex directions.In modern research, it can be said that N. N. Lukyanchikov, Yu. D. Vishnyakov, S. P. Kiselyova, A. N. Kosarikov, I. V. Kosyakova, A. L. Novoselov, I. M. Potravny, A. S. Tulinov, N.V. Chepurnykh and others.

The problem of optimizing the interaction of industrial activity and environmental pollution in the process of socio-economic development Anonchenko T.Yu., Vukovich G.G., Lisochenko A.A., Savon D.Yu., Tyaglov S.G., Chesheva A.S. took place in his works. The theoretical aspects of updating the economic complex in the direction of environmentally oriented production activities and efficient use of resources are presented in the works of V. V. Garkavy, V. V. Kuznetsov and Yu. D. Pevsner.

The works of V. G. Goncharenko, V. V. Kolesnichenko, S. V. Meshcherkov, K. V. Rybakov, A. P. Solomkin, Yu. S. Churyukov are devoted to the problem of the optimal regime of enterprises based on the rational use of fuel and lubricants resources. The study of the application of a systematic approach to the use of recyclables by S.N.Bobileva, T.N.Vdovina, I.G.Gafarova, V.V. Is mentioned in the works of Devyatkmun, P. A. Fokin, I. M. Potravni. The research of A.M. Arkhipov, A. I. Bexter, I. B. Brey, V. D. Lashkhi, N. M. Stavitsky was devoted to the problem of the formation of new technologies for the regeneration of used oils.

The issues of the use of regenerated lubricants in the system of rational environmental management in the field of agriculture were discussed by a number of scientists, including F. Blankenship, S. Gebarin, N. Goldstein, O. Gürtner, K. Connie, E. Lacoste, W. Patrick, P. Statuilla, he was included in the works of D. Troyer, M. Farrell, P. Edward.

Despite the fact that the results of these studies play an important role in solving the problem under consideration, insufficient attention has been paid to improving the environmental friendliness of the process of using secondary raw materials for the agricultural economy. The potential of environmental technologies has not been evaluated.

The purpose of the stage is to assess the technological intensity of the territory and anthropogenic impact in the direction of improving the working conditions of machine operators and improving environmental safety.

Object of Research and Methodology

An assessment of the factors affecting the environment shows that it is impossible to ensure the sustainable development of production without solving the resource and environmental problems of the region. The sustainable development strategy should take into account the resource and environmental problems of the region when making decisions on the direction and pace of socio-economic development. It should be noted that nature itself is a degraded resource, and also has the ability to restore environmental components and purify it from pollution. Here, taking into account the anthropogenic impact, the most important potential indicator of self-restoration of nature is considered to be the ecological technology intensity of the territory.

GCT is a generalized characteristic of the territory corresponding to the ability to withstand shock loads and preserve the recipient and ecological systems without disturbing structural and functional properties for a long period of time (years). On the one hand, GCT reflects the ability of the natural system to recover from the resources taken from it and neutralize the harmful anthropogenic impact, and on the other hand, it reflects the maximum amount of human activity that can be released into natural cycles. It is known that without an assessment of this indicator, it is impossible to develop a scientifically based system of restriction (regulation) of life safety.

When determining this parameter, the limit for determining the integral indicator of man-made load was used. The maximum man-made load is considered to be the maximum load that the natural system of the region will experience. The method is used to calculate the values of the ecological volumes of air, water and soil and the ecological technology intensity of the territory.

The report is based on empirically verified estimates. Therefore, GCT is found as a share of the total volume, determined by the coefficients of variation of the trends of its natural variations.

The reason for the increase in the level of change of this level is that the stability of the natural complex of the territory has reached the value of hudud due to anthropogenic (man-made) impact.

According to the methodology, the GCT can be calculated using the following formula:

$$H_T = \sum_{i=1}^{3} Ə_i \cdot X_i \cdot Ʈ_i \qquad (i=1, 2, 3) \qquad (1)$$

Where:

H_T- the price of the ecological technological capacity of the territory is measured in units of artificial load mass, conditional tons / year..

$Ə_i$- environmental volume price of the environment ton/year.

X_i - coefficient of natural changes in the presence of the main substance in the environment (natural changes of oxygen and carbon dioxide in the air: $X_{air} = 3 * 10^{-5}$; for water: $X_{water} = 4 * 10^{-5}$; for soil: $X_{soil} = 0.06$.

$Ʈ_i$ conditional tone conversion coefficient relative hazard coefficient of mixtures: for air $Ʈ_{air}$ = 0.46 conditional ton/ton; for water $Ʈ_{water}$ = 0.3 conditional ton/ton; for soil $Ʈ_{soil}$ = 0.37 conditional ton/ton.

The ecological volume for each component of the environment is calculated by the following formula:

$$Э = VCF, \qquad ton/year \qquad (2)$$

Where:

Э-the ecological volume, measured, tons/year.

V- the extensi e parameter is determined by the dimensions of the area. $V_{air} = 1930.5$ km^3; $V_{water} = 35$ km^3; $V_{soil} = 143000$ km^3.

C-the main environmental significance of the substance (oxygen, carbon dioxide in the atmosphere and water): $C_{air} = X_{air} = 3 * 10^5$ ton/km^3; C_{water} = 109km^3; quantity of carbon in soil: C_{soil} = 9472 ton/km^3, surface biomass density in the area).

F-refresh rate of volume or mass of the environment by years^{-1}. F_{air} = 591.25years^{-1}; F_{water} = 7.13 years^{-1}; F_{soil} = 0.14 years^{-1}.

The actual man-made load (U) on the territory of the region is determined by the average annual consumption of primary energy resources. The ratio of the actual load to the ecological technocompatibility of the area ($K = \frac{U}{GCT}$) indicates the environmental hazard of the region.

If the risk of danger (environmental hazard coefficient K-environmental risk, K = 0,5 – 1) or ecological crisis is K>1 (norm K<0,5), then the development of projects should be carried out to neutralize negative effects and eliminate the negative effects of man-made sources at the expense of natural resources of the region.

As can be seen, the level of environmental danger depends on two indicators: the ecological technocompatibility of the territory and the actual load on the nature-ecosystem. GCT is a stable indicator and characterizes the self-recovery potential of the selected region. This means that the actual man-made load must be reduced in order to overcome the environmental crisis.

Research results and discussion

Impact of machinery. In accordance with the objectives of the study, samples of soil, water and plants from the flat and sloping agricultural territories of the Northwestern zone of the country (Geranboy, Yevlakh, Agdash, Sheki, Gakh, Samukh, Geigel) were taken for analysis and analyzed in the relevant laboratories of the university.

An analysis of the availability of mechanization tools showed that the number of combine harvesters has not increased in twenty years, but, on the contrary, decreased. Accordingly, the load on the harvester has increased. In recent years, there has been an increase in the propensity of enterprises to purchase collector equipment. It is expected that the fleet will expand in the near future.

During the period under study, the supply of grain harvesting, tractor equipment and varieties to the machine-building market of foreign countries, including our republic, increased.

However, during the operation of the enlarged equipment, the harmful effects on the environment increase. This includes, in particular:

- Pollution of the atmosphere by export gases;
- the loss of weed seeds on the field surface;
- the fall of fuel, waste oils, hydraulic fluids and other means of mechanization to the ground;
- pollination of the non-grain part of the product;
- the occurrence of soil compaction, the creation of conditions for increased soil erosion.

Exhaust and crankcase gases of internal combustion engines are one of the main sources of pollution. The most dangerous compounds for the environment are nitrogen oxides, soot, aldehydes, carbon oxides, sulfur oxides, carbohydrates, benzapyrene contained in exhaust gases. The toxicity of carbohydrates (C_nH_m) is 3.2 times higher than that of carbon monoxide (CO). The toxicity of sulfur oxide (SO_4) is 22 times higher, and the toxicity of nitrogen oxide (NO_x) is 41 times higher than that of carbon monoxide. The proportion of nitrogen oxides and particulate matter (soot) in the total toxicity of diesel engines exceeds 95%. The toxicity of solid particles is explained by the fact that soot, which is non-toxic in itself, adsorbs heavy metals, as well as carcinogenic and mutagenic carbohydrates. More energy-efficient combines use more fuel to harvest 1 ton of grain [1]. As a result, more exhaust gases are released into the environment. Thus, burning 1 kg of fuel in a diesel engine means releasing 20-27.3 kg of exhaust and crankcase gases into the atmosphere.

Based on the technical characteristics of the engines of most combine harvesters, it has been established that they have significantly more power than is required in local conditions. It is possible to reduce the engine power in the total number of revolutions of the crankshaft relative to the nominal one by combining the fuel-air mixture. However, as a result, with an increase in the content of nitrogen oxides in exhaust gases, the toxicity of common exhaust gases also increases. The low quality of diesel fuel also affects the increase in the toxicity of export gases.

In existing combines, the non-grain vegetable part of the crop, along with weed seeds, is not collected during stubble harvesting, the stubble is either placed in a vibrating shake, or crushed and scattered across the field. Processing the plant part of the product according to this scheme leads to the fact that the seeds of all weeds remain in the field and spread. In addition, crushing stubble in the field leads to excessive dusting of the air around the combine.

Increasing the volume of the fuel tank to 800-1000 liters and the fact that these tanks are not so durable increases the possibility of fuel falling to the ground.

In agricultural production, soil compaction by mobile aggregates is a separate problem. Increasing the operational weight of high-performance combines (26...30 tons) is associated with an increase in the volume of bunkers. At the same time, an increase in the load on one wheel of the walking part of the combines (10,2....12,2) $\cdot 10^4$ H is about 10.4....12.5 tons. The recommended tire sizes for this type of load are as follows: for Claas model Lexion 580,600, the load on the drive wheel is 11.7...12.5 tons, the tire size is 650/75R34 (or 680/75R32); For the New Holland CX980,8090 model, the load on the drive wheel is 11.7...12.5 tons, tire sizes 620/75R34 (or 650/75R32); For the New Holland CR980,9080 model, the load on the drive wheel is 11.2...12 tons, tire sizes 620/75R34 (or 650/75R32); For the model John Deer the load on the drive wheel is 10.8...11.6 tons, the tire sizes are 710/65R32 (or 800/65R32).

In operation, even the most powerful combines are often equipped with tires of 800/65R32 and 30.5LR32 dimensions. Tires with profile widths of 620, 650, 680, 710 mm and especially 900 and 1050 mm are rarely used due to insufficient bearing capacity (620...710). Therefore, combined tires are rarely used in combines. Due to the rules and conditions of the road, it is not allowed to use wide-gauge tires (900...1050 mm), as well as paired tires, since they cause a large load on the axle of the driving wheels.

To ensure the necessary bearing capacity of the tires (800/65R32 and 30.5LR32), a pressure of 0.24...0.28 MPa is provided in the tires of high-power mowers. In a corn harvester, this pressure was assumed to be 0.3.0.34 MPa..

In order to minimize the impact of the tread parts on the soil, the maximum pressure standards for the tread parts of mobile units are determined as follows: Depending on the lowest moisture capacity in the soil layer of 0-250 mm, the maximum pressure given by a wheeled tractor to the soil varies from 99 kPa to 229 kPa for the driving wheels. According to the results obtained, the pressure of the driving wheel on the soil is 211 kPa at a minimum humidity (MH) of less than 0.50, 178 kPa at 0.5-0.6 MH, 140 kPa at 0.6 0.7, 0.7 kPa- It was 119 kPa when it was 0.9, and 99 kPa when it was above 0.9. 100% (minimum humidity) occurs when the relative humidity of the soil is from 20% (in light soils) to 40% (in clay soils).

The initial requirements for technological operations with basic machines in the cultivation of agricultural crops are defined in a specific range of pressure of combine harvesters on the soil of 150 kPa (80...100 kPa with a minimum moisture content (MC) of 0.6). Soil moisture levels for different zones of the republic are as follows: Goygol district: 0.4-0.75 MC, Geranboy district: 0.55-0.85 MC, Yevlakh district: 0.55-0.9 MC, Sheki district: 0, 4-0,75 MC, Gakh district: 0.45-0.75 MC.

The load on one driving wheel of combines in the USA and Western Europe with a density of 6.5-7 kg per second ranges from $7.3 \cdot 10^4$ to $9.5 \cdot 10^4$ N under the above conditions of the soil

MC. When replacing the tires of the walking part with 800/65R32, the maximum ground pressure is 180...240 kPa. At a depth of 0.5 m, the normal voltage ranges from 60 to 88 kPa.

The maximum pressure on the soil is 280...350 kPa with a load drop of 10.8...12 tons on the drive wheel in combine harvesters with an unloading capacity of 8.5...12 kg /sec and a hopper volume of 10 hp ...12 m^3, the normal voltage at a depth of 0.5 m is 100...120 kPa. At 0.6 MC, the maximum pressure above normal values increases by 1.9...2.3 times, and at a humidity of 0.7-0.9 ECN - by 2.8-9.5 times. With a mower width of 9 m, 20% of the soil is re-compacted.

Another problem is soil contamination with oils processed by machinery. When 1 liter of waste oil is spilled on the ground, from 100 to 1000 tons of groundwater become undrinkable. Used oils are considered a serious threat to the environment [2]. Poisoning occurs when the skin comes into contact with such oils, they enter the respiratory system and digestive system. It should be borne in mind that processed fats, when ingested, are cumulative in nature, and their gradual increase in the body destroys the nutritious roots of plants.

Research in this area shows that there is a great need for affordable innovative solutions for the collection, recovery and disposal of used oils.

The influence of packaging materials. When sampling soil, vegetation and tree leaves for the environmental assessment of traditional agricultural fields, it was noticed that funds of various origins were scattered along the roadsides.

Bottles, cans, cardboard, etc. when packing water and food products. containers made of materials are used [3]. One of the important requirements for them is that they do not react with the finished product. Special polymer materials for water and food products are not produced. Only cold water can be stored in containers made of them for a limited period of time.

Observations have shown that after using such containers, they are thrown onto the side of roads passing by agricultural fields, and for a long time the sun, air oxygen, microorganisms, etc. are there under the influence.

Packaging tools made of new materials, on the one hand, have opened up prospects, but on the other hand, they have created an environmental problem. Tons of packaging materials are currently being used. These products pollute the environment and have a negative impact on people's lives.

These discarded containers, collected at the edges of cultivated fields (usually through irrigation channels), cause an increase in plant diseases, water pollution and crops.

The order of the roads passing along the edge of the agricultural fields of the areas we observed, according to the level of debris contamination, is as follows: Geranboy, Yevlakh, Sheki, Gakh, Samukh, Gei-gel.

It should also be noted that synthetic polymer materials are made from non-renewable natural resources (oil, coal, gas, etc.). Although they are long-lived, they pose a threat to the ecology of the planet in the future. In this area, it is also necessary to develop effective innovative proposals and scientific support.

The natural capacity of the technosphere. An important indicator of the effectiveness of the natural-spiritual system is the natural capacity of the technosphere [4,5]. This indicator characterizes the type and level of ecological and economic development. Dynamically, this indicator is considered the most effective criterion for sustainable development among the criteria for reducing the natural capacity of economic activity.

Two types of natural capacity are characteristic:

● The specific consumption of natural resources per unit of the final result (final product). Here, the natural potential depends on the efficiency of the use of natural resources in the entire production chain. It combines primary natural resources, a product created on their basis (processes directly related to the transformation of natural material at the last stage of the technological process);

● The specific cost of environmental pollution per unit of the final result (final product). This indicator can also be taken as the intensity of environmental pollution by various gases and wastes. The value of this indicator depends on the level of waste-free technology and the efficiency of wastewater treatment plants.

The two levels of the natural capacity indicator can be considered separately. One is at the level of the entire economy: the macro level and the product level: at the level of the production sector. In the first case, the indicator of natural capacity may reflect macroeconomic indicators: consumption of natural resources, the amount of waste per unit of gross domestic product. Their unit of measurement can be taken in value form (person/person) or in kind (ton/person).

The second level of natural capacity (can be determined at the product or production area level).

Here, the consumption of natural resources for the volume of final products (V) is taken (for example, the acreage required to produce 1 ton of grain). In fact, it consists in evaluating the effectiveness of the nature-product system, which combines the primary natural resource with the final product.

At the same time, the lower the indicator of natural capacity, the more efficient the process of converting natural material into the final product.

Alternatively, you can take the amount of pollution per unit of use of natural resources or per person.

The advantage of this indicator is that it helps to compare the dynamics of technological improvement, the level of modernization and the economic structures of regions with each other, as well as with other countries.

A comparison of prices obtained in the studied regions with the corresponding prices of developed countries showed that prices differ significantly in terms of natural capacity. However, with the experience of developed countries and innovative work, it is possible to reduce the capacity of nature by 2-3 times both at the macro level and at the level of the production area.

Assessment of the technical loading of the territory. The model proposed by Professor Forester from the Massachusetts Institute of Technology, USA, was used as a methodological basis in this study. The model is expressed as follows:

$$\text{TH} \leq \text{ƏTT}, \qquad (3)$$

where,

TH- the natural capacity of the territory (production area).;

ƏTT-the ecological capacity of the territory. It reflects the self-healing potential of the natural environment. The quantity indicates the technical stability of the room to loads (without changing its structural and functional characteristics) for a certain period of time..

There are two approaches here. In the first case, as TH – which territory is occupied by technological processes (ha); TT – shows which part of the territory is able to recover with the use of technologies (artificial load-bearing territory).

And the coefficient of environmental hazard:

$$K = \frac{U}{ӘTT} \qquad (4)$$

where,

K -the ecological risk factor,

U -the technogenic load on the area in tons/hectare. year,

ӘTT -the ecological load-bearing capacity of the land in tons/hectare. year.

Among the researched regions, the highest pollution was observed in Goranboy district. The results obtained for the district area are as follows: total area – 916 km^2; solid waste in the air – 0.02 km^2; water consumption in rivers – 0.04 m^3/s; average annual biomass – 5000 tons/km^2.

The ecological technological index for the year 2022 is as follows:

1) For the atmosphere: \(ӘTT = 39100\) tons/year; \(TH = 14500\) tons/year; \(K = 0.4\)
2) For the hydrosphere: \(ӘTT = 1430\) tons/year; \(TH = 8710\) tons/year; \(K = 0.58\)
3) For the lithosphere: \(ӘTT = 833000\) tons/year; \(TH = 525400\) tons/year; \(K = 0.44\)

The results obtained show that the hazard coefficient in the hydrosphere is high. This is due to the absence of industrial and domestic wastewater treatment plants at most facilities. In general, the environmental hazard coefficient in all directions is not yet in a crisis state, but it tends to it. The characteristic of the distribution of indicators suggests the presence of such a trend.

The report shows that the price situation in other regions is unsatisfactory. The anthropogenic load indicates the need to improve the environmental situation in the regions. The technogenic load exceeds the ecological technological capacity of the territory.

At the same time, it should be noted that the demographic volume in the studied territories is not violated. This can be explained by the presence of lands in this territory that are not used in agriculture for the settlement of the population. The presence of tourist attractions in the area can double the demographic burden. This indicates that the resort and tourism potential of the region is still not being used enough.

The disposal of technological and household waste has not been solved. Therefore, the state of the environment is not considered satisfactory.

Air pollution is affected by mobile and stationary sources. The indicator of traffic congestion in the territory is 0.53..... 1000 people The number of vehicles per is 0.51. The density of highways is estimated at 0.34. According to these indicators, the state of the environment has not been assessed satisfactorily in the Gornaboy, Agdash and Yevlakh districts.

Air pollution from stationary sources is estimated at 0.93, which can be considered satisfactory.

The levels of dangerous pollution of surface waters change over time, and drinking water sources need to be protected.

CONCLUSION

Considering the above, it can be concluded that in order to improve the environmental situation in the studied territories, minimize the penetration of the noxosphere into the anthroposphere, characterize innovations in the direction of safety, technological and technical improvements, machine operators and the environment are the conditions created..

COMPETING INTERESTS

The authors have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

Manuscript has no associated data

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